Total No. of Questions : 8]

SEAT No. :

P2069

[Total No. of Pages : 2

[4165] - 142

M.E. (Electronics) (Digital Systems)
(Electronics and Telecommunication) (Instrumentation)
EMBEDDED SYSTEM DESIGN
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answers to the two sections should be written in separate answer Papers.***
2) ***Answer any three questions from each sections.***
3) ***Figures to the right indicates full marks.***

SECTION - I

Q1) a) What is an embedded system? List and define the main characteristics of embedded system that distinguish such system from other system. **[8]**

b) Compare microprocessor and microcontroller. **[8]**

Q2) a) With the help of block diagram explain the architecture of 8051. **[8]**

b) Explain the different addressing modes of 8051. **[8]**

Q3) a) With memory map explain internal memory organization of 8051. **[8]**

b) Explain the Thumb mode of ARM microcontroller. **[8]**

Q4) Write short notes on : **[18]**

a) PCI bus

b) Logic analyzer

c) SPI bus

SECTION - II

Q5) a) Explain different modes of operation of ARM Processor, along with its advantage and disadvantages. **[8]**

b) Explain memory organization of ARM. **[8]**

P.T.O.

Q6) a) Explain the functions of linker, loader, simulator and emulator. **[8]**

b) List the features of 12C bus protocol. Explain how peripherals are addressed in 12C. **[8]**

Q7) a) Differentiate between embedded operating system and real time operating system. **[8]**

b) What are functional and nonfunctional requirements during development of embedded system? **[8]**

Q8) Write short notes on : **[18]**

a) RTOS.

b) RISC and CISC architecture.

c) Architecture of PIC microcontroller.

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Total No. of Questions : 8]

SEAT No. :

P2070

[Total No. of Pages : 2

[4165] - 152
M.E. (Electronics) (Digital Systems)
NETWORK SECURITY SYSTEM
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer 3 questions from Section - I and 3 question from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the different types of attacks in computer networks? **[4]**

b) What are the different security Services / Requirements? **[8]**

c) Explain the concept of Block cipher and Key Management. **[4]**

Q2) a) What is network management security and what is role of SNMP protocol. **[4]**

b) Compare SNMPv-1 and SNMPv-2. **[4]**

c) Explain the different types of intruders and Viruses in detail. **[4]**

d) What are the merits of Oakley key determination protocol over diffie-Hellman key exchange? What are clogging attacks? **[4]**

Q3) a) What are the different Hash function requirements? Explain HMAC in detail. **[6]**

b) What is Digital signature concept? **[4]**

c) Explain the design principles of firewall system. **[4]**

d) What is Layer-3 firewall? **[2]**

P.T.O.

Q4) Write short note on any three : **[18]**

a) RSA algorithm.

b) AES algorithm.

c) Authentication and Authorization.

d) Cryptography model.

SECTION - II

Q5) a) Explain the following in detail. **[6]**

- IP security Architecture.
- Authentication on header.

b) Explain the following in detail. **[6]**

- Encapsulation of Security Payload.
- Combining security association.

c) Explain the Denial of service attack with suitable example. **[4]**

Q6) a) What are different attacks with respect to 7-Layer Network model? **[6]**

b) Explain Diffie-Hellman algorithm in detail and compare with RSA algo. **[8]**

c) List the different security products used now days. **[2]**

Q7) a) Explain the DES algorithm in detail. **[6]**

b) Explain IPSec. Briefly. **[6]**

c) Explain PGP briefly. **[4]**

Q8) Write short note on any three : **[18]**

a) S/MIME.

b) Secure Electronic Transaction (SET).

c) X. 509 formats.

d) Group attacks on Hash functions and MACs.

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Total No. of Questions : 8]

SEAT No. :

P2033

[Total No. of Pages : 2

[4165] - 218

M.E. (Petroleum)

HORIZONTAL AND MULTILATERAL DRILLING

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Casing size = 9.625 inch, drift diameter = 8.55 inch, depth of casing is 9800 ft, maximum surface pressure = 6400 psi, fracture gradient at 9800 ft = 17.8 ppg, maximum anticipated mud weight = 13 ppg, mud weight set = 10.7 ppg. Cement top = 6900 ft from surface, cement slurry weight = 16.4 ppg, casing pipe selected as weight = 43.5 ppf, P110. Burst pressure = 8700 psi. Collapse pressure = 4430 psi.
Plot burst load line, and collapse line. Check selected casing pipe with respect to collapse, burst and tension. Take Buoyancy factor = 0.875. **[18]**

Q2) a) What is neutral point in a casing? Write design considerations for Casing. **[8]**

b) Discuss geotechnical order for drilling program of horizontal wells. **[8]**

Q3) a) A 'S' type profile is planned for the well having V_t = 11,000 ft, Ht = 4100 ft , BUR = 2.2° per 100 ft and DOR = 2° per 100 ft. Inclination at the end of the drop off section is to be zero at TVD = 9100 ft. If inclination over tangential section is not exceed 50° what is the deepest kick off point that will meet the requirements of the well? **[10]**

b) Explain window cutting operation. **[6]**

Q4) a) Write the different types of deflection methods used in drilling. **[4]**

b) Explain any one type of survey tool. **[4]**

P.T.O.

c) Discuss minimum curvature method widely used in oil industry to measure well path. Find increments ΔV, ΔN and ΔE using following data. **[8]**

Measure depth (ft)	inclination ($\propto$)	Azimuth (β)
2100	2.0	45
2190	4.5	50

Dog leg angle = 1.3°

SECTION - II

Q5) a) A drill string consists of 800 ft of 8.25" x 2-13/16" drill collar and rest is 5" drill pipe, 19.5 ppf X-95 grade drill pipe. If required MOP is 90000 lb and mud weight 12 ppg, calculate maximum depth of the hole that can be drilled when using new drill pipe. P_t = 200000 lb.
Steel density = 489.5 ppf and B. F. = 0.837. **[8]**

b) Write short note on any one of the following : **[10]**
i) Types of bit. ii) BHA.

Q6) Discuss in detail primary cementation process along with various equipments, neat schematic sketch and it's merits, demerits. **[16]**

Q7) a) Explain the importance of optimum hydraulics during cementation. **[8]**

b) While drilling 8.5" hole following parameters and observed. **[8]**
Pump pressure = 2400 psi
Bit pressure loss = 1200 psi
Mud weight = 10 ppg
Calculate,
i) B. H. H. P. ii) BHHP/ sq. in hole she.

Q8) a) Write short note on, **[10]**

i) Coiled tubing drilling. ii) Primary well control.

b) Discuss any one type of multilateral well completion technique. **[6]**

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Total No. of Questions : 10]

SEAT No. : ____

P2038

[Total No. of Pages : 4

[4165] - 234

M.E. (Instrumentation) (Process & Biomedical)

ADVANCED MATHEMATICS

(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With usual notation, prove that (any two): **[6]**

i) $\Delta = \frac{\delta^2}{2} + \delta . \sqrt{\left(1 + \frac{\delta^2}{4}\right)}$

ii) $(1 + \Delta)(1 - \nabla) = 1$

iii) $\nabla y_{n+1} = h \left[1 + \frac{\nabla}{2} + \frac{5}{12}\nabla^2 + ... \right] y_n$

b) The pressure P of wind corresponding to velocity V is given by the following data. Estimate P when V = 25. **[10]**

V :	10	20	30	40
P :	1.1	2.0	4.4	7.9

Q2) a) The corresponding value of x and y are given by following table : **[8]**

x :	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y :	1.1	1.3	1.6	2.0	2.7	3.4	4.1

Fit a parabola of the form $y = a + bx + cx^2$.

b) Find by Newton - Raphson method, the real root of the equation $3x = \cos x + 1$. **[8]**

P.T.O.

Q3) a) Apply Runge - Kutta method to find approximate value of for $x = 0.2$ in steps of 0.1 if $x + y^2 = \frac{dy}{dx}$, given that $y = 1$ where $x = 0$. **[8]**

b) Solve, by iteration method, the following equations **[9]**

$20x + y - 2z = 17$
$3x + 20y - z = -18$
$2x - 3y + 20z = 25$

Q4) a) Given that : **[8]**

x :	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y :	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find $\frac{dy}{dx}$ and $\frac{dy^2}{dx^2}$ at $x = 1.6$.

b) The velocity v (km / min.) of a moped which starts from rest, is given at fixed intervals of time t (min.) as follows : **[8]**

t :	2	4	6	8	10	12	14	16	18	20
v :	10	18	25	29	32	20	11	5	2	0

Estimate approximately the distance covered in 20 minutes by appropriate method of numerical integration.

Q5) a) Apply Lagrange's interpolation formula, to find the value of y when $x = 10$, from the following table : **[6]**

x :	5	6	9	11
y :	12	13	14	16

b) Given: **[6]**

θ :	0°	5°	10°	15°	20°	25°	30°
tan θ :	0	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774

Using Stirling's formula, show that $\tan 16° = 0.2867$.

c) Express $y = 2x^3 - 3x^2 + 3x - 10$ in factorial notation and hence find the value of $\Delta^3 y$. **[5]**

SECTION - II

Q6) a) Velocity distribution for a fluid flow is given by $u = -x$, $v = 2y$ and $w = 3 - z$. Find the equation of stream line passing through the point (1, 1, 2). **[6]**

b) Prove that Euler's dynamical equations of motion is given by **[10]**

$$\int \frac{dp}{\rho} + \Omega + \frac{1}{2}(\bar{q})^2 - \frac{\partial \phi}{\partial t} = \text{constant}$$

Where ρ be the density, P the pressure, Ω the force potential, ϕ the velocity potential and $\bar{q}$ the velocity of the fluid.

Q7) a) If ρ and $\bar{v}$ are the density and velocity of a moving fluid then derive the equation of continuity of fluid dynamics namely $\nabla.(\rho\bar{v}) + \frac{\partial p}{\partial t} = 0$.

Also show that the above equation of continuity can be rewritten as

$$\rho\nabla.\bar{v} + \bar{v}.\nabla\rho + \frac{\partial p}{\partial t} = 0. \quad \textbf{[10]}$$

b) If a fluid is at rest, $\frac{d\bar{q}}{dt} = \bar{0}$, show that $\nabla \times (\rho\bar{F}) = 0$ and hence $\bar{F}$. curl $\bar{F} = 0$. **[6]**

Q8) a) The density function of the time to failure of an appliance is $f(t) = \frac{32}{(t+4)^3}$, $t(>0)$ is in years : **[6]**

i) Find the reliability function R(t).

ii) Find the failure rate $\lambda(t)$.

iii) Find the MTTF.

b) A device has a decreasing failure rate characterized by a two - parameter weibull distribution with α = 180 years and β = 0.5. The device is required to have a design life reliability of 0.90. **[6]**

i) What is the design life, if there is no wear - in period?

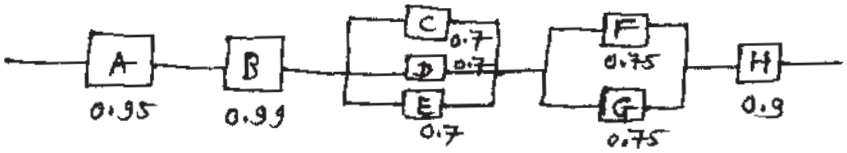
ii) What is the design life, if there is a wear - in period of 1 month in the begining ?

c) A component has MTBF = 100 hours and MTTR = 20 hours with both failure and repair distributions exponential. Find the availability and unavailability of the component after a long time. **[4]**

Q9) a) A system may be found in one of the three states : **[8]**
operating, degraded or failed. When operating, it fails at constant rate of 1 per day and becomes degraded at the rate of 1 per day. If degraded, its, failure rate increases to 2 per day. Repair occurs only in the failed mode and restores the system to the operating state with a repair rate of 4 per day. If the operating and degraded states are considered the available states, determine the steady - state availability. If $\lambda_1 = 1; \lambda_2 = 2; \lambda_3 = 3$ and $\mu = 10$, find the steady - state availability.

b) Six identical components with constant failure rates are connected in. **[8]**
i) High level redundancy with 3 components in each subsystem.
ii) Low level redundancy with 2 components in each subsystem.
Determine the component MTTF in each case, necessary to provide a system reliability of 0.90 after 100 hours of operation.

Q10) a) Obtain the expressions for the reliabilities of **[9]**
i) Series system and
ii) Parallel system.
Using them find out the reliability of the system given below:



b) The time to repair a power generator is best described by its p.d.f.
$m(t) = \frac{t^2}{333}$, $1 \leq t < 10$ hours.
i) What is the MTTR?
ii) Find the repair rate.
iii) Find the probability that a repair will be completed in 6 hours. **[9]**

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Total No. of Questions : 8]

SEAT No. :

P2040

[Total No. of Pages : 2

[4165] - 249

M.E. CSE (Information Technology)

OPERATING SYSTEMS

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the Bully and Ring election algorithms. Discuss the time complexity for both algorithms. **[8]**

b) Describe the implementation of logical clocks using : **[8]**

i) Counters

ii) Physical clocks

Q2) a) Explain what is meant by absolute ordering, consistent ordering and causal ordering of messages. Give a mechanism to implement each one. **[10]**

b) What are the desirable features of a good message passing system? **[8]**

Q3) a) Describe four distributed computing system models with the help of neat diagrams. **[8]**

b) Discuss the reasons why distributed computing systems are gaining popularity. **[8]**

Q4) a) Implement the Reader Writer problem using semaphores and discuss how the critical section requirements are fulfilled. **[8]**

b) Define the following terms : Virtual memory, Thrashing. Explain how address translation takes place with the help of neat diagrams in paging.**[8]**

P.T.O.

SECTION - II

Q5) a) Discuss the desirable features of a good process migration mechanism. **[8]**

b) Discuss the relative advantages and disadvantages of implementing a thread package in user space and in the kernel. **[8]**

Q6) a) How does the Gifford Quorum based protocol handle the network partition problem and increase the availability of write operations at the expense of read operations? **[8]**

b) Explain the three cache location policies. Which of these policies can be preferred to extend scalability and reliability? **[8]**

Q7) a) Discuss the various data locating mechanisms that are used in a DSM system that uses the NRMB strategy. **[8]**

b) Discuss the two protocols that are used to ensure sequential consistency in a DSM system that uses the RMB strategy. **[8]**

Q8) Write short notes (Any three) **[18]**

a) Fault tolerance

b) Ricart Agrawala algorithm.

c) Group communication.

d) LRPC.

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Total No. of Questions : 10]

SEAT No. :

P2041

[Total No. of Pages : 2

[4165] - 251

M.E. CSE (Information Technology)

SOFTWARE ENGINEERING

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) If you were developing a security-critical system, how would you integrate the security requirements engineering and assurance processes into the model? **[8]**

b) What is RAD model? Explain the need for it in current industry scenario. What are major issues with this model? **[8]**

Q2) a) Explain why the process of project planning is iterative and why a plan must be continually reviewed during a software project. **[8]**

b) What do you mean by process maturity? With the help of neat labeled diagram explain Capability Maturity Model? **[8]**

Q3) a) What is PERT / CPM technique? How is this technique useful in software project planning? Explain it with suitable example. **[8]**

b) Software requirement analysis is unquestionably the most communication intensive step in the software engineering process. Why does the communication path frequently breakdown? **[8]**

Q4) a) Explain forward engineering for Client Server Architecture. **[8]**

b) What is change control? Explain the procedure of change control process? **[8]**

P.T.O.

Q5) a) Define TQM. Explain in brief quality planning and quality improvement. **[8]**

b) What are the components of project plan? Explain. **[10]**

SECTION - II

Q6) a) Explain why an object oriented approach to software development may not be suitable for real time systems. **[8]**

b) What are design Patterns? What are different elements of design pattern? **[10]**

Q7) a) How do components differ from objects? Why does object-oriented design become easier when a new abstract entity, component, is added between subsystems and objects? **[8]**

b) Write a short note-Object Oriented Software Life Cycle Model. **[8]**

Q8) a) Define dependability of a Computer System. What are the four principle dimensions of dependability? **[8]**

b) With suitable example, explain fault free analysis in critical system. **[8]**

Q9) a) Explain how CMM encourages continuous improvement of software process. **[8]**

b) Write a short note-Software Version and Software Release. **[8]**

Q10) a) State and explain different organizational paradigms for software Engineering teams. **[8]**

b) What are the guidelines for achieving design quality and quality attributes? What is abstraction? What is the importance of modularity? **[8]**

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Total No. of Questions : 8]

SEAT No. :

P2049

[Total No. of Pages : 2

[4165] - 291
M.E. (Chemical Engg.)
ADVANCED THERMODYNAMICS
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculators and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How is the effect of centrifugal field and gravitational field considered? **[12]**

b) Explain chemical potential and its importance. **[6]**

Q2) a) Compare the transitions of I & II order. **[8]**

b) Explain solid-liquid equilibrium. **[8]**

Q3) a) Explain the phenomenon of superconductivity and how it can be achieved. **[10]**

b) What is LCST and UCST? **[6]**

Q4) a) Explain exergonic and endergonic processes. **[4]**

b) Describe the thermodynamics in the biochemical processes of glucose phosphorylation and ATP hydrolysis. **[12]**

SECTION - II

Q5) a) Compare classical and statistical thermodynamics. **[6]**

b) What is meant by a statistical analogue? Explain with an example. **[12]**

P.T.O.

Q6) a) What are weak and strong electrolytes? **[4]**

b) What is the isopiestic method? Where is it used? **[12]**

Q7) a) Compare open and closed systems. **[6]**

b) Explain De Donder's inequality. **[10]**

Q8) Explain the following : **[16]**

a) Degeneracy.

b) Ensemble.

c) Canonical ensemble.

d) Reaction coordinate.

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Total No. of Questions : 8]

SEAT No. :

P2082

[Total No. of Pages : 4

[4165] - 401
M.E. (Civil/Const. & Mgmt.)
MATHEMATICS (PMSMAIC)
(2008 Course) (Sem. - I)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Attempt any three questions from section - I and three questions from section -II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) A contractor has kept the data as regards delay of his works and the penalties, which he had to pay, on 6 of his earlier executed construction projects. The data is as follows :- **[18]**

Project	Delay time in (months)	Penalty in (Rs)
1	32	23,00,000
2	4	30,000
3	16	15,00,000
4	7	1,50,000
5	12	7,00,000
6	27	18,00,000

Using Monte Carlo Simulation, simulate the mean delay and the mean penalty which he should consider for his next 8 works.

Q2) a) With the help of any example, explain how the methods of dispersion are useful in the quality control of any construction work. **[8]**

b) Two material suppliers have been evaluated for delivering materials on time. The following values are obtained.

P.T.O.

Supplier A $\rightarrow$ p = 0.7, q = 0.3

Supplier B $\rightarrow$ p = 0.4, q = 0.6

Determine the probability of both the suppliers delivering 10 deliveries on time, out of 30 deliveries. **[8]**

Q3) a) A tenderer is bidding for construction works averagely 8 numbers in a year for the past 4 years. Find the probability that **[10]**

i) he gets at least 6 works.

ii) he does not get more than 2 works.

iii) he gets all the works.

iv) he gets exactly 4 works

v) he does not get any work.

b) Explain concept of equipment sizing and matching with an example. Explain how and what data needs to be generated to use the queuing theory model, with any construction example. **[6]**

Q4) Explain with examples :

a) Normal distribution applications in Civil Engg. **[5]**

b) Nunally model **[3]**

c) Failure cost profile and Vorster - Sears model. **[8]**

SECTION - II

Q5) Determine Karl Pearson's Coefficient of correlation and its probable error for the following data set. **[18]**

Sr.No.	Compressive Strength N/mm^2	W/C ratio
1	55	0.34
2	42	0.36
3	49	0.36
4	60	0.28
5	40	0.38
6	52	0.33
7	45	0.31
8	58	0.27
9	60	0.30
10	50	0.40

Q6) Based on the analysis of the co-relation coefficient in the above data set, determine the regression equation between the 2 variables. Offer your comments as regards its utility or otherwise. Discuss multiple linear regression analysis. **[16]**

Q7) On a multistoreyed housing building complex involving similar buildings, the contractors data for actual total cost/m^2 of built up area, as well as the actual duration required for building completion is as follows. **[16]**

Building	Cost in Rs./sq.m	Duration of completion
1	12,000	23 months
2	8,550	18 months
3	11,500	23 months
4	7,650	16 months
5	8,000	18 months
6	8,800	19 months
7	9,865	21 months
8	8,200	17 months
9	12,500	25 months
10	8,200	17 months

Determine all the basic dispersion parameters and explain the utility of these parameters to the contractor.

Q8) a) Explain importance of and application of Spearman's rank co-relation coefficient in Human Resource development with an example. **[8]**

b) Explain how the partial co-relation coefficients are worked out and why they are worked out in co-relation analysis. **[8]**

APPENDIX 'C'

TABLE OF RANDOM NUMBERS

39 65 76 45 45	19 90 69 64 61	20 26 36 31 62	58 24 97 14 97	95 06 70 99 00
73 71 23 70 90	65 97 60 12 11	31 56 34 19 19	47 83 75 51 53	30 62 38 20 44
72 20 47 33 84	61 67 47 97 19	98 40 07 17 66	23 05 09 51 80	59 78 11 52 69
75 17 25 69 17	17 95 21 78 48	24 33 45 77 48	69 81 84 09 29	93 22 70 45 80
37 48 79 88 74	63 52 06 34 30	01 31 60 10 27	35 07 79 71 53	28 99 52 01 41
02 89 08 16 94	85 53 83 29 95	56 27 09 24 43	21 78 55 09 82	72 61 88 73 61
87 18 15 70 07	37 40 79 12 38	48 13 93 15 96	41 92 45 71 51	09 18 25 58 94
98 83 71 70 15	89 09 39 59 24	00 06 41 41 20	14 36 59 25 47	54 45 17 24 89
10 08 58 07 04	76 62 60 48 68	58 76 17 14 86	59 53 11 52 21	66 04 18 72 87
17 90 56 37 31	71 82 13 50 41	27 55 10 24 92	28 04 67 53 44	95 23 00 84 47
93 05 31 03 07	34 18 04 52 35	74 13 39 55 22	68 95 23 92 35	36 63 70 35 31
21 80 11 47 99	11 20 99 45 18	76 51 94 84 86	13 79 93 37 55	98 16 04 41 67
95 18 94 36 97	23 37 83 28 71	79 57 95 13 91	09 61 87 25 21	56 20 11 32 44
97 08 31 55 73	10 65 81 92 59	77 31 61 95 46	20 44 90 32 64	23 99 76 75 63
69 26 88 86 13	59 71 74 17 32	48 38 75 93 29	73 37 32 04 05	60 82 29 20 25
41 27 10 25 03	87 63 93 95 17	81 83 83 04 49	77 45 85 50 51	79 88 01 97 30
91 94 50 63 62	08 61 74 51 68	92 79 43 83 79	29 18 94 51 23	14 85 11 47 23
80 06 54 18 47	08 52 85 08 40	48 40 35 94 22	72 65 71 08 86	50 03 42 99 36
76 72 77 63 99	89 85 84 46 06	64 71 06 21 66	89 37 20 70 01	61 65 70 22 12
59 40 24 13 75	42 29 82 23 19	07 94 76 10 08	81 30 15 89 14	81 83 17 16 33
63 62 06 34 41	79 53 36 02 95	94 61 09 43 62	20 21 14 68 86	84 95 48 46 45
78 47 23 53 90	79 93 96 38 63	34 85 52 05 09	85 43 01 72 73	14 93 87 81 40
87 68 62 15 43	97 48 72 66 48	53 16 71 13 81	59 97 50 99 92	24 62 20 42 30
47 60 92 10 77	26 97 05 73 51	88 46 38 00 58	72 63 49 29 31	75 70 16 08 24
56 88 87 59 41	06 87 37 78 48	65 88 69 58 39	88 02 84 27 82	85 81 56 39 38
22 17 68 65 84	86 02 22 57 51	68 69 80 95 44	11 29 01 95 80	49 34 35 86 47
19 36 27 59 46	39 77 32 77 09	79 57 92 36 59	89 74 39 82 15	05 50 94 34 74
16 77 23 02 77	28 06 24 25 93	22 45 44 84 11	87 80 61 65 81	09 71 91 74 25
78 43 66 07 61	97 66 63 99 61	80 45 67 93 82	59 73 19 85 23	53 33 65 97 21
03 28 28 26 08	69 30 16 09 05	53 58 47 70 93	66 56 45 65 79	45 56 20 19 47
04 31 17 21 56	33 63 99 19 87	26 72 39 27 67	53 77 57 68 93	60 61 97 22 61
61 06 98 03 91	87 14 77 43 96	43 00 65 98 50	45 60 33 01 07	98 90 46 50 47
23 58 35 26 00	99 53 93 61 28	52 70 05 48 34	56 65 05 61 86	90 92 10 79 80
15 39 25 70 99	93 86 52 77 65	15 35 59 05 28	22 87 26 07 47	86 96 98 29 06
58 71 96 30 24	18 46 23 34 27	85 13 99 24 44	49 18 09 79 49	74 16 32 23 02
93 22 53 64 39	07 10 63 76 35	37 03 04 79 88	08 33 33 85 51	55 34 57 72 69
78 76 58 54 74	92 38 70 96 92	52 06 79 79 45	82 63 18 27 44	69 66 92 19 09
61 81 31 96 82	00 57 25 60 56	46 72 60 18 77	55 66 12 62 11	09 99 55 64 57
42 88 07 10 05	24 98 65 08 21	47 21 61 88 32	27 80 30 21 60	10 92 35 36 12
77 94 30 05 33	28 10 99 00 27	12 73 73 99 12	39 99 57 94 82	96 88 87 17 91

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Total No. of Questions : 8]

SEAT No. :

P2084

[Total No. of Pages : 2

[4165] - 423

M.E. (Civil) (Hydraulic Engg.)

COMPUTATIONAL METHODS IN HYDRAULIC ENGINEERING

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from section - I and 3 questions from section -II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Solve by relaxation method, the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ inside the square bounded by the lines $x = 0$, $x = 4$, $y = 0$, $y = 4$ given that $u = x^2 y^2$ on the boundary. **[10]**

b) What is finite difference method? Discuss one application of finite difference method with reference to hydraulics. **[8]**

Q2) a) Discuss normal distribution and gamma distribution with the help of neat diagrams and equations. **[8]**

b) Explain simple and multiple regression. **[4]**

c) Write in detail about Markov chain. **[4]**

Q3) a) Solve the boundary - value problem $\frac{\partial^2 y}{\partial x^2} - y = 0$ with y (0) = 0 and y(2) = 3.62686 by finite difference method. **[12]**

b) Discuss solution of Poisson's equation in detail. **[4]**

P.T.O.

Q4) Write short notes on any four of the following. **[16]**

a) Chi-square test

b) Coefficient of correlation.

c) Pearson type I, II and III distribution.

d) Initial boundary value problem.

e) Methods of numerical integration.

SECTION - II

Q5) a) Discuss in detail Gauss - Quadrature method of numerical integration. **[8]**

b) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using **[10]**

i) Trapezoidal rule and

ii) Simpson's rule.

Q6) a) Discuss applications of conformal mapping in classical hydrodynamics. **[6]**

b) Prove that, if $u = x^2 - y^2$, $v = -y/(x^2 + y^2)$, both u and v satisfy Laplace equation, but $u + iv$ is not an analytic function of z. **[10]**

Q7) a) Derive Kutta - Jukowski equation for the flow past a cylinder and prove that $\Gamma = \rho V L$ **[8]**

b) Discuss in detail the family of auto regressive moving average process. **[8]**

Q8) Write short notes on : **[16]**

a) The schwarz Christoffel trans formation.

b) General transformations.

c) Newton - Cotes method.

d) Classification of second order partial differential equations.

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Total No. of Questions : 8]

SEAT No. :

P2088

[Total No. of Pages : 3

[4165] - 432
M.E. (Civil/Structures)
STRUCTURAL MATHEMATICS
(2008 Course) (Sem. I)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Attempt three questions from section - I and three questions from section -II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Using Flexibility method, analyze the two span continuous beam shown. **[12]**

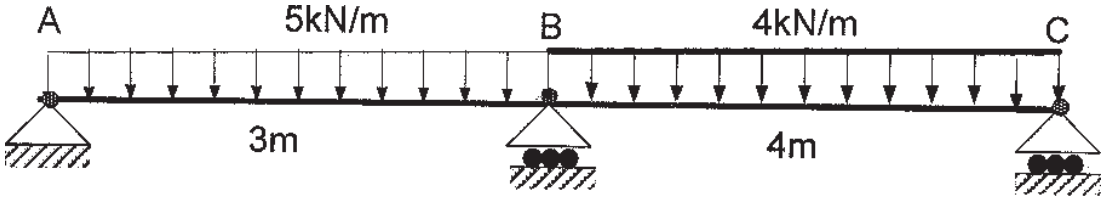

Fig.1.a

b) Explain how the band width and half band width of stiffness matrix of a three storey double bay portal frame can be minimized. **[5]**

Q2) a) Weight of 300 N is attached to end of rod at D. The rod is held by ball and socket joint at B and by two cables AD and CD as shown in the Fig.2.a. Find the displacement of joint D by using stiffness method. **[13]**

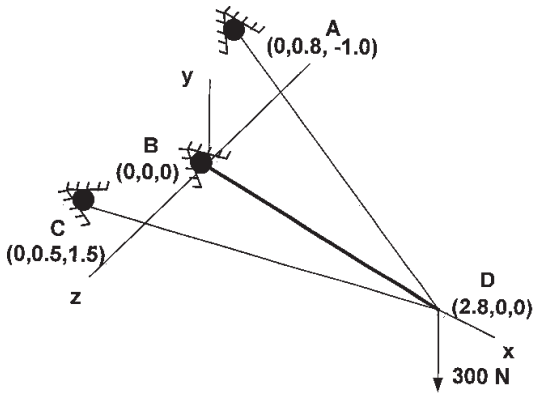

Fig. 2.a

P.T.O.

b) Write short note on Inverse of matrix by partitioning. **[4]**

Q3) a) For a grid member, develop the member stiffness matrix with proper sketches. **[8]**

b) Derive the transformation matrix for the plane frame member. **[8]**

Q4) a) Find an approximate value of y when $x = 0.1$, given that **[7]**

$d^2y/dx^2 + x^* dy/dx + y = 0$ and $dy/dx = 0$ when $x = 0$.

Use Runge-Kutta method of fourth order.

b) Solve the pair of simultaneous equations **[9]**

$dy_1/dx = y_2$, $y_1(0) = 1$

$dy_2/dx = y_1 * y_2 + x^2 + 1$, $y_2(0) = 0$

Estimate the values of y_1 (0.2) and y_2 (0.2).

SECTION - II

Q5) a) A beam simply supported at its end has a span of 6 m and is loaded with uniformly distributed load of 12 kN/m over its full length. Second moment of area of its cross section is I at supports and uniformly increases to 4I at centre. Using nodes at 1 m interval, calculate the deflection at the centre using finite difference method. **[10]**

b) Give the bi-Harmonic Finite difference net for a plate simply supported at its edges. Explain how the boundary conditions are incorporated.**[6]**

Q6) a) Data for values of y at values of x are given below. **[11]**

x	3	5	7	9	11
y	5.39943	6.59468	8.05501	9.83841	12.01666

Using least square method obtain an equation for y in terms x.

b) Write short notes on : **[6]**

i) Spline Fit technique.

ii) Fast Fourier Transform.

Q7) a) Values of y are given at values of x as shown below. **[9]**

x	1.0	1.5	4.0	6.0
y	16.0	22.5	40.0	36.0

Calculate the value of y at $x = 4.5$ using Lagrange interpolation Technique.

b) A flat bar of uniform thickness 10 mm is fixed at one end and free at the other end. It has a width of 240 mm for a length of 1.2 m from fixed end and a width of 120 mm for the next 0.8 m length. Calculate the maximum axial buckling load it can carry. **[8]**

Q8) a) A beam 9 m long simply supported at its ends supports uniformly distributed load of 4 kN/m over the entire length. Find a Fourier expression for the load. Calculate the deflection and bending moment at its centre. **[10]**

b) When the values of y at values of x at uniform interval are known, state how the area under the curve is to be calculated using Simpson's rule and Gauss Quadrature. **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

P2060

[Total No. of Pages : 3

[4165] - 46

M.E. (Mechanical) (Common to Heat Power & Design Engg.)

NUMERICAL METHODS AND COMPUTATIONAL TECHNIQUES

(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) From the following specifications :

a) Power to be transmitted (P) = 10 kW.

b) Bending stress (S) = 200N/mm^2.

c) No. of teeth on pinion (Z_p) = 24.

d) speed of pinion (N_p) = 1440 rpm.

e) Factor of safety (C_s) = 1.25.

f) Tooth width (b) = 10 cm Lewis form factor (Y) = $0.484 - \frac{2.85}{Z_p}$

and $C_v = \frac{3}{3 + \frac{\pi (mZ_p) N_p}{60 \times 10^3}}$

a) Estimate the module of spur gear using.

$$S \times b \times m \times Y = \frac{C_s}{C_v} \times \frac{2T_p}{mZ_p} FS$$ **[12]**

b) Torque of pinion (T_p) in N-mm. **[4]**

P.T.O.

Q2) Solve the following system using Gaussian Jordan (or any other direct method): **[16]**

$$x + y + z = 9$$

$$2x - 3y + 4z = 13$$

$$3x + 4y + 5z = 40$$

Q3) The value of Nusselt number (y) and Reynold's number (x) found experimentally are given below. If the relation between x and y of the type $y = a.x^b$ **[16]**

a) Derive the formula for finding out values of a and b.

b) Find the values of a and b for given values of x and y.

Reynold's No. (x)	3000	4000	5000	6000	7000
Nusselt No. (y)	14.3575	15.6517	16.7353	17.6762	18.5128

Q4) a) Using Newton's divided difference formula, evaluate f (8), and f (15) given **[10]**

x	4	5	7	10	11	13
F(x)	48	100	294	900	1210	2028

b) Determine value of y for x = 8.2 using following data and forward difference formula. **[8]**

x	2	3	4	5	6	7	8	9
y	–14	4	40	100	190	316	484	700

SECTION - II

Q5) Evaluate the integral $\int_0^1 \frac{x^2}{1+x^3}\,dx$ using : **[16]**

a) Trapezoidal Rule

b) Simpson's one-third rule

c) Simpson's 3/8th rule

d) Compare against the exact solution.

Q6) Solve equation $5x\frac{dy}{dx} + y^2 - 2 = 0$, y(4) = 1 for y(4.1) and y(4.2), taking h = 0.1 by:

a) Modified Euler's Method. **[6]**

b) Runge Kutta 4th order Method. **[12]**

Q7) Consider steady state conduction given by the Laplace equation in a square of 1m length. The boundary conditions are as follows :

- T = 130 for y = 0, $0 \leq x \leq 1$
- T = 190 for y = 1, $0 \leq x \leq 1$
- T = 90 for x = 0, $0 \leq y \leq 1$
- T = 260 for x = 1, $0 \leq y \leq 1$

With $\delta_x = \delta_y = \frac{1}{3}$

a) Form the equations at the interior nodes **[8]**

b) Carry out 2 cycles of iteration. **[8]**

Q8) a) Explain Bezier curve and it's parametric representation. **[9]**

b) Explain how B spline is different from Bezier curve. **[7]**

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Total No. of Questions : 6] **SEAT No. :**

P2100 **[Total No. of Pages : 3**

[4165] - 475

M.E. (Civil) (Environmental Engg.)

NUMERICAL METHODS & APPLIED STATISTICS

(2008 Course) (Sem. - I)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***All question carry equal marks.***

SECTION - I

Q1) a) Obtain roots of equation $x^3 - 3xy^2 + 1 = 0$. & $3x^2y - y^3 = 0$, using Newton - Raphson method. (Choose initial root as 0.25, 0.25). **[12]**

b) Solve the following system of equations using Gauss. Elimination method. **[13]**

$$7.9x_1 + 5.6x_2 + 5.7x_3 - 7.2x_4 = 6.68$$

$$8.5x_1 - 4.8x_2 + 0.8x_3 + 3.5x_4 = 9.95$$

$$4.3x_1 + 4.2x_2 - 3.2x_1 + 9.3x_4 = 8.6$$

$$3.2x_1 - 1.4x_2 - 8.9x_3 + 3.3x_4 = 1$$

Q2) a) Maximize $F = x_1 + 2x_2 + x_3$, **[15]**

Subject to $2x_1 + x_2 - x_3 \leq 2$,

$-2x_1 + x_2 - 5x_3 \geq -6$,

$4x_1 + x_2 + x_3 \leq 6$,

Where $x_1 \geq 0$, $l = 1, 2, 3$, using simplex Algorithm.

b) State and explain main objective and characteristics of a central tendencies. **[10]**

P.T.O.

Q3) a) Comment on measures of skewness and kurtosis based on moments. **[7]**

b) Compute coefficient of skewness and kurtosis based on following data,

X	4.5	14.5	24.5	34.5	44.5	54.5	64.5	74.5	84.5	94.5
Y	1	5	12	22	17	9	4	3	1	1

[10]

c) Two friends 'A' & 'B' apply for two vacancies at the same post. The probabilities of their selection are $\frac{1}{4}$ and $\frac{1}{5}$ respectively. What is the chance that. **[8]**

i) One of them will be selected

ii) Both will be selected.

iii) None of them will be selected.

iv) Atleast one will be selected.

SECTION - II

Q4) a) The joint pdf of a bivariate random variable (x, y) is given by **[8]**

$$f_{xy}(x, y) = \begin{cases} k(x+y) & 0<x<2,\ 0<y<1 \\ 0 & else \end{cases}$$

Where 'K' is a constant.

i) Find value of 'K'

ii) Find marginal pdf's of X and Y

iii) Are X and Y independent.

b) Fit a Binomial distribution for the following data,

X :	0	1	2	3	4	5	6	7	8	9	10
Y :	6	20	28	12	8	6	0	0	0	0	0

[9]

c) In a certain examination, the percentage of passes and distinction were 46 & 9 respectively. Estimate average marks. Obtained by the candidate, the minimum pass and distinction marks are being 40 & 75 respectively. (Assume distribution of marks to be normal.) Also determine what would be the minimum marks for admission to a re-examination of the failed candidates, had it been desired that the best 25% of them should be given another opportunity of being examined. **[8]**

Q5) a) Explain the procedure for testing of a hypothesis. **[15]**

b) The life time of electric bulbs for a random sample of '10' items from a large consignment gave the following data. **[10]**

Item	1	2	3	4	5	6	7	8	9	10
Life in '000 hrs	4.2	4.6	3.9	4.1	5.2	3.8	3.9	4.3	4.4	5.6

Can we accept the hypothesis that average life term of bulb is 4000 hrs.

Q6) a) Obtain two regression equations for the following data : **[10]**

X :	6	2	10	4	8
Y :	9	11	5	8	7

b) Analyze the following results of Latin square experiment. **[15]**

Columm/row	1	2	3	4
1	A (12)	D (20)	C (16)	B (10)
2	D (18)	A (14)	B (11)	C (14)
3	B (12)	C (15)	D (19)	A (13)
4	C (16)	B (11)	A (15)	D (20)

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Total No. of Questions : 8]

SEAT No. : ____

P2103

[Total No. of Pages : 2

[4165] - 492

M.E. (Mechanical) (Heat Power Engineering)

NUMERICAL METHODS IN THERMAL AND FLUID ENGINEERING

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answer 3 questions from each section.***
2) ***Assume suitable data, if required***
3) ***Figures to the right (in square brackets) indicate full marks.***
4) ***Use of a calculator is allowed.***

SECTION - I

Q1) Using Gauss Elimination method, solve the following equations : **[16]**

$x + 2y + 3z - u = 10$

$2x + 3y - 3z - u = 1$

$2x - y - 2z + 3u = 7$

$3x + 2y - 4z - 3u = 2$

Q2) Determine water level in mm so that the spherical tank will contain 1000 lit. water. The volume in lit. and water level in mm are related to each other as:

$$V = \frac{\pi h^2 (3R - h)}{3 \times 10^6}$$

Where R is radius of the tank and is equal to 3000 mm. **[17]**

Q3) An experiment is conducted n expansion of steam in a cylinder having 100mm dia. And 200mm length. Fine equation of curve in P(bar) = cV^{-n} form for following observations. **[16]**

P	V
5	0.3714
10	0.2264
15	0.1694
20	0.1380
25	0.1176
30	0.1033

P.T.O.

Q4) Using Cubic splines, estimate the function value f at x = 7 by the given the data points : **[17]**

i	0	1	2
x_i	4	9	16
f_i	2	3	4

SECTION - II

Q5) A particle is moving along a straight line. The displacement x at various times in instances are given below : **[16]**

t	0	1	2	3	4
x	5	8	12	17	26

Q6) Employ the Power method to determine the highest eigen value for the following system: **[18]**

$$3.556x_1 - 1.778x_2 = \lambda\, x_1$$
$$-1.778x_1 - 3.556x_2 - 1.778x_3 = \lambda x_2$$
$$-1.778x_2 + 3.556x_3 = \lambda x_3$$

Q7) Using the Runge Kutta 4th order, solve $10\dfrac{dy}{dx} = x^2 + y^2, y(0) = 1$ for the interval $0 \le x \le 0.5$ with $h = 0.10$. **[16]**

Q8) Solve the Poisson equation

$$v^2 f = 2x^2y^2$$

over the square domain $0 \le x \le 3$ and $0 \le y \le 3$ with $f = 0$ on the boundary and $h = 1$. **[16]**

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Total No. of Questions : 8]

SEAT No. :

P1832

[Total No. of Pages : 4

[4165] - 493

M.E. (Mech. - Heat Power)

ADVANCED THERMODYNAMICS

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of log tables, molliar charts, electronic pocket calculators & steam tables is permitted.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define the terms reduced temperature, reduced pressure & reduced volume. **[2]**

b) Can methane at 2 MPa & 1000°C be treated as an ideal gas? Critical point data for methane T_{cr} = 191K, P_{cr} = 46.4 bar. **[4]**

c) 5 kg of methane is enclosed in a rigid container at a pressure of 90 bar and a temperature of 250 K. Find the volume of the container using the generalized compressibility chart. M_{CH4} = 16.04 kg / kmol. **[6]**

d) Estimate Van der Walls constants for methane. **[6]**

Q2) a) Sketch a phase (P versus T) diagram for water and indicate the solid, liquid and vapor regions on it. State the values of pressure & temperature at the tripple point of water & the critical values. **[4]**

b) Calculate the pressure of steam at a temperature of 500°C & density of 24 kg /m^3 using **[12]**

i) ideal gas equation
ii) van der Walls equation
iii) the Redlich-Kwong equation
iv) the compressibility factor &
v) the steam table.

Use following Data for

P.T.O.

Constants for a & b for Van der Walls & the Redlich - Kwong Eq^{n} of state.

	Van der Wall	Redlich Kwong
a kPa m^6/kg^2	1.703	43.9
b m^3/kg	0.00169	0.00117

Attachment : Compressibility chart :

Q3) a) State the principle of entropy increase and explain it with the help of an example. **[5]**

b) Is the availability function same for a non - flow and a flow process. Give the mathematical equations. **[4]**

c) One kg of steam is expanded in a piston - cylinder device from the initial state of 3MPa and 523 K to the state of 100 kPa & 423 K. During this process, 10 kJ heat is transferred to the surrounding at a pressure of 100 kPa & 298 K. Estimate

i) the availability of steam at state 1 & state 2 and

ii) reversible work. **[7]**

Q4) a) Explain the term thermoelectric effect or thermoelectricity or Peltier - seebeck effect. **[3]**

b) Define fugacity and activity. **[3]**

c) What do you understand by the enthalpy of formation and enthalpy of combustion. **[5]**

d) Write a note on Nernst's Heat Theorem & the III Law of thermodynamics. **[5]**

SECTION - II

Q5) a) Derive the most commonly used Max well relations starting from the thermodynamic potentials in terms of their natural variables. **[5]**

b) Show that Joule - Thomson coefficient $\mu_{JT} = 0$ for an ideal gas at all temperatures and pressures. **[5]**

c) For a single component liquid - vapor system in a state of equilibrium at a specified pressure, if temperature is changed its saturation pressure also changes. Apply the criterion for equilibrium and deduce the Clapeyron equation. **[8]**

Q6) a) Is the state postulate equivalent to Gibbs phase rule? **[4]**

b) What is meant by standard enthalpy change (on standard heat) of a reaction? Given the standard enthalpy change 298.15 K for the reaction $N_2\,(g) + 3H_2\,(g) \rightarrow 2NH_3\,(g)$ is –96.11 kJ.
Calculate the standard enthalpy change at 298.15 K for the following reactions.

i) $\frac{1}{2}\,N_2\,(g) + \frac{3}{2}\,H_2\,(g) \rightarrow NH_3\,(g)$ **[4]**

ii) $NH_3\,(g) \rightarrow \frac{1}{2}\,N_2\,(g) + \frac{3}{2}\,H_2\,(g)$ **[4]**

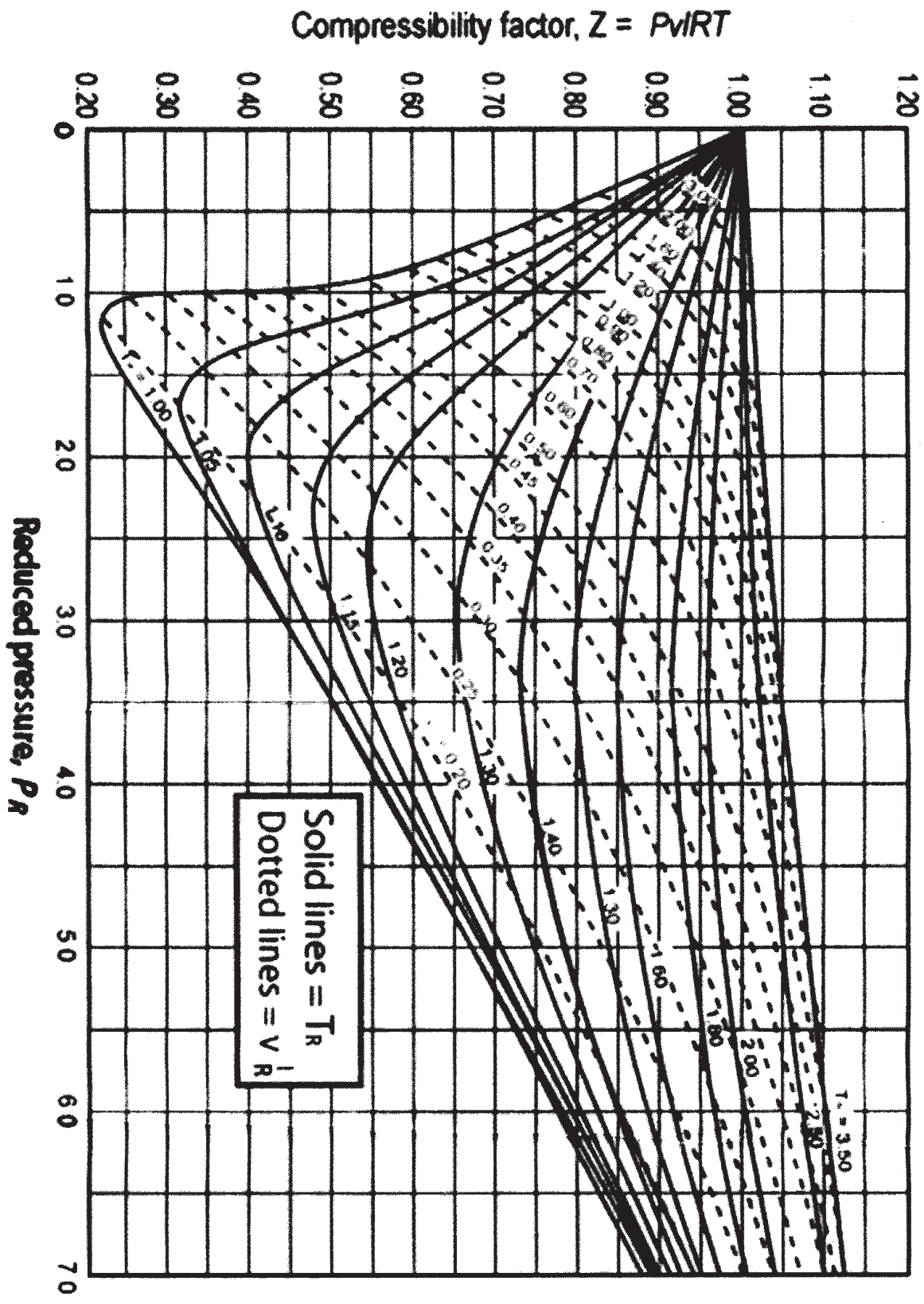
iii) $2NH_3\,(g) \rightarrow N_2\,(g) + 3H_2\,(g)$ **[4]**

Q7) The gravimetric analysis of air is 23.14% oxygen (M = 31.999 kg / kmol), 75.53% nitrogen (M =28.013 kg / kmol), 1.28% argon (M = 39.948) and 0.05% carbon dioxide (M = 44.010). Calculate the specific gas constant for air and the molar mass. Give the analysis by volume and partial pressure of each constitutent when the total pressure is 1 bar.

The above mixture (air) is contained in the engine cylinder at a temperature of 1000K. It is expanded ideally through a volume ratio of 7:1, according to law $PV^{1.25} = C$. Calculate work done, heat flow / unit mass of mixture. The values of C_P for constituents averaged over the temperature range of expansion are : oxygen (C_P = 1.110 kJ / kg), nitrogen (1.1961), argon (0.529) and carbon dioxide (1.271 kJ / kg k). **[16]**

Q8) a) Show clearly the difference between three statistics (MB, BE & FD). Write the thermodynamic probability of a macro state for each of these statistics. What will happen if gi = 1? **[6]**

b) How is the partition function defined? Determine it for transitional, vibrational and rotational modes. **[10]**


Compressibility factor, Z = PvIRT
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
1.10
1.20
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
Reduced pressure, P_R
Solid lines = T_R
Dotted lines = v'_R
T_R = 3.50

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Total No. of Questions : 10]

SEAT No. : ____

P1842

[Total No. of Pages : 3

[4165] - 513
M.E. (Mechanical) (Design Engineering)
ADVANCED STRESS ANALYSIS
(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) The Airy's stress function for the stress distribution variation at the cross section of the machine element is represented by $\phi = f(r) \cos 2\theta$; where f(r) is the function of 'r' only. In specific case of large flate plate subjected to uniform tension having a circular hole at the centre, show that stress function is, $\phi = \left[c_1 r^4 + c_2 r^2 + c_3 + \frac{c^4}{r^2} \right] \cos 2\theta$ represents stress distribution around the hole. **[16]**

Q2) a) Give the procedure to analyze a thin rectangular section conduit subjected to a torque 'T'. **[6]**

b) Fig.1. Shows a circular tube with 8 similar longitudinal fins attached to it. It is subjected to a twisting moment T. Find,

i) Percentage of twisting moment taken by the fins.

ii) Maximum shear stresses induced in the fins and the tube. If, T = 400 N-M. **[10]**

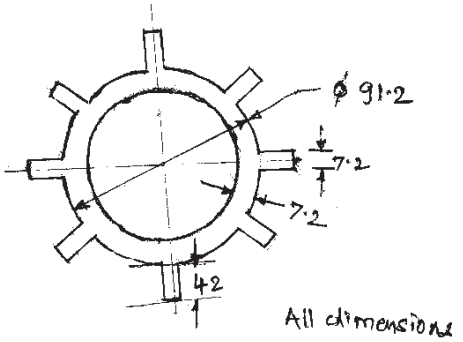

fig. 1 Q. 2 b)

P.T.O.

Q3) a) Derive fundamental equation for bending of rectangular plate with uniform loading clamped at edges with usual notations. **[10]**

b) Write note on: stresses in beam subjected to unsymmetrical bending. **[6]**

Q4) Explain the significance of shear centre & locate the position of shear centre for the section as shown in fig. 2. The thickness of the section is 't' throughout. **[16]**

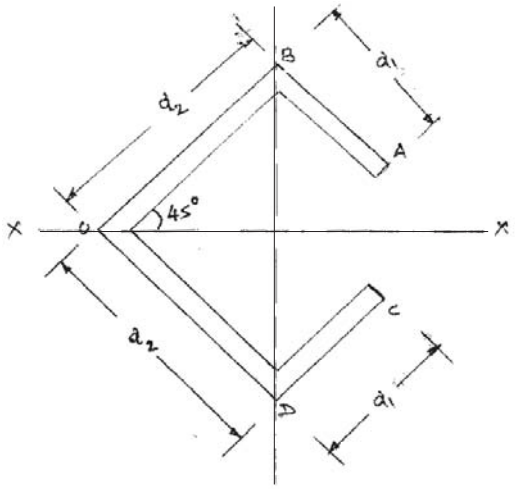

Fig. 2. Q. No. 4

Q5) Write short notes on any three. **[18]**

a) Stresses in disc of variable thickness.

b) Torsion of non circular shaft.

c) Membrance Analogy.

d) Two dimensional problems in polar coordinates.

SECTION - II

Q6) A circular disc of uniform thickness with 800 mm diameter has a central hole of 70 mm diameter. Material density is 8000 kg/m^3 and Poisson's ratio is 0.3. Determine the radial and circumferential stress distribution in the disc when it is rotating at 3000 rpm about its own axis. Plot the stress distribution and comment on it.
Derive the expressions you use. **[16]**

Q7) a) What is critical stress intensity factor? How it is useful in design of cracked machine component? **[8]**

b) An edged cracked plate loaded in tension is made of material with fracture toughness 50 MPa – $m^{1/2}$ and tensile strength of 1000 MPa. Width of plate is 50 mm and crack length is 6 mm. Thickness of plate is 20 mm. Find the critical load that would cause unstable propagation of crack. For this geometry of the specimen, the stress intensity factor is **[8]**

$K_1 = f(g)\ \sigma\ \sqrt{\pi a}$

Where $f(g) = 1.12 - 0.231\left(\frac{a}{b}\right)^0 + 10.55\left(\frac{a}{b}\right)^2 - 21.72\left(\frac{a}{b}\right)^3 + 30.39\left(\frac{a}{b}\right)^4$

Q8) a) Derive the expression for the contact stress between two spherical bodies with radii R_1 and R_2 under compressive load 'P'. State the assumptions made. **[8]**

b) Explain the stresses introduced in a compound cylinder by shrink fit. Which stresses out of these are considered for design? **[8]**

Q9) a) A bar of per fectly plastic material with b = 6 mm and h = 25 mm is to be bent so that its mean radius is 2 m after release from the die. Find the die radius to the centre of the bar to give the desired bend.
S_{yp} = 330 MPa and E = 2×10^5 MPa. **[8]**

b) Explain the effect of principal stress directions on a stressed model in a plane polariscope. **[8]**

Q10) Write short notes on any three of the following: **[18]**

a) Plastic action in thick walled cylinders.

b) Crack opening phenomenon.

c) Strain gauge rosette.

d) Characteristics of strain guage measurement.

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Total No. of Questions : 8]

SEAT No. : ____

P2010

[Total No. of Pages : 2

[4165] - 53

M.E. (Mech.) (Heat Power)

I.C. ENGINES - I

(2002 Course) (Elective - I (a))

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive an expression for air standard efficiency of a Otto cycle with usual notations. Hence show that the efficiency of the Otto cycle is lower than that of a Carnot cycle. **[8]**

b) An engine takes in air at 1 bar, 27°C and the compression ratio is 9 : 1. Calculate the air standard efficiency and mean effective pressure based on assumption that heat added is at constant volume. Take Cp = 1.005 kJ/kg K, and Cv = 0.718 kJ/kg K. **[10]**

Q2) a) Draw theoretical and actual valve timing diagrams for four stroke SI engine. Explain the reasons for the difference. **[8]**

b) Why the actual cycle efficiency is much lower than the air standard cycle efficiency? Explain the major losses and differences in actual engine cycle and air-standard cycle with the help of PV diagram. **[8]**

Q3) a) What are the advantages and disadvantages of petrol injection system over conventional carburettor system. **[5]**

b) Discuss the effect of the following engine variables on flame propagation: **[5]**
   i) Fuel-air ratio
   ii) Compression ratio.

c) Drive the equation for simple carburettor to find A/F ration with neglecting compressibility of air. **[6]**

P.T.O.

Q4) a) Explain the following factors which affect the delay period **[8]**

i) Fuel ii) Injection pressure

iii) Compression ratio iv) Speed.

b) Explain with neat sketches the following systems of a carburettor : **[8]**

i) Idling system ii) Choke.

SECTION - II

Q5) a) Explain any *three* types of combustion chambers used in S.I. Engines. **[6]**

b) Explain the combustion stages in a CI engine with the help of p – θ diagram. **[6]**

c) Explain MPFI and GDI system for SI Engine. **[6]**

Q6) a) Explain the factors which affect the tendency to detonate. **[8]**

b) Explain the spark plug location in combustion chamber and effect on P - θ diagram. **[8]**

Q7) a) Explain Inlet-Valve mach index (Z) and effect on volumetric efficiency. **[4]**

b) A Eight cylinder four stroke engine of 95 mm bore and 82 mm stroke with a compression ratio of 8 is tested at 4000 rpm on a dynamometer which has 50 cm arm. During 10 min test dynamometer scale beam reading was a 40 kg and the engine consumed 4.4 kg of gasoline having a CV 44000 kJ/kg. Air at 27°C and 1 bar was supplied to a carburettor at rate of 6 kg/min. Find BP, bsfc, brake thermal efficiency, volumetric efficiency, air std. Efficiency and relative efficiency. **[12]**

Q8) a) Explain engine performance characteristics. **[6]**

b) Explain the instruments for measuring the following invisible emission. **[6]**

i) Oxides of nitrogen.

ii) Carbon monoxide.

iii) Unburned hydrocarbons.

Write their approximate values for SI engine.

c) Name various methods to find frictional power & explain Morse test. **[4]**

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Total No. of Questions : 8]

SEAT No. :

P2011

[Total No. of Pages : 2

[4165] - 54

M.E. (Mech.) (Heat Power Engg.)

ENVIRONMENTAL POLLUTION AND CONTROL

(2002 Course) (Elective - I (b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answer 3 questions from section I and 3 questions from section II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the effect of particulate matter on human health and the environment. **[8]**

b) What are effects of NOX on air quality? What is the ozone hole? **[8]**

Q2) a) What is acid rain? What causes acidic deposition? **[8]**

b) Explain Involute cyclone separater. **[8]**

Q3) a) Explain in brief the economic effects of air pollution. **[8]**

b) What are the types of sampling method for air pollutants and explain Beta radiation instrument for the same? **[8]**

Q4) Write short notes on (Any three) : **[18]**

a) Air quality monitoring station.

b) Radiation and health.

c) Vehicular Air pollution.

d) Electrostatic precipitators.

P.T.O.

SECTION - II

Q5) a) Explain in brief the air pollution problem because of a large capacity cement plant. **[8]**

b) Explain the importance of forests in environmental protection in our country. **[8]**

Q6) Explain in brief the following term in context to environmental pollution. **[16]**

a) Solid and food contaminants.

b) Water and health.

c) Radiation and health.

d) Climate change and health.

Q7) a) Explain in brief pollution due to pulp and paper industry. **[8]**

b) Explain in brief pollution due to thermal power plant and sugar industry. **[8]**

Q8) Write short notes on (Any three) : **[18]**

a) Ozone depletion and Global warming.

b) Effect of carbon monoxide on health.

c) Biological waste water treatment.

d) Methods of odour control.

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Total No. of Questions : 8]

SEAT No. :

P2012

[Total No. of Pages : 3

[4165] - 55

M.E. (Mechanical) (Heat Power Engg.)

ADVANCED REFRIGERATION & CRYOGENICS

(2002 Course) (Elective - I (c))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary and mention it clearly.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, non programmable electronic pocket calculator is allowed.***

SECTION - I

Q1) a) What are the various types of compressors used in refrigeration? Explain the selection criteria for compressors. **[8]**

b) What are the secondary refrigerants? Discuss with suitable applications. **[8]**

Q2) a) Explain how ternary cascade refrigeration system is used to manufacture LNG. Draw the cycle on T-s and P-h chart. **[8]**

b) Explain in brief, the guidelines for refrigerant piping design. **[8]**

Q3) A cascade refrigeration system shown in the figure 1 uses CO_2 as refrigerant for the low-stage and NH_3 as the refrigerant for the high-stage. The system has to provide a refrigeration capacity of 10 TR and maintain the refrigerated space at –36°C, when the ambient temperature (heat sink) is at 43°C. A temperature difference of 7 K is required for heat transfer in the evaporator, condenser and the cascade condenser. Assume the temperature lift (T_{cond}-T_{evap}) to be same for both CO_2 and NH_3 cycles. **[16]**

Find :

a) Total power input to the system.

b) Power input if the cascade system is replaced with a single stage NH_3 system operating between same refrigerated space and heat sink. Actual COP can be estimated using

P.T.O.

$$COP_{act} = 0.85\ COP_{Carnot}\left[1-\frac{T_c - T_e}{265}\right]$$

where

COP_{Carnot} = Carnot COP

T_c = Condensing Temp.,

T_e = Evaporator Temp.

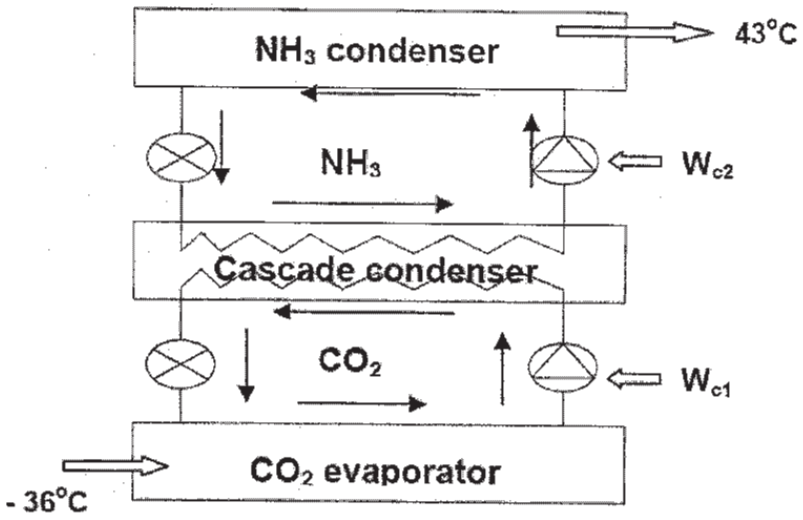

Figure 1. Cascade refrigeration system

Comment on the result.

Q4) Write short notes on (any three) : **[18]**

a) Multistage Thermoelectric refrigerator.

b) Types of Evaporators.

c) Vortex tube.

d) Thermostatic expansion valve.

SECTION - II

Q5) a) Explain Claude air liuefaction system with neat sketch. Draw T-s diagram. **[8]**

b) Explain with neat diagram Practical vapour absorption system. **[8]**

Q6) a) In a vapour absorption system heating, cooling and refrigeration takes place at a temperature of 197°C, 17°C and –3°C respectively. Find maximum COP of the system. Derive the expression you use. **[8]**

b) Discuss the various types of compressors and expanders used in liquification systems. **[8]**

Q7) Explain the followings : **[16]**

a) Linde system for liquefaction of air.

b) Electrolux refrigerator.

Q8) Write short notes on (any three) : **[18]**

a) Materials for cryogenic applications.

b) Cryogenic insulations.

c) Simon helium liquefier.

d) Stirling cryocooler.

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Total No. of Questions : 10]

SEAT No. :

P1863

[Total No. of Pages : 3

[4165] - 560

M.E. (Mechanical - Automotive Engg.)

NOISE, VIBRATIONS AND HARSHNESS

(2008 Course) (Elective - III (a)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the working of laser Doppler vibrometer. **[8]**

b) What are the different sources of interior noise of a vehicle? **[8]**

Q2) Find the fundamental natural frequency and the corresponding mode shape for the system shown in fig. 1 **[16]**

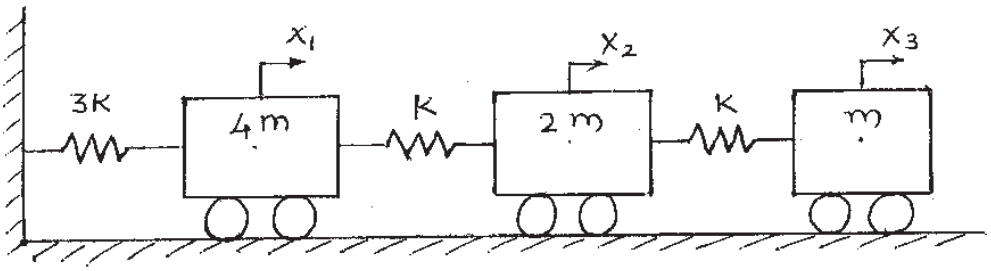

Fig. 1

Q3) a) The sound pressure level measured at 10 m from an automobile horn is 110 dB. Determine the sound pressure level at distance of i) 20 m ii) 80 m. Assume that the inverse square law holds good between intensity and distance. **[8]**

b) Explain propagation of sound, reflection of sound, absorption of sound and refraction of sound? **[8]**

P.T.O.

Q4) a) Explain why noise source identification is required and what are the different methods available? **[8]**

b) What do you mean by Noise spectrum? Explain effect of noise on human beings. **[8]**

Q5) Write short notes on **any three** of the following : **[18]**

a) Importance of NVH.

b) Transverse and Longitudinal sound waves.

c) Windowing.

d) Explain Broad band noise, Pink noise, White noise.

SECTION - II

Q6) a) Explain ISO 3028 : 1998 - Pass-by Noise measurement. **[8]**

b) Explain in detail different sound fields and state its significance. **[8]**

Q7) In construction site following equipment are running during the day time: Pile Driver, Transformer, Air Compressor, Earthmover, Concrete Mixer and Crane. The School is located 50m away from the construction site. Determine combined sound pressure level, sound power level and sound intensity level of all equipment Determine whether the school is likely to be disturbed by the noise from the construction work. If yes what precautions are to be taken? **[16]**

Equipment	Pile Driver	Transformer	Air Compressor	Earthmover	Concrete Mixer	Crane
dBA	105	80	105	96	88	88

Q8) a) Explain the working of reactive type silencer. **[8]**

b) Explain the characteristic of absorptive material : **[8]**

i) Porosity

ii) Flow Resistant

iii) Tortuosity

iv) Viscous characteristic length.

Q9) a) Explain why free-free condition is required for modal testing with a labeled sketch construction and working principle of an Electromagnetic shaker? **[8]**

b) Explain Autocorrelation, Cross correlation, Auto spectrum, Cross spectrum. **[8]**

Q10) Write short notes on **any three** of the following: **[18]**

a) Sound insulation

b) Beam forming technique

c) Digital Signal Processing

d) Types of sound absorbers

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Total No. of Questions : 6]

SEAT No. :

P1885

[Total No. of Pages : 2

[4165] - 604

M.E. (Electrical) (Power Electronics and Drives)

FACTS and HVDC

(2008 Course) (Elective - II (a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer two questions from section - I and two questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) With the help of neat diagram explain the working of static VAR compensation. **[12]**

b) Explain what is the need of reactive power compensation in transmission line. **[13]**

Q2) a) What is the difference between Series compensation and Shunt Compensation? Explain any one method for series compensation in detail along with diagram. **[15]**

b) Explain the principle of operation of Thyristor Switched Capacitors (TSC). **[10]**

Q3) a) What is Unified Power flow? Explain the working of Unified Power Flow Control (UPFC) with the help of neat diagram. **[12]**

b) What are the different types of FACTS controller used for power system stability? Explain the basics of STATCOM along with its block diagram and applications. **[13]**

P.T.O.

SECTION - II

Q4) a) Compare AC and DC Transmission system on the basis of economy, technical performance and reliability. Also discuss the merits and demerits of HVDC system over AC Transmission system. **[15]**

b) Draw a schematic diagram of a typical HVDC converter station and explain the working of each part of it in detail. **[10]**

Q5) a) With the help of neat diagram and necessary waveforms explain the working of 6 pulse bridge converter. **[15]**

b) What are the different faults occurred in converter circuit? Discuss the protection provided against it. **[10]**

Q6) a) From fundamentals explain basic principle of DC link control? Draw and explain basic converter control characteristics. **[12]**

b) Discuss firing angle control and explain the basic requirement for firing angle generation. Explain any one type of firing angle control in detail. **[13]**

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Total No. of Questions : 6]

SEAT No. :

P1888

[Total No. of Pages : 2

[4165] - 608

M.E. (Electrical) (Power Electronics and Drives)

DESIGN OF POWER ELECTRONIC SYSTEMS

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any two questions from section I and any two questions from section II.***
2) ***Answers to the two sections should be written in separate answer sheet.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive steady state equivalent circuit from the dynamic equation of the induction motor. **[15]**

b) Derive transfer function of voltage control SMPS. **[10]**

Q2) a) What is thermal resistance and its components. **[10]**

b) Explain different factors taken into account while designing heat sink. **[15]**

Q3) a) Find the heat sink ambient thermal resistance $R_{\theta sa}$ for the following data surface temperature Ts = 120°C, ambient temperature Ta = 20°C, dimensions of heat sink A1 = 0.075 × 0.063 m, A2 = 0.075 × 0.115 m. **[15]**

b) Derive expression for specific eddy current loss. **[10]**

SECTION - II

Q4) a) What are different magnetic materials available and what are their selection criterion for different applications. **[10]**

b) Design a single phase transformer with following data V pri = 300V rms, lrms = 4A rms, turns ration = 4, operating frequency f = 100kHz, Ts = 100°C, Ta = 40°C. Assume suitable data if required. **[15]**

P.T.O.

Q5) a) Explain single pass transformer design procedure using flow chart. **[10]**

b) Explain the need of soft switching and its concept with V-1 characteristics. **[15]**

Q6) a) Explain procedure for designs of converter also explain what are different factors and assumption taken into account for design. **[15]**

b) Explain procedure for design of inverter. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P1897

[Total No. of Pages : 2

[4165] - 626

M.E. (E & TC) (Microwave)

MOBILE COMMUNICATION - GSM & CDMA

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Solve any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of Erlang tables, calculator is allowed.***

SECTION - I

Q1) a) Explain the fundamentals of cellular communication. **[8]**

b) Discuss TDMA, FDMA and CDMA multiple access techniques. Compare them. **[10]**

Q2) a) Consider a Cellular system with a total of 395 allocated voice channel frequencies. If the traffic is uniform with an average call holding time of 120 seconds and call blocking during Busy hour is 3%, Calculate: **[8]**

i) No. of calls per cell site per hour,

ii) Mean Carrier to Interference Ratio.

For cell reuse factors equal to 4 and 7. Assume omni directional antennas with 6 interferers in the first tier and slope for path loss equal to 40 dB/ decade.

b) Explain the interferences in cellular communication system. Suggest the techniques to reduce them. **[8]**

Q3) a) With the help of a neat block diagram, explain the architecture of GSM. **[10]**

b) Explain why Propagation Path Loss is one of the major parameters of interest in analysis of radio wave propagation for mobile communication? **[6]**

Q4) a) Explain how privacy and security is maintained in GSM system. **[8]**

b) Discuss various handoffs in GSM. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain the physical and logical channels in IS-95 CDMA. **[8]**

b) Explain GMSK modulation technique with the help of transmitter and receiver block diagrams. **[8]**

Q6) a) Explain call origination and call termination in IS-95 CDMA. **[10]**

b) Write a note on various wireless standards. **[8]**

Q7) a) Explain what is meant by Diversity Reception? What are the different types? What are its advantages in Cellular communication? **[8]**

b) What are the causes of Fast and Slow fading? Distinguish between them. **[8]**

Q8) a) Enlist the advantages of spread spectrum modulation techniques. Explain any one spread spectrum modulation technique with the help of a neat block diagram. **[8]**

b) Explain the working principle of a RAKE receiver with the help of a neat block diagram. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P2121

[Total No. of Pages : 2

[4165] - 629

M.E. (E & TC) (Microwave)

EMI & EMC TECHNIQUES

(2008 Course) (Elective - III (c)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Prove that a transmission line of finite length terminated by its characteristic Impedance is equivalent to an infinite length transmission line by using the equation of input impedance of transmission line and also derive the same. **[10]**

b) Draw the typical resistance circles for $r = 0, 0.5, 1, 2, 5, \infty$ and reactance x circles for $x = 0, \pm \frac{1}{2}, \pm 1, \pm 2, \pm 5, \pm \infty$ separately. Combine both the diagram and explain the application of smith chart by taking a suitable example. **[10]**

c) A 30m long transmission line with Z_o = 50 Ω operating at 2MHz is terminated with a load Z_L = 60 + j 40 Ω. If v = 0.6C where C is the velocity of light, find the reflection co-efficient, standing wave ratio, the input impedance. **[5]**

Q2) a) Explain the following methods of attenuation measurements in detail with the help of relevant diagrams and mathematical expressions.

i) Power ratio method
ii) Voltage ratio method
iii) IF substitution method **[18]**

b) What are the important considerations to be made while attenuation measurement explain with illustrations. **[7]**

P.T.O.

Q3) a) Draw the block diagram of following RF voltage measuring instruments, explain the measurement technique and principle of each instrument, also limitations, advantages and applications of each. **[20]**

i) Wide band AC voltmeter.
ii) Fast sampling and digitizing DMM.
iii) RF milli voltmeter.
iv) Oscilloscopes.

b) Explain the sources of errors, uncertainities in RF voltage measurements and significance. **[5]**

SECTION - II

Q4) a) Describe thermal noise by relevant mathematical expressions of mean square value Power, Power spectral density, and also explain other noises. **[8]**

b) Describe how does radio power meter is used to measure RF Noise with help of block diagram, measurement procedure and mathematical expressions. Discuss its sensitivity. **[10]**

c) Draw the set up for measurement of noise of Amplifier and receivers and explain. **[7]**

Q5) a) Explain the significance of vector measurements and why it is so significant. **[5]**

b) Explain the following terms with illustrative diagrams and equations. **[6]**

i) SWR, S_{11}, S_{12}, Reflection co-efficient, Return loss.
ii) Gain / Loss, S_{21}, S_{12}, Transmission co-efficient insertion phase, Group delay.

c) Draw Basic conceptual block diagram of Network Analyzer and explain. **[7]**

d) Draw the basic conceptual block diagram of Spectrum Analyzer and explain. **[7]**

Q6) a) Why RF measurement is so important and what are its different units. **[8]**

b) What are the different power sensing devices, explain the thermo couple power sensor in detail? **[10]**

c) Describe the uncertainities in power measurements. **[7]**

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Total No. of Questions : 10]

SEAT No. :

P1901

[Total No. of Pages : 2

[4165] - 642
M.E. (E & TC) (VLSI & Embedded system)
MEMORY TECHNOLOGIES
(2008 Course) (Elective - II (b)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare and contrast DCTL & ECL bipolar technologies. **[6]**

b) Explain the following application specific SRAMS : **[6]**
   i) Line Buffers
   ii) CAM

c) Describe types of stacked capacitors. How stacked capacitor differ from trench and planner capacitor? **[6]**

Q2) a) Draw the various SRAM cell structures? Explain them for various applications. **[8]**

b) Compare Bipolar PROM and CMOS PROM. **[8]**

Q3) a) What is pattern sensitive fault? What are the three categeries of the neighbourhood pattern sensitive faults? **[8]**

b) What is floating gate tunning-oxide (FLOTOX) technology? Compare it with silicon-oxide Nitride oxide (SONOX) memories. **[8]**

Q4) a) Explain read, program & write (erase) operation of flash memory cells, Refer ETOX (EPROM tunnel oxide) **[8]**

b) Draw IT cell structure of DRAM? Explain its operation in short. **[8]**

P.T.O.

Q5) a) Write short notes on Nonvolatile SRAMs. **[8]**

b) What do you mean by Dual-port-SRAMS? What are its applications? Draw Dual-port RAM cell? **[8]**

SECTION - II

Q6) a) Explain total dose effect. **[8]**

b) Discuss dielectric related failures. **[8]**

Q7) a) Explain FRAM cell & its memory operation. **[8]**

b) What is MSCAN? Explain the steps involved in it. **[8]**

Q8) a) Enlist and compare the commonly used packages for surface mount technology **[10]**

b) What are memory cards? Explain flash memory card. **[8]**

Q9) a) What are the different types of flash memory architectures? How they differ from each other? **[8]**

b) What are magneto resistive random access memories? Do they differ from analog memories? How? **[8]**

Q10) a) Explain the radiation hardening? Explain SEUC (single event upset) hardening. **[8]**

b) Comment on semi conductor dielectric failure. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1904

[Total No. of Pages : 2

[4165] - 646

M.E. (E & TC) (VLSI & Embedded System)

RFIC DESIGN

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain LF & RF models for MOSFET with suitable schematics. What is SPICE model? What are the dynamic elements? List high frequency figures of merit. **[16]**

Q2) a) Explain the effects of short channel. What subthreshold operating region? **[8]**

b) With suitable example explain back gate bias effect. **[8]**

Q3) a) Derive an expression for conversion of single ended MOSFET mixer. MOSFET is operated in CS mode. **[8]**

b) Explain ASIC design flow. At what stage will you care for cross talk. **[8]**

Q4) Write short notes on any three - **[18]**

a) S parameters.

b) Neutralization techniques.

c) Power match versus noise match.

d) EMI / EMC.

P.T.O.

SECTION - II

Q5) a) Design cascade amplifier for voltage gain of 50. Assume suitable data. Comment on Ro and Bw. **[8]**

b) Explain the effect of cascading on gain band width with necessary expressions. Explain super regenerative amplifier. **[8]**

Q6) a) What is power constrained noise optimization? Give the expressions for device width & noise figure. **[8]**

b) Design LNA to operate at 600MHz. Design suitable bias. Compute device width degenerating inductance, noise figure & Lg. Assume suitable data. **[8]**

Q7) a) Explain Johnson noise as applied to RF amplifiers. Give the expression for noise figure. Compare with white noise. **[8]**

b) Explain multiplier & square law MOSFET mixers in detail with schematic & mathematical expressions. **[8]**

Q8) Write short notes on any three : **[18]**

a) Short ckt time constant method.

b) Peaking in mixer.

c) Role of poles in amplifiers.

d) Effects of technology scaling on RF amplifiers.

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Total No. of Questions : 10]

SEAT No. :

P1909

[Total No. of Pages : 2

[4165] - 660

M.E. (E&TC) (Signal Processing)

BIOMEDICAL SIGNAL PROCESSING

(2008 Course) (Elective - II (a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the basic elements of a medical instrumentation system? Explain with a neat block diagram. **[6]**

b) Describe the compensation techniques used in acquiring bio-signals. **[6]**

c) State and explain in brief, the static and dynamic characteristics of a bio-instrumentation system. **[6]**

Q2) a) Explain the electric circuit model of a nerve membrane. **[8]**

b) Calculate the resting potential of a cell when the ratio of intracellular ion concentration to the extracellular ion concentration is 20 at room temperature of 30°C. **[8]**

Given : R = Gas constant = 8.31436 joule^{-1} deg^{-1}

F = Faraday constant = 96488 coulomb/gm-equivalent.

Q3) a) Describe with neat figures the commonly used bio-potential electrodes. **[8]**

b) For the semiconductor temperature sensor (PTAT), T = 300°K, I_{D1} = 250 μA, and I_{D2} = 50 μA, compute VPTAT and temperature coefficient of the sensor.

Given : V_T = 26mV at 300°K. **[8]**

P.T.O.

Q4) a) Explain the various parts of an electrocardiogram and state the application areas of ECG diagnosis. **[8]**

b) Explain the characteristics of alpha (α), beta (β), delta (δ), and theta (θ) waves with reference to EEG signals. **[8]**

Q5) a) Explain phonocardiogram signals with respect to the cardiac cycle. **[8]**

b) Draw the block schematic of a standard X-ray system and explain the various components therein. **[8]**

SECTION - II

Q6) a) What is the importance of electrical isolation of patients? What are the precautions taken for electrical isolation of patients? **[8]**

b) Design an active 4^{th} order LPF with a cut-off frequency of 100Hz. The pass-band gain is desired to be constant. Justify the filter topology used and mention the specification requirements of the components used. **[8]**

Q7) a) A low-pass filter is desired with the cutoff frequency of 10 Hz. This filter should attenuate a 100 Hz signal by a factor of 85. What should be the order of this filter? **[8]**

b) What is aliasing? How does it affect the bio-signals? **[8]**

Q8) a) Explain the terms convolution, correlation, and covariance with suitable examples. **[8]**

b) Explain the Two-Point Central difference Algorithm and its application for bio-signal analysis. **[8]**

Q9) What are the limitations of STFT for analyzing an ECG signal? How is it overcome in wavelet analysis? **[16]**

Q10) Write notes on : (any two) **[18]**

a) Sources of noise in biomedical signals.

b) Window functions for bio-signal processing.

c) Spectral analysis using spectrogram.

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Total No. of Questions : 8]

SEAT No. :

P1910

[Total No. of Pages : 3

[4165] - 661

M.E. (E&TC) (Signal Processing)

WIRELESS AND MOBILE COMMUNICATION

(2008 Course) (Elective - II (b)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw the block diagram of a Cellular Mobile Communication system. Explain the various steps involved in placing a call from : **[10]**

i) Mobile to a Landline phone.

ii) Landline Phone to a Mobile Phone.

b) Why is the mobile radio environment unique as compared to other forms of wireless communication and what are the major difficulties experienced in providing mobile service? **[8]**

Q2) a) A Base station has a 900 MHz transmitter and a vehicle is moving at the speed of 50 kmph. Compute the received carrier frequency if the vehicle is moving :

i) Directly towards the BS,

ii) Directly away from the BS,

iii) In a direction that is 60° to the direction of arrival of the transmitted signal? **[8]**

b) Explain the following terms : **[8]**

i) 1G Telephone Systems, ii) 2G Phone Systems,

iii) 2.5G Systems, iv) 3G Systems,

v) 4G Systems.

P.T.O.

Q3) a) Explain what role the following factors play in while attempting to predict the propagation path loss for a particular mobile radio environment? **[12]**

i) Radio Horizon,

ii) Sky Reflections,

iii) Signal Averaging,

iv) Terminal in Motion,

v) Mobile Antenna Height,

vi) Effect of Surface Waves.

b) Derive an expression for the phase difference between direct path and the ground reflected path. **[4]**

Q4) a) Explain the following effects encountered in Cellular Mobile Communication : **[10]**

i) Long Term Fading,

ii) Short Term Fading,

iii) Delay Spread,

iv) Coherence Bandwidth.

b) Explain the Turbo Codes along with its application. **[6]**

SECTION - II

Q5) a) Explain "Antenna Pattern Ripple Effect". **[8]**

b) Consider a mobile communication link where reception over a distance of 10 km is satisfactory with a base station antenna height of 50 m and mobile antenna height of 2 m. If the base station antenna height is lowered to 10 m, what will be the effect of reception in terms of distance? If the distance is the same i.e. 10 km, how high must the mobile antenna height be raised to ensure satisfactory reception? **[8]**

Q6) a) Name the main elements of GSM system architecture and describe their functions. What are the advantages of specifying not only the radio interface but also all internal interfaces of the GSM system? **[10]**

b) What are the functions of authentication and encryption used in GSM? How is system security maintained? **[8]**

Q7) a) Diagram and explain the forward CDMA channel modulation process. What is the role of Walsh codes in it? **[10]**

b) The IS-95 system uses a rate $\frac{1}{2}$ convolutional encoding in the forward channel and a rate $\frac{1}{3}$ convolutional coding in the reverse channel. What were the reasons for doing so? **[6]**

Q8) a) Explain interference in space, time, frequency and code domain. What are the countermeasures in SDMA, TDMA, FDMA &CDMA systems respectively? **[10]**

b) What is the main physical reason for the failure of many MAC schemes used successfully in wired networks in wireless networks? **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

P1912

[Total No. of Pages : 3

[4165] - 665

M.E. (E & T/C) (Signal Processing)

VLSI IN SIGNAL PROCESSING

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compute the iteration bound for the DFG shown in figure 1 (a) using MCM algorithm. Computation times are given in parenthesis. **[8]**

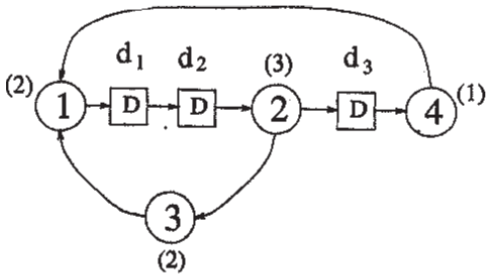

Fig. 1 (a)

b) Consider a direct-form implementation of the FIR filter $y(n) = ax(n) + bx(n-2) + cx(n-3)$. Assume that the time required for multiply and add operation is 2 u.t. and 3 u.t. respectively. **[8]**

i) Draw Pipeline architecture for this filter such that the clock period is 3 u.t. What is the system sample rate?

ii) Draw block filter architecture for a block size of three. What is the system sample rate now?

Q2) a) Consider a 2-parallel version of a 4-tap FIR filter. The parallel filter has exactly 2 copies of the original filter. The original filter has 1 multiplier and 1 adder in its critical path whereas 2-parallel version has 1 multiplier and 2 adders in its critical path. Assume that the multiplication operation takes 8 u.t. and addition operation takes 1 u.t. Also assume that the capacitance of the multiplier is 8 times that of an adder. Both architectures

P.T.O.

are operated at the sample period of 9 u.t. Assume the device threshold voltage to be 0.45 V. Also assume the original filter to be operated at a supply voltage of 3.3 V. **[8]**

i) What is the supply voltage of the 2-parallel filter?

ii) What is the power consumption of the 2-parallel filter as a percentage of the original filter?

b) Explain with the help of an example, the algorithm to retime a DFG for clock period minimization. **[8]**

Q3) a) What are the applications of unfolding? Explain each with an example. **[8]**

b) Design the folded architecture for the biquad filter shown in figure 3 (b). Consider folding factor N = 4. Assume multiplication operation requires 2 u.t. and addition operation requires 1 u.t. **[10]**

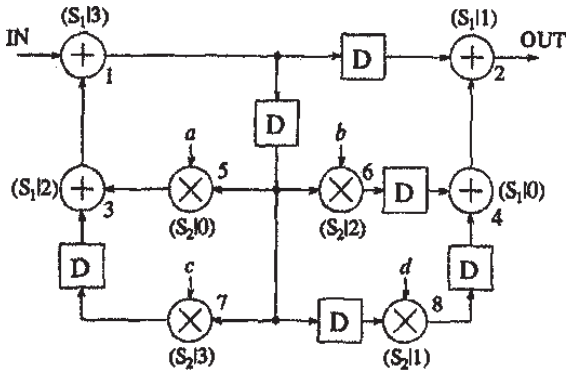

Fig. 3 (b)

Q4) a) Design B_1 FIR filter systolic arrays. Draw block diagram, low level implementation diagram and space-time representation for the same. **[8]**

b) What are the properties of unfolding? Briefly explain each. **[8]**

SECTION - II

Q5) a) Explain modified Booth Algorithm. Illustrate with an example. **[8]**

b) Explain Lyon's bit-serial multiplier and draw its practically implementable architecture. **[8]**

Q6) a) What are the different ways binary numbers are represented in bit-level arithmetic architectures? Explain how the sign bit is taken care. **[8]**

b) Explain hybrid radix-2 adder with the help of suitable architecture. **[8]**

Q7) a) With the help of neat diagrams explain IO block, CLB slice, and block memory of FPGA. **[8]**

b) Explain how floating point arithmetic is implemented on FPGA. **[8]**

Q8) Write short notes on any THREE **[18]**

a) FPGA design flow.

b) Applications of DCM available on FPGA.

c) FIR filter implementation on FPGA.

d) Bit-Serial FIR filter.

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Total No. of Questions : 8]

SEAT No. :

P1918

[Total No. of Pages : 2

[4165] - 678
M.E. (Electronics) (Digital System)
MACHINE INTELLIGENCE
(2008 Course) (Elective - II (a)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Let A = $\{(x_1, 0.2), (x_2, 0.3) (x_3, 0.4)\}$ B = $\{(y_1, 0.3), (y_2, 0.6)\}$ be two fuzzy sets defined on the universe of discourse X = $\{x_1, x_2, x_3\}$ and Y = $\{y_1, y_2\}$ respectively.

a) Find the fuzzy relation R resulting out of the fuzzy Cartesian product. **[8]**

b) If fuzzy set C = $\{(z_1, 0.3) (z_2, 0.4) (z_3, 0.6)\}$ then find relation between R and C using max-min composition. **[8]**

Q2) With reference to fuzzy set define : **[18]**

a) Linguistic variable
b) Concentration
c) Dilation
d) Contrast intensification
e) support
f) Core
g) Convexset
h) Boundary
i) α - cut set

Q3) a) Explain data clustering algorithms. **[8]**

b) Explain mamdani system with suitable example. **[8]**

Q4) Write notes on - **[16]**

a) Genetic Algorithm
b) Fuzzy extension principle
c) Soft computing characteristics
d) Fuzzy set versus classical set.

P.T.O.

SECTION - II

Q5) a) Discuss the strengths and deficiencies of Back propogation learning. **[8]**

b) What is unsupervised learning? Write a short note on competitive learning. **[8]**

Q6) a) What is Adaline network? Explain Adaline training algorithm with architecture. **[8]**

b) Describe the architecture of perceptron. With suitable inputs and weights explain how perceptron can be used to solve two input or problem. **[8]**

Q7) a) Explain the concept of adaptive network based fuzzy Inference system (ANFIS). Discuss the ANFIS architecture for sugeno fuzzy model. **[8]**

b) What is dynamic programming. Discuss in detail incremental dynamic programming. **[8]**

Q8) Write notes on (any three) : **[18]**

a) Neuro Fuzzy control.

b) Fuzzy filtered neural networks.

c) Principal component analysis.

d) Learning Vector Quantization.

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Total No. of Questions : 10]

SEAT No. :

P1919

[Total No. of Pages : 2

[4165] - 680

M.E. (Electronics) (Digital Systems)

MEMORY TECHNOLOGIES

(2008 Course) (Elective - II (c)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) *Answer any three questions from each section.*
2) *Answer to the two sections should be written in separate books.*
3) *Neat diagram must be drawn wherever necessary.*
4) *Figures to the right indicates full marks.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Write important characteristics of SRAM? **[8]**

b) Draw and explain of MOS SRAM architecture. **[8]**

Q2) a) Draw functional block diagram of Non-volatile SRAM & write its important features. **[8]**

b) Explain Silicon-On-Insulator (SOI) technology? What are pro & cones of the same? **[8]**

Q3) a) Draw DRAM three-transistor (3-T) cell and explain its operation. **[9]**

b) What are developments took place for improving the capacitance of DRAM cell? **[9]**

Q4) a) Explain the concept of floating gate & how this is used in semiconductor memory? **[8]**

b) What do mean by E^2PROM? what are its merits and demerits? **[8]**

Q5) a) What is flash memory? How they are better than normal semiconductor memories? **[8]**

b) Write short note on "FLOTOX". **[8]**

P.T.O.

SECTION - II

Q6) a) Enlist the faults which occurs in RAM? **[8]**

b) Explain Stuck at fault with suitable example. **[8]**

Q7) a) How it is different to test the embedded memory then testing of normal memory? **[8]**

b) Write algorithm for "MATS". **[8]**

Q8) a) What are the advantages and disadvantages of the MRAM? **[8]**

b) Explain the operation of FRAM with suitable sketches. **[8]**

Q9) a) Compare FRAM and EEPROM. **[8]**

b) Give the specifications of Tablet PC available in today's market. **[8]**

Q10) Write short note on : **[18]**

a) DRAM Capacitor Reliability.

b) Radiation hardening Techniques.

c) Analog Memories.

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Total No. of Questions : 8]

SEAT No. :

P1922

[Total No. of Pages : 2

[4165] - 683

M.E. (Electronics) (Digital Systems)

IMAGE PROCESSING AND PATTERN RECOGNITION

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) *Answer any three questions from each section.*
2) *Answers to the two sections should be written in separate answer books.*
3) *Use of scientific calculator is allowed.*
4) *Assume suitable data wherever required.*
5) *Figures to the right indicate full marks.*

SECTION - I

Q1) a) Design a gray scale transformation to enhance the intensity levels of the pixels, if it is in the range 50 to 100. Assume 8 bit representation for intensity values. Write a MATLAB program to implement it. **[10]**

b) Explain the representation of the image in digital form. How will you implement the convolution of any 3*3 mask with the image? **[8]**

Q2) a) Write Sobel edge operators to detect the edges in the diagonal direction. What is it named as the gradient operator? Compare the gradient operator with the Laplacian operator. **[8]**

b) Explain the operator called as LOG. Explain the significance of the use of Gaussian filter before the edge operator. **[8]**

Q3) a) List the different forms and sizes of spatial masks used for filtering. Explain the difference in the output image obtained if a 5*5 mask is used instead of a 3*3 mask for implanting the median filter. **[8]**

b) What is the information obtained from histogram of any image? How will you modify the histogram for implementing the image enhancement? **[8]**

Q4) a) What is the nature of pdf for a uniformly distributed random variable? Generate a formula for finding the mean and variance of a random variable varying between -10 to 12. **[8]**

b) Suppose that the values 2, 3, 4, 5, 6, 10 came from a uniform distribution between {a, b}. Use the method of moments to estimate the values of a and b. **[8]**

P.T.O.

SECTION - II

Q5) a) Calculate P($-0.2 \leq x \leq 0.5$) where x has a triangular density given by **[8]**

$$\{P(x) = \{1 - x \text{ if } 0 \leq x \leq 1$$
$$= \{1 + x \text{ if } -1 \leq x \leq 0$$
$$= \{0 \text{ otherwise}$$

b) List the methods for estimation of parameters from the samples. Explain the minimum risk estimator in detail. **[8]**

Q6) a) Feature x is uniformly distributed in the range $0 \leq x \leq 2$ for class A and uniformly distributed in the range $1 \leq x \leq 4$ for class B. The prior probabilities are P(A) = 0.6 and P(B) = 0.4. Find P(A/x) when $x = 1.5$. **[8]**

b) Describe the model based method for estimation of error rates. What are its drawbacks? **[8]**

Q7) a) Explain the Nearest Neighbor classifier technique. Why the error rates for Nearest Neighbor classifier are higher as compared to error rates for Bayesian classifier? **[8]**

b) What is K Nearest Neighbor technique? How is it superior to Nearest Neighbor classifier? Explain the modified algorithm k+k Nearest Neighbor classifier. **[10]**

Q8) a) Explain K means algorithm. Write the steps involved in the two passes of the algorithm. **[8]**

b) Explain back propagation algorithm. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1929

[Total No. of Pages : 2

[4165] - 697

M.E. (E & T/C) (Communication Networks)

NETWORK ARCHITECTURE & DESIGN

(2008 Course) (Elective - II (b)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with examples Information flows between network analysis, architecture, and design. **[8]**

b) What do you mean by supportability? Which two main task it focuses? **[8]**

Q2) a) Explain different service metrics? **[8]**

b) Explain the concept of architecture and design defensibility with suitable example. **[8]**

Q3) a) Give an example of a requirement as it flows from user to application to device to network. Show how it becomes more technical at each component. **[8]**

b) Categorize each of the following requirements as core, feature, or informational. **[8]**

i) Network must support Fast Ethernet and GigE interfaces for all devices on the network.

ii) Network backbone should be upgradable in capacity to 10 Gb/s within 2 years of deployment.

iii) Finance department requires firewall protection to their server.

iv) Existing network consists of 10 BaseT Ethernet and FDDI segments.

Q4) a) Explain with example requirements for predictable performance. **[6]**

b) Explain with example best effort service. **[6]**

c) Given an MTBCF requirement of 5000 hours and an MTTR requirement of 10 hours, calculate an availability requirement. **[6]**

P.T.O.

SECTION - II

Q5) a) Devices can act as both data sources and data sinks depending on the application and flow. Which of the following devices (for the applications given) are data sinks? Which are data sources? **[8]**

i) A storage device receiving streaming video from a camera.

ii) A video-editing unit, using video from the storage device in part a.

iii) A web server and its clients.

iv) A storage disk farm.

b) What is role of Network management mechanisms? **[8]**

Q6) a) Your customer is a hospital that wants to upgrade its LAN. Develop a questionnaire to gather requirements from users, hospital management, and staff. What kinds of questions would you ask to better understand the environment? **[8]**

b) How to choose and apply routing protocols? Give different recommendations. **[8]**

Q7) a) For many hybrid mechanisms, traffic flows can have routed paths or switched paths, depending on the characteristics of each flow. Describe switching and routing. When would you recommend that a flow be switched, and when would it be routed? Present recommendations based on the following : **[8]**

i) Duration of each flow in terms of the numbers of cell, frames, and/or packets.

ii) Type of each flow, by protocol or application.

b) Explain the concept of degrees of hierarchy and interconnectivity in context to routing. **[8]**

Q8) a) Which network monitoring mechanisms are deployed in network management? **[8]**

b) For each of the following queuing mechanisms, give an example of how each would be used within a network. What problem(s) is, each mechanism solving? **[10]**

i) FIFO

ii) WFQ

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Total No. of Questions : 8]

SEAT No. :

P1931

[Total No. of Pages : 2

[4165] - 701
M.E. (E&TC) (Communication Networks)
WIRELESS SYSTEM DESIGN
(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write voltage and current equations, at any point 'z' on transmission line. **[4]**

b) Describe following terms for transmission line; also write expressions. **[12]**

i) Input impedance (Zin)

ii) Reflection coefficient (Γ)

iii) Voltage Standing Wave Ratio (VSWR)

Q2) a) Derive expression of input reflection coefficient (Γ_{in}) for sourced and terminated two port network, by signal flow chart computation method. **[10]**

b) What is role of matching networks in RF amplifier? Explain how and which specifications of RF amplifier are related to them? **[8]**

Q3) a) Derive expression of unilateral power gain (G_{TU}) of RF amplifier. **[8]**

b) Explain output stability circle of RF amplifier, also write expressions for center and radius. **[8]**

Q4) a) Explain negative resistance oscillator, derive expressions for attenuation constant and resonant frequency. **[8]**

b) Explain disadvantages of pure linear oscillator, derive expression for describing function of MOS. **[8]**

P.T.O.

SECTION - II

Q5) a) Describe quarter wave resonator. What is its advantage over RLC tank resonator? **[8]**

b) In quartz crystal resonator, series resistance (R_S) is 200Ω, calculate the frequency of second overtone. Also explain operating principle of a quartz resonator. **[8]**

Q6) a) Define conversion gain of a RF mixer, also write expression for it. **[4]**

b) What do you mean by spurs in RF mixer? **[4]**

c) Explain noise figure relation between SSB and DSB in RF mixer. Also explain IIP3 in RF mixer. **[8]**

Q7) a) Draw and explain single balanced mixer. How to enhance its linearity? **[8]**

b) Which three components are produced in the output of non-linearity type mixer? Which one of these three components is desirable? How to remove remaining two components? **[8]**

Q8) Write short note on any three - **[18]**

a) Active double balanced mixer.

b) Colpitts oscillator.

c) Cost versus performance issues in wireless system architectures.

d) Multistage Amplifier.

e) System Performance degradation due to RF components.

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Total No. of Questions : 8]

SEAT No. : ____

P2128

[Total No. of Pages : 3

[4165] - 717

M.E. (Production) (Manufacturing and Automation)

TOOL AND DIE DESIGN

(2008 Course) (Elective - II (c)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answer three questions from section - I and three questions from section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) In an orthogonal cutting test rake angle = 15°, chip thickness ratio = 0.383, uncut chip thickness = 0.5 mm, width of cut = 3 mm, yield stress of material in shear is 280 MPa, and coefficient of friction on tool face = 0.7. Determine the normal and tangential forces on the tool face. **[8]**

b) Explain various factors affecting the tool life. **[8]**

Q2) a) Calculate the width of the diamond pin for the following data : **[8]**

- Tolerance on center distance between the holes in the workpiece = 0.075 mm
- Tolerance on the center distance between locator pins: 0.025 mm.
- Clearance between the diamond pin and hole = 0.02 mm.
- Clearance between full pin and hole = 0.01 mm.
- Radius of both holes = 20 mm.

b) Explain with neat sketches various principles of location in jigs and fixtures. **[8]**

P.T.O.

Q3) Design a progressive die for the component shown in Fig. 1. Assume thickness of component 2 mm, shear strength of material 200 MPa and sheet size 2500 × 1250 mm. **[16]**

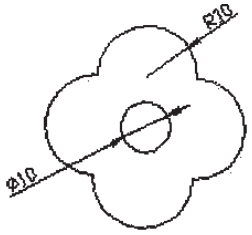

Fig. 1

Q4) Write short notes on : **[18]**

a) Computer applications in press tool design.
b) Quick acting clamps.
c) Design principles of broach.

SECTION - II

Q5) a) Calculate the stock size for forging the component shown in Fig. 2 made up of steel having density 7.85 gm/cm^3. (Dimensions shown in figure are in mm) **[10]**

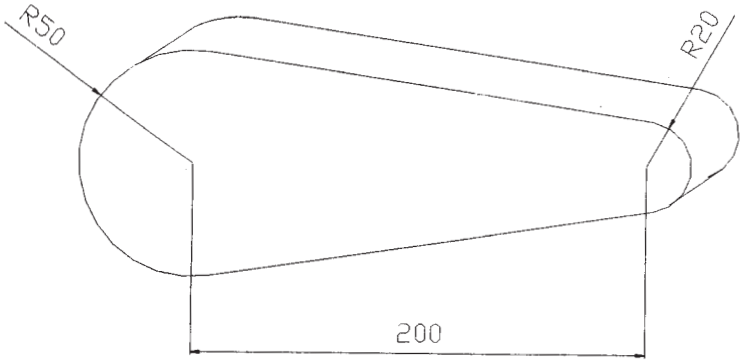

Fig. 2

b) Discuss various factors affecting the selection of parting line in forging die design. **[6]**

Q6) For the component shown in Fig. 3 an injection mold is to be designed,

a) Design the cavity plate and core plate. **[4]**
b) Calculate the mold opening force. **[4]**
c) Calculate the dimensions of the gate and runner. **[4]**
d) Sketch the complete assembly in operation. **[4]**

Given that : Shrinkage = 0.96%, Coefficient of friction = 0.1, Material constant for PVC = 0.9, Poisson ratio and Modulus of elasticity for mold material are 3.33 and 2×10^5 MPa respectively, Injection pressure is 50 MPa.

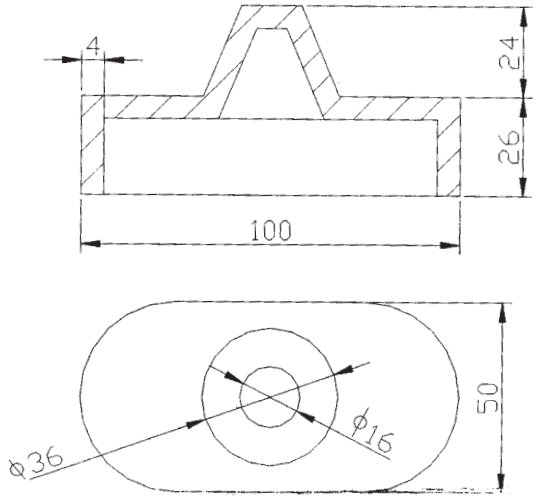

Fig. 3

Q7) a) Explain design aspects of feeding system for the die casting dies. **[8]**

b) Explain with neat sketch the ejection systems used in die casting dies. **[8]**

Q8) Write short notes on : **[18]**

a) Design of cooling system for injection mold.

b) Determination of economic number of cavities in injection molding.

c) Design of edging impression for forging dies.

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Total No. of Questions : 8]

SEAT No. :

P1939

[Total No. of Pages : 2

[4165] - 725

M.E. (Production)

SURFACE TREATMENT PROCESSES

(2008 Course) (Elective - III (d)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Solve any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat sketches wherever required.***

SECTION - I

Q1) a) Explain the mechanism of surface degradation and its importance. **[8]**

b) Explain how the common surfaces will help for initiating engineering failures? **[8]**

Q2) a) Explain different types of surface cleaning processes. **[8]**

b) Classify surface cleaning processes and state their selection criteria. **[8]**

Q3) a) Make a brief classification of surface modification techniques and explain various methods of improving mechanical properties of metal. **[8]**

b) List out different coating materials and their selection. **[8]**

Q4) Write short notes on any three : **[18]**

a) Various surface dependent properties.

b) Tailoring of surface of advanced material.

c) Carbon thin film coating.

d) Electroless deposition.

P.T.O.

SECTION - II

Q5) a) Explain principle of chemical vapor coating and give its application and limitation. **[8]**

b) Explain surface engineering problems related to surface characteristics. **[8]**

Q6) a) What are the recent development methods for adhesion measurement of coated surface. **[8]**

b) Explain different changes in surface properties during surface treatment processes. **[8]**

Q7) a) Explain different characteristics of engineered surface at different level of scale. **[8]**

b) Explain use of laser in surface engineering. **[8]**

Q8) Write short notes on any three : **[18]**

a) Thermal spray coating.

b) PVD.

c) Tribological characteristics of surface.

d) Ion Implantation.

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Total No. of Questions : 10]

SEAT No. :

P2131

[Total No. of Pages : 2

[4165] - 726
M.E. (Production Engg.)
OPTIMIZATION TECHNIQUES
(2008 Course) (Elective - IV (a)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use non-programmable electronic calculators is allowed.***

SECTION - I

Q1) Explain in brief the importance of optimisation in Engineering. **[16]**

Q2) a) Give classification of optimisation techniques. Explain any one in detail. **[8]**

b) State the importance of golden section search methods. **[8]**

Q3) a) With the suitable example explain Newton-Raphson method. **[8]**

b) Compare gradiant based method with secant method. **[8]**

Q4) a) Explain the application of Powell's conjugate direction method. **[8]**

b) Explain the precedure of steepest decent method for optimization. **[8]**

Q5) Explain the evolutionary optimization method with suitable example. Also discuss the significance and drawbacks. **[18]**

P.T.O.

SECTION - II

Q6) a) What is meant by constraint? Discuss various methods of handling the constraints. **[10]**

b) Explain gradiant projection method. **[6]**

Q7) a) What are the tools used for geometric programming? Discuss in brief. **[10]**

b) How to develop specialised algorithms for integer programming? **[6]**

Q8) a) Explain the necessity of using genetic algorithm. **[8]**

b) How the Genetic algorithms are different than traditional methods? **[8]**

Q9) Explain pro's and con's of Integer programming and geometric programming. **[16]**

Q10) Discuss the simulated annealing approach for optimisation. **[18]**

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Total No. of Questions : 8]

SEAT No. : ____

P1944

[Total No. of Pages : 2

[4165] - 736
M.E. (Production) (CAD/CAM)
MECHATRONICS
(2008 Course) (Elective - II (a)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following types of control systems : **[12]**

i) Servomechanisms ii) Sequential control

iii) Numerical control iv) Process control

b) Explain the scope and components of a typical mechatronics systems. **[4]**

Q2) a) Explain the following modes of control with neat diagrams : **[10]**

i) Proportional control ii) PID control

b) Draw a simple hydraulic system that will advance and retract a cylinder using PLC outputs. Sketch should include details from the PLC output card to the hydraulic cylinder. **[6]**

Q3) a) Design ladder logic for a car that considers the variables below to control the motor M. Also add a second output that uses any outputs not used for motor control. Justify the logic. **[8]**

-doors opened/closed (D)
- keys in ignition (K)
- motor running (M)
- transmission in park (P)
- ignition start (I)

b) Simplify the following Boolean equation and write corresponding ladder logic. **[8]**

$$Y = \overline{(AB\overline{C}D + AB\overline{C}\ \overline{D} + \overline{A}BCD + \overline{A}\ \overline{B}CD)} + D$$

P.T.O.

Q4) Write a short note on the following : **[18]**

a) Piezoelectric sensors

b) Analog to Digital converters

c) Karnaugh maps

SECTION - II

Q5) a) Distinguish between a micro controller and a micro processor? Explain the organization of a microcontroller system. **[8]**

b) "The choice of coordinate system and the position sensor used for the CNC machine tool is interconnected". Justify this statement with an example? **[8]**

Q6) a) Write a ladder logic program that does what is described below. Justify the logic. **[8]**

- When button A is pushed, a light will flash for 5 seconds.
- The flashing light will be on for 0.25 sec and off for 0.75 sec.
- If button A has been pushed 5 times the light will not flash until the system is reset.
- The system can be reset by pressing button B.

b) Explain the following in brief : **[8]**

i) Internal relays

ii) Shift registers

Q7) a) What are the trade-offs between encoders and potentiometers? **[6]**

b) Why is logical control so popular when continuous control allows more precision? **[6]**

c) What are the elements of data acquisition and control system. **[4]**

Q8) Write a short note on the following : **[18]**

a) Pin diagram of 8051

b) Micro-sensors

c) Application of Fuzzy sets in control.

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Total No. of Questions : 8]

SEAT No. : ____

P2134

[Total No. of Pages : 2

[4165] - 737

M.E. (Prod.) (CAD/CAM)

RAPID PROTOTYPING

(2008 Course) (Elective - II (b)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Attempt any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the process strengths and limitations of rapid prototyping (RP) with proper justification. **[8]**

b) How CAD models help to generate part in RP? Explain the STL file generation, verification and repair procedure. **[8]**

Q2) a) Classify the RP systems and explain the Laser Sintering (LS) process. **[8]**

b) Describe the advantages of Rapid Prototyping in-terms of its beneficiaries to the product designer, tool designer, manufacturing engineer, marketers and consumers? **[8]**

Q3) a) Explain with suitable example the following properties of prototype : **[8]**

i) Material

ii) Dimensional accuracy

iii) Surface finish

iv) Machinability

b) Describe with a suitable example the concept of Meniscus Smoothing and how this is achieved. **[8]**

P.T.O.

Q4) Write short notes on (any three) : **[18]**

a) File formats in RP.

b) Application of RP in medical field.

c) Environmental resistance in RP.

d) Reverse engineering in RP.

SECTION - II

Q5) a) Discuss the design concepts in generation of models, form and fit checking, and functional testing in Rapid Prototyping (RP). **[8]**

b) *"Direct and indirect rapid tooling helps to enhance production,"* comment. **[8]**

Q6) a) Explain the line spread function of scanned Gaussian Laser Beam. **[8]**

b) Discuss in detail the *photomodulus model*? **[8]**

Q7) a) Explain the additive Laser Point-by-Point Method in RP manufacturing with a flow chart. **[8]**

b) Describe with a neat sketch the Laser Additive Non Laser fabrication process. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Miniaturization using RP.

b) Application of RP in forensic science.

c) Dynamic testing of RP&M models.

d) Photoelastic stress analysis of RP&M models.

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Total No. of Questions : 8]

SEAT No. :

P1947

[Total No. of Pages : 3

[4165] - 742

M.E. (Production) (CAD / CAM)

ADVANCED MATHEMATICS

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer 3 questions from section - I & 3 questions from section - II.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) If $A=\begin{bmatrix} 2+i & 3 & -1+3i \\ -5 & i & 4-2i \end{bmatrix}$ show that AA* is a hermitian where A* is the conjugate transpose of A. **[8]**

b) Reduce the quadratic from $2x_1x_2 + 2x_1x_3 - 2x_2x_3$ to the canonical form by an orthogonal reduction and discuss. Also find the modal matrix. **[8]**

Q2) a) Solve the boundry valve problem $y'' + y + x = 0\ (0 \le x \le 1), y(0) = y(1) = 0$ by Galerkin's method compare your solution with the Exact solution. **[8]**

b) Solve the variational problem : **[8]**

$$\delta \int_1^2 \left[x^2 (y')^2 + 2y\,(x+y)\right] dx$$

Given $y(1) = y(2) = 0$

Q3) a) Solve by the method of Laplace transform the equation $y''' + 2y'' - y' - 2y = 0$, with $y(0) = y'(0) = 0$ and $y''(0) = 6$. **[6]**

b) Show that the Fourier transform of : **[8]**

$f(x) = e^{-x^2/2}$ is $e^{-\lambda^2/2}$

c) Apply convolution theorem to evaluate : **[4]**

$$\bar{L}^1 \left\{ \frac{s^2}{(s^2 + a^2)(s^2 + b^2)} \right\}$$

P.T.O.

Q4) a) Show that the transformation : **[6]**

$y_1 = 2x_1 + x_2 + x_3$

$y_2 = x_1 + x_2 + 2x_3$

$y_3 = x_1 - 2x_3$

is Regular, writedown the inverse transformation.

b) Solve the integral equation: **[6]**

$$\int_0^{\infty} f(x)\cos\lambda x\,dx = \begin{cases} 1-\lambda, & 0 \le \lambda \le 1 \\ 0, & \lambda > 1 \end{cases}$$

Hence deduce that $\int_0^{\infty} \frac{\sin^2 z}{z^2}\,dz = \frac{\pi}{2}$

c) Two masses M_1 and M_2 are connected by an inextensible string which passes over a fixed pulley. Using Lagrange's equations show that the acceleration of either mass is numerically = $(m_1 - m_2)g / (m_1 + m_2)$. **[6]**

SECTION - II

Q5) a) The ends A and B of a rod 20 cm long have the temperature at 30°C and 80°C until steady state prevails. The temperature of the ends are changed to 40°C and 60°C respectively. Find the temperature distribution in the rod at time t. **[9]**

b) Solve the Laplace equation. $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, subject to the condition.

$u(0,y) = u(l,y) = u(x,0) = 0$ and $u(x,a) = \sin\left(\frac{n\pi x}{l}\right)$. **[9]**

Q6) a) Discuss the state variable model and its advantage's over differential equation model. **[8]**

b) Explain discrete and continuous system simulation by taking example of each. **[8]**

Q7) a) For a chi-square distribution with n.d.f establish the following recurrence relation between the moments. $\mu_{r+1} = 2r(\mu_r + n\mu_{r-1})$, $r \geq 1$, Hence find β_1 & β_2. **[8]**

b) A random variable 'X' has a uniform distribution over (–3, 3). Find 'k' for which $p(x > k) = \frac{1}{3}$ Also evaluate $p(x < 2)$ and $p[|x-2|<2]$. **[8]**

Q8) a) A random variable 'X' has the following probability function values of X. **[9]**

x :	0	1	2	3	4	5	6	7
P (x) :	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$.

i) Find k.

ii) Evaluate $p(x < 6)$, $p(x \geq 6)$ and $p(0 < x < 5)$.

b) An insulated rod of length '*l*' has its end A and B maintained at 0°C and 100°C respectively until steady state condition prevail. If B is suddenly reduced to 0°C and maintained at 0°C. Find the temperature at a distance x from A at time t. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

P1953

[Total No. of Pages : 2

[4165] - 752

M.E. (Computer Engg.) (Common to Network Engineering)
EMERGING TRENDS IN COMPUTER ARCHITECTURE
(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss issues of cache coherence problem and how it is solved by directory based protocol in CC-NUMA architecture. **[8]**

b) What is a cluster? Explain the various design issues in clusters. **[8]**

Q2) a) Draw and explain ATM network architecture. **[8]**

b) What are the main difference between shared media network and switched networks. Explain their advantages and disadvantages with suitable examples. **[8]**

Q3) a) Explain the various synchronizations mechanisms in threads. **[8]**

b) Draw the internal block diagram of IBM Power IV and list its salient features. **[8]**

Q4) Write Short notes on - **[18]**

a) Advantages and Disadvantages of Blade Server

b) Myrinet PSN

c) Lop P Communication model

P.T.O.

SECTION - II

Q5) a) How and why, can we use a SAN? **[8]**

b) With the help of suitable diagram demonstrate the visual differentiation of DAS vs SAN. **[8]**

Q6) a) What are the different standards of grid? Explain architectural considerations of grid computing? **[8]**

b) Explain various components associated with grid computing. **[8]**

Q7) a) Compare implicit and explicit parallel computing models. **[8]**

b) Describe process management in Parallel Virtual Machine. **[8]**

Q8) Write Short Note - **[18]**

a) System area network

b) ARC model

c) Message passing paradigms

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Total No. of Questions : 8]

SEAT No. :

P1957

[Total No. of Pages : 2

[4165] - 758

M.E. (Computer Engineering)

INFORMATION AND NETWORK SECURITY

(2008 Course) (Elective - II (a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain how different types of passive and active security attacks are handled by the conventional or symmetric encryption? **[8]**

b) Explain privacy and data protection. **[6]**

c) What is the need of one way hash function? **[4]**

Q2) a) What is the difference between a block cipher and a stream cipher? Why do some block cipher modes of operation only use encryption while others use both encryption and decryption? **[8]**

b) Explain authentication protocol based on symmetric and asymmetric cryptosystem. **[8]**

Q3) a) What is the difference between differential and linear cryptanalysis? **[8]**

b) Enlist and explain fragmentation vulnerabilities and remedies. **[8]**

Q4) Write Short Notes on (Any Three) : **[16]**

a) Issues in multi-level secure systems.
b) Cyber laws
c) Information hiding
d) Security Lifecycle

P.T.O.

SECTION - II

Q5) a) What is session key management? Explain with suitable example. **[8]**

b) List ways in which keys can be distributed to two communication parties? **[6]**

c) What is a secure binding of multimedia streams? **[4]**

Q6) a) What is reference monitor concept? What properties are required of a reference monitor? **[8]**

b) What is source masking and hidden channels in Firewalls? **[8]**

Q7) a) What is digital signature? Explain steps to create a digital signature. **[8]**

b) Explain two party Diffie-Hellman key exchange with suitable example. **[8]**

Q8) Write Short Notes on (Any Three) : **[16]**

a) Secure SNMP
b) Certificate management
c) Wireless network security
d) One-time passwords

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Total No. of Questions : 8]

SEAT No. : ____

P1961

[Total No. of Pages : 2

[4165] - 762
M.E. (Computer Engineering)
DISTRIBUTED SYSTEMS
(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe blocking and non-blocking types of IPC. Which is easier to implement and why? Discuss their relative advantages and disadvantages. **[8]**

b) Explain RCP mechanism in detail with the halp of a diagram. **[6]**

c) Differentiate between the monolithic kernel and microkernel approach for designing a distributed operating system. **[4]**

Q2) a) Explain how causality can be captured by means of vector timestamps. **[8]**

b) Why are elections algorithms needed in a distributed system? Explain bully and ring algorithm. **[8]**

Q3) a) What is automounter? Explain how does the NFS automounter helps to improve the performance and scalability of NFS. **[8]**

b) How does AFS deal with the risk that call back message may be lost. **[8]**

Q4) Write Short notes on (any 3) : **[16]**

a) Peer to peer system

b) LDAP

c) Global State of distributed system

d) Mutual exclusion

P.T.O.

SECTION - II

Q5) a) What is false sharing? When is it likely to occur? Can this problem lead to any other problem in a DSM system? Give reason for your answer. **[6]**

b) What are the main causes of thrashing in a DSM system? What are the correctly used methods to solve the thrashing problem in a DSM system? **[8]**

c) What are the three main approaches for designing a DSM system? **[4]**

Q6) a) What are the commonly used approaches for user authentication in each of these approaches. **[8]**

b) What is a digital signature? What are its uses in the security of a distributed system? Give a method to create a digital signature. **[8]**

Q7) a) What is SOAP? Why SOAP? Explain SOAP building blocks. **[8]**

b) To what extend do web services satisfy the requirement for supporting grid? Outline how the OGSI services add the functionality that web services do not provide. **[8]**

Q8) Write short notes on (any 3) : **[16]**

a) Differentiate - Hellman key and Exchange protocol

b) Accessmatrire

c) Consistency models

d) XML Security

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Total No. of Questions : 8]

SEAT No. :

P1963

[Total No. of Pages : 2

[4165] - 764

M.E. (Computer Engineering)

NETWORK DESIGN, MODELING AND ANALYSIS

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail Binomial distribution with its suitable application? **[7]**

b) Define Poisson process? Explain it with reference to **[7]**

i) Superimposition of Poisson process

ii) Decomposition of Poisson process

iii) Independence of Arrivals

c) Explain traffic requirement with respect to design of computer network.**[4]**

Q2) a) Messages arrive independently to a system at the rate of 12 messages per minute. The lengths of messages are exponentially distributed with an average 4800 characters. The channel used for transmission has rate of 9600 bps, character is represented by ASCII format. Find, **[8]**

i) Average service time

ii) Arrival rate

iii) Service rate

iv) Utilization of server

v) Average number of messages

b) Analyze M/M/2 Queue with state transition diagram? **[8]**

Q3) a) Explain & Analyze in detail queuing system with infinite servers? Give its Applications. **[8]**

b) What is terminal concentrator? Explain in detail features of terminal concentrator in computer network? **[8]**

P.T.O.

Q4) Write short notes on (Any Three) **[16]**

a) Gaussian probability density function

b) Exponential distribution

c) Little's Theorem

d) Network modeling

SECTION - II

Q5) a) Explain M/M/m Queue with state transition diagram? **[7]**

b) Explain in detail ADO algorithm for terminal concentrator location? **[7]**

c) Enlist and compare various network security tools. **[4]**

Q6) a) Explain Sharma's algorithm with example? **[8]**

b) Explain with examples open queuing networks and closed queuing networks? **[8]**

Q7) a) Define minimum spanning tree? Explain with suitable example its application in network? **[8]**

b) Explain Esau-William's algorithm? **[8]**

Q8) Write short notes on (Any three) **[16]**

a) Probability for network analysis

b) Network bandwidth management tools

c) Sub-netting

d) Performance analysis of data link layer

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Total No. of Questions : 8]

SEAT No. :

P1974

[Total No. of Pages : 2

[4165] - 780

M.E. (Computer Engineering)(Computer Networks)

OPERATING SYSTEM DESIGN

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answer any 3 questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are different scheduling criteria? Explain the different type of scheduling. **[8]**

b) Explain steps in making a system call with neat diagram. **[8]**

Q2) a) Discuss the desirable features of a good process migration mechanism. **[8]**

b) Explain implementation of thread in user space and kernel space. **[8]**

Q3) a) Explain blocking and nonblocking types of IPC. Which is easier to implement & why? Discuss their relative advantages and disadvantages. **[8]**

b) Explain what is meant by absolute ordering, consistent ordering & casual ordering of message. Give a mechanism for implementing absolute ordering. **[8]**

Q4) a) Explain the different types of Semaphore and its primitives. Discuss the Reader Writer problem having priority using Semaphore. **[10]**

b) Write the conditions to provide mutual exclusion. Explain Peterson's solution for achieving mutual exclusion. **[8]**

P.T.O.

SECTION - II

Q5) a) Prove that the presence of a cycle in a general resource allocation graph is a necessary but not a sufficient condition for the existence of deadlock. **[8]**

b) What are the main issues involved in the selection of victim for recovery from a detected deadlock? Discuss how to take care of a starvation problem. **[8]**

Q6) a) Differentiate between stateful and stateless file servers. **[8]**

b) Explain different file sharing semantics. **[8]**

Q7) a) What is an access matrix? Explain how the following issues can be handled in a security system that uses access matrix for access control : **[10]**

i) Deciding the contents of the access matrix entries.

ii) Validating access to objects by subjects.

iii) Allowing subjects to switch domains in a controlled manner.

b) Explain the password based approach for user login authentication. What are problems associated with this approach. **[8]**

Q8) a) Discuss the names and unnamed pipes. Write the pseudo code for client server application using pipes. **[8]**

b) Discuss the system calls for memory management in Unix. **[8]**

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Total No. of Questions : 8]

SEAT No. : ____

P1975

[Total No. of Pages : 2

[4165] - 782

M.E. (Computer) (Computer Networking)

ADVANCED SOFTWARE ENGINEERING

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How system modeling is applied in various system design activities. **[6]**

b) How spiral model achieves evolutionary software development? Justify **[6]**

c) Which are the types of formal specification? **[4]**

Q2) a) What are the modular decomposition approaches? Explain. **[8]**

b) What is dynamic design OO model? How it can be applied for weather forecasting system. **[8]**

Q3) a) Give the application of RAD Model to word processing System. **[6]**

b) Give the types of component composition. **[6]**

c) How exception handling supports safe programming? **[4]**

Q4) Write short notes on :

a) Data Flow models **[6]**

b) Non functional requirements specification. **[6]**

c) Design pattern. **[6]**

P.T.O.

SECTION - II

Q5) a) How software inspection process is used in verification and validation of software system? **[6]**

b) What are the static product metrics measured in software (product). **[6]**

c) What do you mean by attribute based version identification? **[4]**

Q6) a) How extreme programming activities support Agile process model? Justify. **[8]**

b) Explain the elements of Box structure specification in clean room software engineering. **[8]**

Q7) a) Explain LOC based estimation with an example. **[8]**

b) Give the categories of risks. How risk table can be used in risk projection. **[8]**

Q8) Write short notes on :

a) Interface testing. **[6]**

b) Software quality factors. **[6]**

c) Software reliability specification. **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

P1978

[Total No. of Pages : 4

[4165] - 788
M.E. (Chemical)
APPLIED STATISTICS FOR CHEMICAL ENGINEERS
(2008 Course) (Sem. - I) (Chemical Engineering)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Eleven runs are taken on a pilot - plant reactor at constant conditions, which gives the following values of the percentage yield of desired product : **[18]**

32, 55, 58, 59, 60, 63, 63, 63, 63, 67, 59

Find -

a) Mean, median and mode values of yield.

b) M.D., S.D., coefficient of variation.

c) Quartiles, Q.D., coefficient of Q.D., Bowley's coefficient of skewness.

Q2) a) Draw the "less than ogive" for the data given below and answer the following from the graph. **[8]**

Marks	No. of candidates
0-10	5
10-20	20
20-30	40
30-40	70
40-50	85
50-60	65
60-70	50
70-80	35
80-90	20
90-100	10

i) Determine the median and the two quartiles graphically.

ii) If the pass mark is 40, what % of candidates pass the examination?

P.T.O.

b) Find the missing frequency from the following data if the arithmatic mean is 34 marks.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of students	5	15	20	-	20	10

Also find the median and mode of the distribution. **[8]**

Q3) a) Explain the following terms with suitable sketch. **[8]**

i) Skewness
ii) Symmetrical Distribution
iii) Asymmetrical Distribution
iv) Positively skewed distribution
v) Negatively skewed distribution
vi) Absolute measure of skewness
vii) The karl Pearson's coefficient of skewness
viii) The Bowley's coefficient of skewness

b) The first four moments of a distribution about X = 2 are –2, 12, –20, 100. Calculate **[8]**

i) Moments about the mean.
ii) Values of coefficients β_1 & β_2.
iii) State whether distribution is symmetric or unsymmetric?
iv) Also state whether the distribution is leptokurtic, mesokurtic or platy kurtic?

Q4) a) Calculate karl Pearson's coefficient of correlation from the following data. **[8]**

Roll No.	1	2	3	4	5
Marks in subject - 1 (X)	48	35	17	23	47
Marks in subject - 2 (Y)	45	20	40	25	45

Comment on the nature of correlation between X & Y.

b) A laboratory record shows the following results. **[8]**

$\sigma^2_x = 9$,

Regression equations between X & Y are

$8X - 10Y = -66$

$40X - 18Y = 214$

Find -

i) $\overline{X}$ & $\overline{Y}$

ii) Coefficient of regression between X & Y.

iii) σ Y.

SECTION - II

Q5) a) In a random sample of 1000 persons from town A, 400 are found to be consumers of wheat. In a sample of 800 from town B, 400 are found to be consumers of wheat. Do there data reveal a significant difference between town A & town B, so far as the proportion of wheat consumers is concerned.

(Take 1% LOS with $Z\alpha = 2.58$) **[6]**

b) The fatality rate of typhoid patients is believed to be 17.26%. In a certain year 640 patients suffering from typhoid were treated in a Metropolitan hospital and only 63 patients died. Can you consider the hospital efficient?

(Take 1% LOS with $Z\alpha = -2.33$ for left-tail test) **[6]**

c) A sample of 100 students is taken from a large population. The mean height of the student in this sample is 160 cm. Can it be reasonably regarded that in the population the mean height is 165 cm & SD 10 cm.

(Take 1% LOS with $Z\alpha = 2.58$) **[6]**

Q6) a) In a random sample of size 500, the mean is found to be 20. In another independent sample of size 400, the mean is 15. Could the samples have been drawn from the same population with SD 4.

(Take 1% LOS with $Z\alpha = 2.58$) **[6]**

b) A manufacturer of electric bulbs, according to a certain process finds the SD of the life of lamps to be 100 h. He wants to change the process so that the new process results in a smaller variation in the life of the lamps. In adopting a new process a sample of 150 bulb's gave an SD of 95 h. Is the manufacturing justified in changing the process?

(Take 5% LOS with $Z\alpha = 1.96$) **[6]**

c) Two samples A & B refer marks scored by boys & girls respectively. Based on the following data test whether the boys perform better than the girls.

Boys : $n_1 = 32$, $\bar{x}_1 = 72$, $s_1 = 8$

Girls : $n_2 = 36$, $\bar{x}_2 = 70$, $s_2 = 6$

(Take 5% LOS with $Z\alpha = 1.96$) **[4]**

Q7) a) Tests made on breaking strength of 10 pieces of a metal gave the following results - 578, 572, 570, 568, 572, 570, 570, 572, 596, 584.
Test if the mean breaking strength of the wire can be assumed as 577.
(use t - test with $t_{0.05}$ ($\nu = 9$) = 2.26) **[8]**

b) Following data gives the values of the variables :

A :	9	11	13	11	15	9	12	14
B :	10	12	10	14	9	8	10	

Do the estimates of population variances differ significantly?
(use F - test with $F_{0.05}$ ($\nu_1 = 7, \nu_2 = 6$) = 4.21) **[8]**

Q8) a) A completely randomized design of experiment with 10 plots and 3 treatments gave the following results.

Plot No.	1	2	3	4	5	6	7	8	9	10
Treatment	A	B	C	A	C	C	A	B	A	B
Yield	5	4	3	7	5	1	3	4	1	7

Prepare ANOVA table and analyze the result for treatment effect.
(Take $F_{0.05}$ ($\nu_1 = \nu_2 = 2$) = 4.74) **[10]**

b) Explain transportation problem in LP with suitable example. **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

P1985

[Total No. of Pages : 2

[4165] - 799
M.E. (Chemical)
PROCESS MODELING & SIMULATION
(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

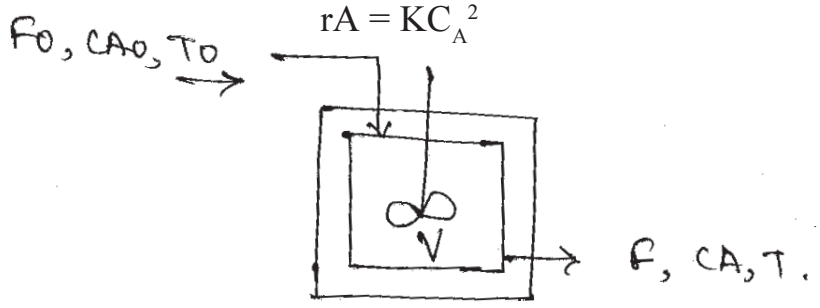
SECTION - I

Q1) a) Define process model and discuss how to form the model.

b) Write the classification of models. What are the differences between lumped and distributed model? Explain with suitable example.

[16]

Q2) Consider an adiabatic insulated CSTR shown below. The reacting mixture can be considered to be liquid of constant density and constant heat capacity. The reactor converts a species A into products. The reaction is exothermic with heat of reaction equal to $-\Delta H$. The rate of consumption is described by following 2nd order reaction kinetics. **[18]**



a) Write dynamic mass, mole and energy balance for the adiabatic CSTR.

b) Consider the feed flowrate, conversion and temperature to be the inputs. Write differential equation in the state - space form - clearly identifying the elements of A & B matrix.

P.T.O.

Q3) Model a batch reverse osmosis plant unit. Assume the notations as per your choice and write the assumptions. **[16]**

Q4) Derive the model for batch distillation with suitable notations. **[16]**

SECTION - II

Q5) a) What are different design of experiments?

b) Discuss full factorial design method in detail.

[16]

Q6) What is process simulation? Explain in detail. Enlist different process modeling softwares and discuss any one in detail. **[18]**

Q7) Write short notes on :- **[16]**

a) Application of optimization in separation techniques.

b) Application of optimization in Heat Transfer and energy conservation.

Q8) A dynamic behavior of a cylindrical tank with zero input can be modeled by following equation. **[16]**

$$A \frac{dh}{dt} = -b \times h^{2/3}$$

Where A is 0.25 m^2 and b is 0.5 m^3/min.

A t = 0, h = 8m.

a) Use Runge-Kutta method to estimate the tank height at t = 1, 2, & 3 minutes.

Use a time - step of t = 1 min.

b) Compute the analytical solution and compare the solution from part @ at time t = 1 and t = 3 minutes.

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Total No. of Questions : 8]

SEAT No. : ____

P1991

[Total No. of Pages : 2

[4165] - 809

M.E. (Chemical) (Environmental Engg.)

APPLIED STATISTICS FOR ENVIRONMENTAL ENGINEERS

(2008 Course) (Sem. - I) (Chemical Environmental Engg.)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss Spearman's Rank correlation coefficient **[8]**

b) Growth of bacteria (N) in a culture after 1hr is given in following table:

t	0	1	2	3	4	5	6
N	32	47	65	92	132	190	275

Fit a curve of the form $N = ab'$ and estimate N when t = 7 using least square method. **[8]**

Q2) An experiment was designed to study the performance of four different detergents. The following "whiteness" readings were obtained with specially designed equipment for 12 loads of washing distributed over three different models of washing machines :

	Machine 1	Machine 2	Machine 3	Totals
Detergent A	45	43	51	139
Detergent B	47	46	52	145
Detergent C	48	50	55	153
Detergent D	42	37	49	128
Total	182	176	207	565

Looking on the detergents as a treatments and the machines as blocks, obtain the appropriate analysis of variance table and at the 0.01 level of significance whether there are differences in the detergents or in the washing machines.**[16]**

Q3) a) Find the covariance of the two random variables whose joint density is given by $f(x,y) = \begin{cases} 2 & for\ x > 0,\ y > 0,\ x + y < 1 \\ 0 & elsewhere \end{cases}$ **[8]**

P.T.O.

b) Explain chebyshev's theorem to demonstrate how σ or σ^2 is indicative of the speed or dispersion. **[10]**

Q4) Prove that F distribution is unimodal at the value

$$\left(\frac{V_1-2}{V_1}\right)\left(\frac{V_2}{V_2+2}\right) \text{ if } V_1>2$$ **[16]**

SECTION - II

Q5) a) State and explain model equations for one way classification for completely randomized Designs. **[8]**

b) Write the equations to find the sums of the squares for two way analysis of variance. **[8]**

Q6) A farmer wishes to test the effect of four different fertilizers, A, B, C, D, on the yield of wheat. In order to eliminate sources of error due to variability in soil fertility, he uses the fertilizers in a Latin square arrangement as indicated in table, where the numbers indicate yields in bushels per unit area.
Perform an analysis of variance to determine if there is a significant difference between fertilizers at the (a) 0.05, (b) 0.01 levels of significance.

A 18	C 21	D 25	B 11
D 22	B 12	A 15	C 19
B 15	A 20	C 23	D 24
C 22	D 21	B 10	A 17

[16]

Q7) Write short notes on : **[18]**

a) Northwest corner Rule

b) Least cost Rule

c) Transportation algorithm

Q8) a) What is the function of the minimum ratio rule in the simplex method. **[8]**

b) Maximize $Z = 5x_1 + 4x_2$

Subject to

$$6x_1 + 4x_2 \le 24$$
$$x_1 + 2x_2 \le 6$$
$$-x_1 + x_2 \le 1$$
$$x_1 \ge 0, x_2 \ge 0$$

Use graphical method. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P1992

[Total No. of Pages : 2

[4165] - 810
M.E. (Chemical) (Environmental Engg.)
ENVIRONMENTAL GEOSCIENCES
(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Write notes on the following :

a) Extrusive volcanism and causes of Volcanism. **[11]**

b) Igneous Intrusions. **[5]**

OR

Explain Geothermal energy and our Environment **[16]**

Q2) Describe following as pects of Earthquake ? **[16]**

a) Earthquake waves

b) Earthquake Intensity

c) Effects of Earthquake

d) Causes of Earthquake

OR

Write a detailed note on Mineral Resources and our Environment. **[16]**

Q3) Explain in detail Lithosphere, hydrosphere Atmosphere and Biosphere. **[18]**

OR

Write notes on the following :

a) Earths Ecosystem **[6]**

b) Geological Hazards **[6]**

c) Air Pollution and Global warming **[6]**

P.T.O.

SECTION - II

Q4) Write notes on :

a) Classification and mobility of trace elements. **[8]**

b) Geochemical Cycles. **[8]**

OR

a) Diseases induced by human use of land. **[8]**

b) Biochemical factors in Environmental health. **[8]**

Q5) Describe Acid mine drainage. **[16]**

OR

Write notes on :

a) Oxidation of Iron **[5]**

b) Effect of AMD **[5]**

c) Importance of Trace elements **[6]**

Q6) Explain Use of Remote sensing and GIS in Environmental science. **[18]**

OR

Write notes on :

a) Principles of Remote sensing **[6]**

b) Formation and Chemistry of AMD **[6]**

c) Microbiology of AMD **[6]**

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Total No. of Questions : 8]

SEAT No. :

P1997

[Total No. of Pages : 2

[4165] - 820

M.E. (Chemical) (Environmental Engg.)

WASTEWATER TREATMENT AND DESIGN

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Question one is Compulsory and attempt any two from the remaining questions in section - I.***
2) ***Question five is compulsory and solve any two from the remaining questions in section - II.***

SECTION - I

Q1) a) Explain the need for the tracer analysis in Wastewater treatment. **[6]**

b) How E and F curves are obtained? Explain the role of Mean Residence Time. **[6]**

c) Explain Diffusion and Dispersion and outlined the procedure for obtaining a plug flow Similarity in CSTR. **[6]**

Q2) a) Discuss reasons for Wastewater formation and the order of treatment for its purification. **[8]**

b) How quality of water is determined? Explain the significance of BOD and COD. **[8]**

Q3) a) Why mixing is important in Wastewater treatment? How Power of mixing is determined? **[8]**

b) What is Henry's law? Explain its use in determining the quantity of dissolved gases in water? **[8]**

Q4) Write short notes on the following : **[16]**

a) Non Ideal flow.

b) Reactors in Wastewater treatment.

c) Cell configuration.

d) Peclet Number.

P.T.O.

SECTION - II

Q5) a) Explain how adsorption isotherms are obtained? How data is used in the design of a column. **[6]**

b) Explain the phenomenon of mass transfer over a solid porous surface. **[6]**

c) How Break through curve is obtained? Explain its significance in the design of a column. **[6]**

Q6) a) What is SRT? Explain its role in the design of a bioreactor. **[8]**

b) How Biological processes are classified as per metabolic functions? **[8]**

Q7) a) Explain Perikinetic and Orthokinetic flocculation. **[8]**

b) Explain Varity of mixers required for wastewater treatment. **[8]**

Q8) Write short notes on the following : **[16]**

a) Ion Exchange in Wastewater treatment.

b) Ideal CSTR.

c) Growth of a cell.

d) Settling.

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Total No. of Questions : 8]

SEAT No. : ____

P1998

[Total No. of Pages : 2

[4165] - 822

M.E. (Chemical) (Environmental Engg.)

INDUSTRIAL WASTE TREATMENT

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is wastewater and Industrial waste water? Explain. Also classify the Industrial wastewater.

b) What is reuse, reduce and recycle concept in water treatment. **[18]**

Q2) Discuss about water budget, of a typical chemical Industry in detail. **[16]**

Q3) How to remove heavy metals from Industrial wastewater? Explain any one method to remove the heavy metal from Industrial waste water. **[16]**

Q4) a) Explain the design of aerated lagoons.

b) Removal of fluoride is essential from water explain. Also give the treatment method. **[16]**

P.T.O.

SECTION - II

Q5) Describe the flowsheet for dairy wastewater treatment and focus on its cost benefit analysis. **[18]**

Q6) Explain the sources, characteristics and treatment of sugar Industry wastewater. Draw flowsheet for complete treatment plant. **[16]**

Q7) Draw a flowsheet for petroleum refinery waste water treatment plant and discuss it in detail. **[16]**

Q8) Write notes on : **[16]**

a) Cleaner Technologies.

b) Common effluent treatment plant.

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Total No. of Questions : 8]

SEAT No. : ____

P2149

[Total No. of Pages : 3

[4165] - 842

M.E. (Petroleum)

ARTIFICIAL LIFT TECHNIQUES

(2008 Course) (Elective - III (a)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw the neat schematic sketch and explain the unloading operation to be used in wells with low P.I. and a reasonably low bottom hole pressure relative to well depth. **[9]**

b) Draw the sketch of a Casing pressure operated valve and show that the casing pressure at depth must be reduced to the dome pressure at depth for this valve to close the valve. **[9]**

Q2) a) For a intermittent flow injection, use the following data and graphically decide depth for single point of gas injection. **[10]**

Given data :

Depth = 9900 ft. Expected rate = 1070 bbls/day. (100% oil) Tubing size = $2\frac{3}{8}$ inch. Flowing well head pressure = 150 psig, SBHP = 2900 psig. P.I. = 3.0, Formation GLR = 300, SCF/STB, Sp. Gravity of injection gas = 0.7, S/C operating pressure = 1000 psig, °API = 41, S/C Temp. = 122 °F B.H. Temp. = 222 °F. 300 psi/1000 ft = flowing gradient of FBHP. 22 psi/1000 ft = casing pressure gradient. Subtract 100 psi from point of balance. Also calculate the daily gas injection rate necessary if, optimum GLR = 650 SCF/STB.

b) Discuss in brief the candidate well selection criteria's for well stimulation job. **[6]**

P.T.O.

Q3) a) Write, how the following well parameters can affect working and operational efficiency of ESP pump. **[6]**

i) Pump setting depth and intake pressure

ii) Viscosity of oil

b) Calculate TDH and total HP, if pump with 0.4 HP/stage is available and each stage gives a head of 28 feet. **[10]**
Given data: Sp. Gravity of fluid = 0.93.
Desired production rate of 1100 bbls/day
Well Depth = 6850 ft.

The static liquid level = 2000 ft. Casing = 5 $\frac{1}{2}$ inch O.D. Tubing = 2 $\frac{3}{8}$ inch O.D. T = 164°F. During the test on this water well it was seen that, it is producing 800 bbls/day with liquid level at 3100 ft in the csg., which then stabilized to above 2300 ft. Use 100 ft safety in setting pump. Tubing friction is given as 30 ft / 1000 ft. At the surface there is 2100 ft of 2.0 inch flow line with an increase in elevation = 40 ft., with friction = 30 ft/ 1000 ft.

Q4) Explain the working and functions of following components in case of ESP **[16]**

a) Electric motor

b) Protector

c) Centrifugal pump

d) Gas separators

SECTION - II

Q5) a) A 2 inch pump is to be set in a well at the working fluid level of 4400 ft., and 230 bbl/day of fluid rate is desired at the surface. If the pumping speed is 20 spm and the effective plunger stroke is 55 inch., calculate the volumetric efficiency of the pump. Comment on pump size and plunger size. **[10]**

b) Explain ideal counterbalance effect in detail. **[8]**

Q6) a) What is dynagraph? Draw typical dynagraph sketch to show the problem of gas pound and excessive friction conditions in a SRP installed well. **[6]**

b) Draw the neat schematic sketch of a surface and sub-surface set up of SRP system. Name the components. **[10]**

Q7) Given data : **[16]**

Q_{sc} Mscfd	Pwfs. Psia	ΔP psi (d = 2.441)
25,000	5880	470
20,000	5600	1380
15,000	5350	1900
10,000	5200	2800
5,000	5100	3200

T_S = 100 °F, γ_g = 0.83, ϵ = 0.0006 inch, H = 11,900 ft,

T_R = 268 °F μ_g = 0.014 Cp, r_e = 1138 ft, Well bor radius = 0.50 ft,

S = 0, Pay thickness = 25ft., Perforation diameter = 0.50 inch., compressibility factor = 0.94, Gravel permeability = 34 darcys., screen O.D. = 3.06 inch., Hole diameter = 12.25 inch, 4, 6 and 10 perforations per foot are to be evaluated. Use the above data of bottom hole flowing pressure Vs gas flow rate and pressure drop for 2.441 inch tubing, decide the feasible perforation sizing, flow capacity for possible pressure loss across the sandface.

Q8) a) Write the reaction of 15% HCL solution with Calcite. Calculate the volumetric dissolving power of acid solution and describe the necessary steps to calculate it if specific gravity of acid is 1.06 and Calcite density is 167 lbm/ft^3. **[6]**

b) Explain in brief the role of following elements in successful completion of a fracturing job. **[10]**

i) Viscosity of fracturing fluid.

ii) Fluid - loss/leak-off coefficient.

iii) Fracture conductivity and fracture geometry.

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Total No. of Questions : 8]

SEAT No. :

P2150

[Total No. of Pages : 2

[4165] - 847
M.E. (Petroleum)
ADVANCED OFFSHORE TECHNOLOGY
(2008 Course) (Elective - IV (c)) (Sem. II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Classify different types of platforms used in offshore field development. What is concrete gravity platform? Write the principle of its operation. Also draw the neat schematic sketch and explain the construction, working, advantages and disadvantages of this platform. **[18]**

Q2) a) Draw the typical graph for a Drill stem testing operation. Indicate all the features of it. **[4]**

b) Define the following : **[2]**

i) API gravity

ii) Cement viscosity

c) For a structural casing installation program, explain the procedure involved in drilling a required hole, casing lowering and cementing operation from a floating offshore platform. **[10]**

Q3) Explain in detail various types of well trajectories. Write their merits and demerits. **[16]**

Q4) Write short notes on : **[16]**

a) Hole problems

b) Production Riser

c) ROV

d) Drill ship

P.T.O.

SECTION - II

Q5) a) Write the various API types of cement. What is the basis for selection and design of a cement slurry used in offshore casing cementation? Explain in brief. **[9]**

b) State and explain equations to calculate pressure drop inside a pipe line with their assumptions and applications. **[9]**

Q6) a) Discuss working of a Group gathering station in brief. **[8]**

b) Draw the neat schematic sketch of a multiple zone well completion. **[8]**

Q7) Describe in detail one case study to explain the application of horizontal well technology. Explain drilling, completion, production and related aspects, challenges and objectives during field development using horizontal wells. Draw the free-body diagram, graph along with mathematical expressions, if any to elaborate this case study. **[16]**

Q8) Write short notes on : **[16]**

a) Types of drilling fluids.

b) Oil and gas separator.

c) Offshore well control.

d) Sub sea completion.

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Total No. of Questions : 8]

SEAT No. :

P2151

[Total No. of Pages : 4

[4165] - 848 - A

M.E. (Petroleum Engineering)

PIPING DESIGN AND ENGINEERING

(2008 Course) (Elective - IV (d)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any two questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the piping codes and standards related piping design and engineering. **[10]**

b) Calculate the pressure drop for fluid flowing through a pipe of diameter 10 cm and length 10 m with flow rate 25 liters/sec for following cases:**[15]**

i) Newtonian fluid with viscosity 10 poise.

ii) Fluid with zero shear viscosity = 10 Poise and flow behavior index, n = 0.9.

iii) Fluid with zero shear viscosity = 10 Poise and flow behavior index, n = 1.1.

Q2) a) Discuss in brief flow patterns and flow regimes in multiphase mixtures.**[10]**

b) Sand with a mean particle diameter of 0.2 mm is to be conveyed in water flowing at 0.5 kg/s in a 25 mm internal diameter horizontal pipe 100 m long. Assuming fully suspended flow, estimate the maximum amount of sand which may be transported in this way if the head developed by the pump is limited to 300 kN/m^2?

The terminal falling velocity of the sand particles in water may be taken as 0.0239 m/s. **[15]**

Q3) a) Write short notes on : **[15]**

i) Types of pipe supports and their selection.

ii) Bellows type expansion joints.

iii) Pipeline material and components.

b) Discuss in brief piping fabrication and inspection and non-destructive testing methods used in Piping Engineering and design. **[10]**

P.T.O.

Q4) A process sketch of a fractionating tower is given in Figure 1. The vessel has the following specifications. Shell thickness is to be determined. As a thumb rule. it is to be noted that for each 5-6 m height, shell thickness can be increased by 1-2 mm. This is required to determine the number of shell courses. **[25]**

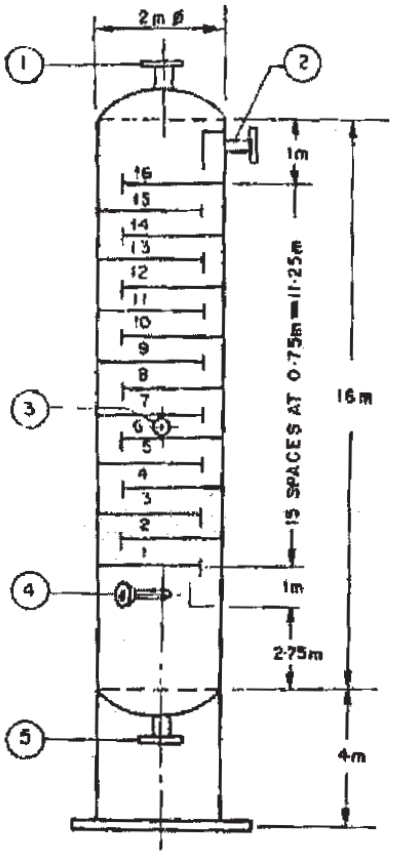

Figure 1 for Q.4

Max. Wind. Velocity expected (for height up to 20m)	=	140 km/hr
shell OD	=	2.0 m
Shell length tangent to tangent	=	16.0 m
Skirt height	=	4.0 m
Operating Temperature	=	573 K
Operating Pressure	=	0.7 MN/m^2
Design Temperature	=	593 K
Design Pressure	=	0.8 MN/m^2
Shell material: Shell, double welded butt joints, no stress relieving or radiographing	=	IS: 2002-1962, Grade 2B
Corrosion Allowance	=	3 mm
Tray Spacing	=	0.75 m
Top disengaging space	=	1.0 m
Bottom Separator space	=	2.75 m
Weir height	=	75 mm for all trays
Downcomer clearance	=	25 mm for all trays

Weight of each head	=	7.5 kN
Tray loading excluding liquid (alloy steel trays)	=	1.0kN/m^2 of tray area
Tray Support rings	=	60 mm × 60mm × 10 mm angles
Insulation	=	75 mm asbestos
Accessories	=	One caged ladder

Manways, gauge glass and level control connections are provided.
Design in accordance with IS: UPV code for class 2 vessels neglecting seismic forces.
Nozzle specifications are given below

No.	Size (m)	Service
1	0.400	Overhead Vapor
2	0.075	Reflux
3	0.300	Feed inlet, internal distributor designed to provide even distribution across length of tray
4	0.400	Reboiler, made tangential
5	0.200	Bottoms

SECTION - II

Q5) a) Discuss in brief the application and techniques of cathodic protection for underground pipeline systems. **[10]**

b) Discuss with process flow diagram the considerations for piping for distillation systems. **[10]**

c) Write a brief note on : "Pipeline construction for cross country and offshore systems". **[5]**

Q6) a) Calculate the minimum required wall thickness and choose suitable pipe schedule for 250 NB (OD = 273 mm) pipe under following conditions :
Internal Pressure = 30 kg/cm^2
Joint efficiency factor = 85%
Corrosion allowance = 1.7 mm
Material of construction = Carbon steel, having maximum allowable stress = 900 kg/cm^2 at operating temperature.
Assume standard mill tolerance
Also calculate maximum allowable internal pressure for above pipe of adopted schedule. **[10]**

b) Write short notes on : **[15]**

i) Plot plan and Equipment Layout

ii) HAZOP

iii) Fire Protection Systems.

Q7) a) Discuss the importance and principles of Piping Network analysis in Piping Engineering and design. Derive an equation for flow of liquids through circular pipe that relates relationship between friction head loss and flow as well as branch parameters (such as equivalent length and diameter) State the assumptions made in this derivation. **[15]**

b) Discuss various factors to be considered for piping design for flow through perforated pipes and porous media. **[10]**

Q8) Consider the process flow sheet for distillation plant (Capacity = 30 KLPD) for Ethyl alcohol from fermented molasses as shown in Figure 2. **[25]**

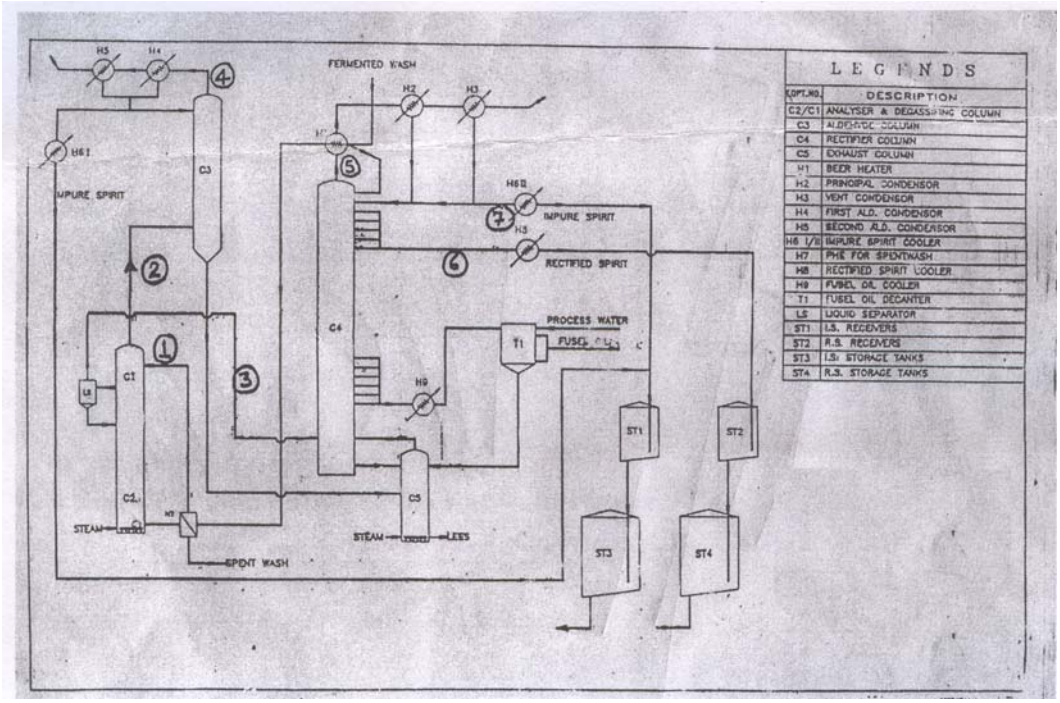

Figure 2 For Q.8

Do the Pipe size analysis for stream No. 1 to 7 as shown in Figure 2.

Additional data for pipe sizing :

Alcohol concentration in fermented wash = 9.0% (v/v)

Alcohol concentration in Rectified spirit = 95% (v/v)

Alcohol concentration in vapors generated in Analyzer column = 44.5% (w/w)

Optimum velocity for rectified spirit vapors = Range 15-20 m/s

Optimum velocity for pump discharge liquid = Range 1.2-2.0 m/s

Optimum velocity for gravity flow = Range 0.3-0.5 m/s

Reflux Ratio (R) = 7.0.

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Total No. of Questions : 10]

SEAT No. :

P2159

[Total No. of Pages : 2

[4165] - 863

M.E. (Information Technology)

MOBILE COMPUTING AND M-COMMERCE

(2008 Course) (Elective - III (c)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the various steps involved in placing a call from : **[8]**

i) Mobile to a Landline phone,

ii) Landline Phone to a Mobile Phone.

b) Compare TDMA, FDMA and CDMA schemes. **[8]**

Q2) a) What are the causes of co-channel interference in cellular mobile communication? Why is this effect the most pre-dominant in Cellular communication? What are the limitations caused by this interference in cellular communications? **[8]**

b) Explain GPRS architecture reference model with diagram. **[8]**

Q3) a) Discuss the spread spectrum techniques. **[8]**

b) How is localization, location update, roaming etc, done in GSM and reflected in the databases? What are the typical roaming scenarios? **[8]**

Q4) a) Explain the three algorithms used for providing security in GSM i.e. A3, A5 & A8. How is subscriber authentication and data Encryption done in GSM. **[8]**

b) Describe logical and physical channels and frame hierarchy of GSM with neat sketch. **[8]**

P.T.O.

Q5) Write a short note on : **[18]**

a) WLL Protocols

b) SMS

c) Cell Splitting

SECTION - II

Q6) a) Describe relation between GPRS, EDGE, 3G, GSM, 3G CDMA and WAP? **[10]**

b) Enumerate types of services offered by Bluetooth and its packet header. **[8]**

Q7) a) Compare and contrast the 1G, 2G and 3G technologies. **[8]**

b) Discuss how to increase the quality of service in an ad hoc network. **[8]**

Q8) a) Explain the DECT system architecture and reference model, with the help of a suitable diagram. **[8]**

b) Explain the architecture of WIFI in detail. **[8]**

Q9) a) Define m-commerce and explain how an e-government could use it to increase its efficiency and effectiveness. **[8]**

b) Explain UMTS system architecture. **[8]**

Q10) a) Write a short note on m-commerce framework. **[8]**

b) Explain the implementation challenges in M-commerce. **[8]**

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Total No. of Questions : 9]

SEAT No. :

P2160

[Total No. of Pages : 3

[4165] - 864

M.E. (Information Technology)

USER INTERFACE DESIGN

(2008 Course) (Elective - III (d)) (Sem. II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Solve any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe a simple model of human cognition, at the level of functions such as "long term memory". How do the evaluation methods of KLM, GOMS, Cognitive Walkthrough, and Heuristic Evaluation relate to this model? **[8]**

b) What are mental models, and why are they important in interface design? What can a system designer do to minimize the memory load of the user? **[8]**

Q2) a) Which usability evaluation techniques are most appropriate to the following situations? For each, say why this is so. **[8]**

i) An expert user performing a familiar task.

ii) An expert user designing a novel solution.

iii) A new user using a system for the first time.

b) What is requirement analysis? What are the methods involved in it? What is the impact of it on UI design? Explain. **[8]**

Q3) a) The use of mobile devices has been increasing rapidly over the past few years. These devices typically feature much smaller screens than desktop computers. List two strategies of how you could successfully implement an interface to browse through a user's set of digital photographs on a small device. **[8]**

b) Do you think that today's keyboard is well suited for blind people? If not what design alternative you suggest? Draw suitable diagram. **[8]**

P.T.O.

Q4) a) Take any real world software as example and explain the following terms on that software. Time to learn, Speed of performance, Rate of errors by users, Retention over time and subjective satisfaction? **[8]**

b) Look back at the scenario for arranging a meeting in the shared calendar application. Perform hierarchical task analysis for the goal of arranging a meeting. Include all plans in your answer. Express the task analysis textually and graphically. **[8]**

Q5) Write short notes on any three of the following : **[18]**

a) Emotional design

b) Personas

c) Navigation design

d) Patterns in Interaction Design.

SECTION - II

Q6) a) What influence does the social environment in which you work have on your interaction with the computer? What effect does the organization (commercial or academic) to which you belong have on the interaction? **[8]**

b) Explain the features, their strength and weakness of the following three user interface styles: menu driven, natural language, direct manipulation.**[8]**

Q7) a) Below are a number of proposed interactive products. What do you think are the key usability goals and user experience goals for each of them? **[8]**

i) a mobile device that allows young children to communicate with each other and play collaborative games.

ii) a video and computer conferencing system that allows students to learn at home.

iii) an Internet application that allows the general public to access their medical records via interactive TV.

iv) a CAD system for architects and engineers.

b) Explain how you might use of virtual world interface capabilities in a system for users to choose and book their holidays. **[8]**

Q8) a) What is the need for usability test? What are the types of tests? Explain any two in detail. **[8]**

b) Think of examples of the following systems and write down the usability and user experience features that are important for the success of each:**[8]**

i) a word processor

ii) a cell phone

iii) a website that sells clothes

iv) an online patient support community.

Q9) Write short notes on any three of the following : **[18]**

a) Groupware & Coordination

b) Object Oriented User Interface

c) Wizard Testing

d) Ergonomics

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Total No. of Questions : 6]

SEAT No. :

P2167

[Total No. of Pages : 3

[4165] - 903

M.E. (Instru. and Control) (Process Instru. Biomedical Instru.)

MODERN CONTROL THEORY

(2008 Course) (Elective - II (a)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Assume suitable data, if necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Answer any two questions from each section.***

SECTION - I

Q1) Attempt following :

a) Determine the transfer matrix for the system given below

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 3 \\ -2 & -5 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} u(t)$$

and $y = \begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ **[15]**

b) Test controllability and observability of a given system.

$$\dot{x}(t) = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 3 & 1 \end{bmatrix} x(t) + \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 0 & 1 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} x(t)$$ **[10]**

Q2) Attempt following :

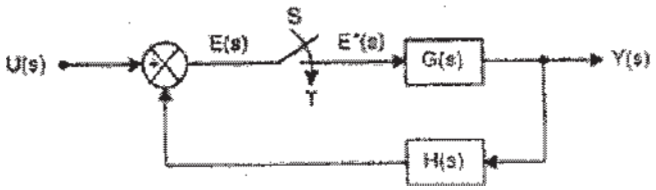
a) Consider the digital controller defined by

$$D(z) = \frac{U(z)}{E(z)} = \frac{4(z-1)(z^2+1.2z+1)}{(z+0.1)(z^2-0.3z+0.8)}$$ **[15]**

Realize this digital controller in the cascade scheme and in parallel scheme.

P.T.O.

b) Obtain the pulse transfer function for the error-sampled system given below, where sampling time T = 1 sec. **[10]**



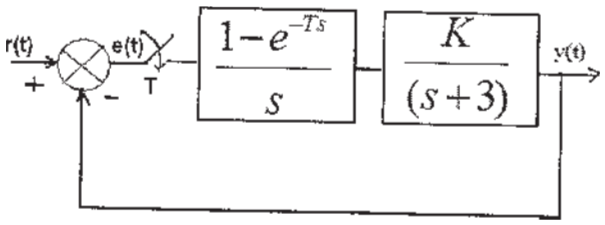
$$G(s) = \frac{1}{s(s+1)}, \; H(s) = 1$$

Q3) Attempt following :

a) Compare stability properties of the system shown with **[15]**

i) T = 0.5,

ii) T = 1. Assume K > 0.



b) A nonlinear system described by **[10]**

$$\dot{x}_1 = x_2$$

$$\dot{x}_2 = -x_1 - x_2^{\,3}$$

Check the system's stability using the direct method of Lyapunov.

SECTION - II

Q4) For a given transfer function matrix

$$G(s) = \begin{bmatrix} \dfrac{4}{s^2+3s+2} & \dfrac{-0.5}{s+1} \\ \dfrac{1}{s+2} & \dfrac{2}{s^2+3s+2} \end{bmatrix}$$

a) Find polynomial matrix P(s) **[15]**

b) Find Smith McMillan form M(s) of G(s). Also find zeros and poles of G(s). **[10]**

Q5) Attempt following :

a) Synthesize a PI controller for a plant having a nominal model given by

$G_0(s) = \frac{1}{s^2 + 6s + 9}$ in such a way that Mg $\geq$ 10[dB] and Mf $\geq \pi / 4$. **[15]**

b) By using the Nyquist criterion, determine whether the closed loop system having the following open loop transfer function is stable or not. If not, how many closed loop poles lie in the right half *s*-plane.

$$G(s)H(s) = \frac{1 + 4s}{s^2(1 + s)(1 + 2s)}$$ **[10]**

Q6) Attempt following :

a) For a nominal plant model Consider all closed loop poles to lie to the left of –0.5 in the complex plane also controller include integral action.

$$G_0(s) = \frac{(s - 4)}{(s - 1)(s + 4)}$$

Find a particular controller satisfying these conditions and Parameterize all controllers satisfying this condition. **[15]**

b) Write short notes on : **[10]**

i) Pulse transfer function.

ii) Sampling theorem.

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Total No. of Questions : 12]

SEAT No. : ____

P2176

[Total No. of Pages : 3

[4165] - 927
M.E. (Polymer)
SCIENCE AND ENGINEERING OF FIBERS
(2008 Course) (Elective - III (a)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answers to section - Iand section - II should be written on separate answer book.***
2) ***Solve 3 questions from section - I and 3 questions from section - II.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) With appropriate flow diagram explain various stages involved in production of PET fibers. **[6]**

b) What are the various sources of Natural fibers? Give suitable examples of each source. **[5]**

c) What criteria given polymer should satisfy so as to use for fiber manufacture. **[7]**

OR

Q2) a) Briefly comment on By-products of thermal degradation of PET. **[4]**

b) What are various stages involved in production of Nylon 66 fibers? Draw the flow diagram. **[6]**

c) Explain in detail the spinning technique used to manufacture PP fibers. **[8]**

Q3) a) Explain the process of preparing hydrophilic acrylic fibers. **[6]**

b) Why pre-drying step is necessary for PET fiber spinning while not for PP fiber spinning? **[4]**

c) What are the various types of cooling systems used in melt spinning technique? With neat sketch explain any one in detail. **[6]**

OR

P.T.O.

Q4) a) Write a short note on Modified Synthetic Fibers. **[6]**

b) Explain in brief the dry-jet wet spinning technique. **[6]**

c) Enlist the advantages of bicomponent acrylic fibers. **[4]**

Q5) a) With neat profile diagrams explain the effect of distance from spinneret on various characteristics of fiber in threadline. **[6]**

b) Explain the effect of orientation and crystallinity on the properties of fibers. **[7]**

c) What do you understand by Regenerated Cellulose? **[3]**

OR

Q6) a) Write a short note on Regenerated Protein Fibers. **[8]**

b) Why it is not possible to manufacture fibers from cellulose using melt spinning technique? Explain in detail any one method used to convert cellulose into fiber form. **[8]**

SECTION - II

Q7) a) Write a short note on structural changes taking place during spinning, drawing and heat setting operation during fiber manufacture. **[7]**

b) Explain the Direct Spinning process for staple fiber production. **[6]**

c) Why is it necessary to carry out stretching or drawing of fibers? Enlist various Drawing Conditions in fiber drawing stage. **[5]**

OR

Q8) a) What is the significance of heat setting in fiber manufacture? Briefly explain how it is done. **[6]**

b) Write a short note High Speed Spinning process. **[6]**

c) Explain in detail Sequential Draw Texturing Process. **[6]**

Q9) a) Explain "Mass Colouration" of fibers. **[3]**

b) Enlist various methods of mass colouration of polyesters. Explain any one in detail. **[10]**

c) Why is it difficult to dye polyester fibers? **[3]**

OR

Q10) a) What do you understand by Acid dyeing and Base dyeing? **[4]**

b) PP fibers difficult to dye. Justify the statement. **[4]**

c) Enlist advantages and disadvantages of Mass colouration. **[8]**

Q11) a) Write a short note on "Dyeability of Synthetic Fibers". **[6]**

b) Explain Disperse dyeing as well as Carrier dyeing processes alongwith their mechanism. **[10]**

OR

Q12) a) Explain in detail the Thermosol Process of fiber dyeing. **[8]**

b) Write a short note on High Temperature processes used for fiber dyeing. **[8]**

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Total No. of Questions : 12]

SEAT No. : ____

P2177

[Total No. of Pages : 3

[4165] - 929
M.E. (Polymer)
SPECIALTY POLYMER MATERIALS
(2008 Course) (Elective - III (c)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates :-

1) ***Answers to section - Iand section - II should be written on separate answer books.***
2) ***Solve 3 questions from section - I and 3 questions from section - II.***
3) ***Neat diagrams should be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) With neat sketch explain the physical mechanism responsible for obtaining liquid crystallinity. **[6]**

b) Write a short note on techniques used to reduce melting temperature of aromatic polyesters so as to form thermotropic mesophases without decomposition. **[6]**

c) What are the various methods used for mesophase identification in Thermotropic polymers? **[6]**

OR

Q2) a) Enlist the factors governing effectiveness of processing conditions in enhancing molecular orientation and mechanical properties in Thermotropic LCPs. Explain any one in detail. **[8]**

b) Is poly (P-phenylene terephthalamide), PPTA [Kevlar®] Thermotropic or Lyotropic type LCP? Justify your answer with writing its repeating unit structure. **[6]**

c) What do you understand by isotropic and anisotropic phases? Draw schematic diagrams. **[4]**

Q3) a) With suitable example explain Electrochemical Synthesis of Conducting polymers. **[6]**

b) Although both, polyethylene and polyacetylene, contain only carbon and hydrogen elements, polyethylene can not conduct electricity while polyacetylene can. Do you agree with statement? Justify your answer.**[4]**

c) Write a short note on Band Theory of Conducting Polymers. **[6]**

OR

P.T.O.

Q4) a) What do you understand by Doping in conducting polymers? Explain in brief various doping techniques. **[7]**

b) Write a short note on Use of Conducting Polymers in Sensors. **[6]**

c) Explain the terms - Polaron, Bipolaron, Solitons. **[3]**

Q5) a) How the heat resistance can be increased in polymers like PPS? What are the additives used for the same? **[4]**

b) Briefly explain the chemical factors affecting heat resistance of polymers. **[6]**

c) Write short note on Synthesis and Applications Polyimides. **[6]**

OR

Q6) a) What criteria given polymer should satisfy so as to consider it as 'Heat Resistant Polymer'? **[3]**

b) Generally for a given same chemical constitution, high molecular weight polymers have higher heat resistance compared to low molecular weight. Justify the statement. **[4]**

c) Enlist the applications of PEEK in Aerospace field. **[5]**

d) Explain the importance of primary bond strength in heat/thermal stability of polymers. Give suitable examples. **[4]**

SECTION - II

Q7) a) What do you understand by Biocompatible and Biodegradable polymers? Give at least one example as well as application of each. **[5]**

b) Enlist various modes of mass transport through membrane. Explain any one in detail. **[6]**

c) Explain any one method used to manufacture membranes. **[5]**

OR

Q8) a) What is Interpenetrating Polymer Network (IPN)? Give at least one example and application of IPN. **[4]**

b) Explain in detail the concept of Reverse Osmosis. Comment on polymers used for this technique. **[6]**

c) Write a short note on Polymers used in Drug delivery application. **[6]**

Q9) a) What is telecommunication? Describe the role of optic fiber cables in telecommunications. Which properties of the polymers render it useful in such applications? **[8]**

b) Alongwith advantages, disadvantages and various applications explain the concept of polymer concrete. **[8]**

OR

Q10) a) What are hydrogels? Explain various applications of polymeric hydrogels. **[8]**

b) What is the principle used in optic fiber cables? Describe various applications of them. **[8]**

Q11) a) Define the terms miscible and immiscible blends. Discuss the importance of polymer blends. **[6]**

b) With suitable examples, explain the role of Compatibilizer in polymer blends. **[6]**

c) Write a short note on Thermodynamics of Polymer Blends. **[6]**

OR

Q12) a) Enlist various theories pertaining to polymer-polymer miscibility. Explain any one theory in detail. **[9]**

b) Explain in detail how impact strength of polystyrene can be increased using blend technology? **[6]**

c) What do you understand by the terms LCST and UCST in polymer blend technology? **[3]**

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Total No. of Questions : 8]

SEAT No. :

P2178

[Total No. of Pages : 2

[4165] - 931
M.E. (Polymer Engineering)
ELASTOMER TECHNOLOGY
(2008 Course) (Elective - IV (b)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Attempt any three questions from section - I and any three questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) With suitable data explain how vulcanization brings about the changes in properties of raw rubber. **[9]**

b) Enlist the molecular requirements for any material to show properties of rubber. **[8]**

Q2) a) Explain in detail extrusion of rubber. Comment on the issues related to the same. **[9]**

b) Explain the experimental method to study curing in rubber. **[8]**

Q3) a) Discuss in detail manufacturing process of any one latex based dipped good. **[8]**

b) Enlist various ASTM standard methods for rubber. Discuss any one. **[8]**

Q4) a) Differentiate SBR and NBR. **[8]**

b) With experimental outcomes explain how carbon black reinforcement alters the properties of rubber. **[8]**

P.T.O.

SECTION - II

Q5) a) What are thermoplastic elastomers. Compare with rubbers. **[9]**

b) Define and explain the role of tackifiers, plasticizers and softeners. **[8]**

Q6) a) Write a note on kinetic and thermodynamic theory of rubber elasticity. **[9]**

b) What is mastication? Prove its importance with suitable data. **[8]**

Q7) a) Discuss in detail various stages involved in tyre manufacture. **[8]**

b) Write a note on factors affecting rate vulcanization. **[8]**

Q8) a) Differentiate between CR and BR in detail. **[8]**

b) Discuss manufacturing details of foot wear. Give the typical composition. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P2186

[Total No. of Pages : 2

[4165] - 945

M.E. (Printing & Graphic Communication)

MULTIMEDIA SYSTEMS & COMMUNICATION

(2008 Course) (Elective - III (a)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer any two questions from section - I and any two questions from section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following terms related to future television graphics : **[10]**

i) Graphic Centralization.

ii) HDTV.

b) Justify with proper example that 'Encapsulation, Inheritance and Polymorphism are said to be main pillars of OOPs'. **[15]**

Q2) a) Explain in brief the following Image Editor features : **[10]**

i) Contrast change and Brightening.

ii) Sharpening and softening of Images.

b) Explain with proper examples the JPEG and MPEG Standards for Multimedia Applications. **[15]**

Q3) a) Explain the following in brief : **[10]**

i) TFT - LCD Display.

ii) SED Display.

b) Explain with proper supporting examples the emerging trends in Multimedia systems. **[15]**

P.T.O.

SECTION - II

Q4) a) Justify that 'A stand-alone Internet radio devices emerged to offer listeners a no-computer option for listening to audio streams'. **[10]**

b) State different Animation issues and explain in brief how different Animation issues can be handled? **[15]**

Q5) a) Explain in detail the 'Social Cultural Impact' and 'Social Criticism' of the followings : **[10]**

i) Online Shopping.

ii) Online Chat.

b) With the help of simple block schematic explain in detail the working principle of 'Web Search engine'. **[15]**

Q6) a) Explain in the following in brief : **[10]**

i) Camera Raw.

ii) Metadata & Asset Management.

b) List various audio, video & animation authoring tools. Explain one tool in detail. **[15]**

⌘⌘⌘

Total No. of Questions : 6]

SEAT No. :

P2187

[Total No. of Pages : 1

[4165] - 946

M.E. (Printing Engg. & Graphic Communication)

TOTAL PRODUCTIVE MAINTENANCE IN PRINTING

(2008 Course) (Elective - III (b)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer any two questions from each sections.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures on right indicates marks.***

SECTION - I

Q1) a) Explain tool used in printing Industry Known as 5 W.l H. **[15]**

b) What is Quality Assurance? **[10]**

Q2) a) What is 5S? **[15]**

b) Explain standardization in printing Industry. **[10]**

Q3) a) Explain Histogram and pareto Analysis in printing Industry. **[15]**

b) Explain stop and speed loss. **[10]**

SECTION - II

Q4) What is planned Maintenance? Considering Mission & Target. **[25]**

Q5) a) What is statistical process control? **[15]**

b) What are the control charts for subgroups? **[10]**

Q6) Explain Supporting pillars of T. P. M. **[25]**

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Total No. of Questions : 8]

SEAT No. : ____

P1812

[Total No. of Pages : 3

[4165] - 425

M.E. (Civil - Hydraulic Engg.)

FLUID MECHANICS

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, and non - programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary and mention it.***

SECTION - I

Q1) a) Define two - dimensional source, sink and doublet. Derive expressions of velocity potential function and stream function in these cases in polar and cartesian co - ordinates. Sketch the patterns of ϕ - lines and ψ - lines in these cases. **[10]**

b) Velocity components for three - dimensional flow are as follows : $u = y + z + k$; $v = x + y + z$, $w = x + y - z$ where k is a constant **[8]**

i) Check whether flow is possible.

ii) If the flow is possible, check whether it is rotational or irrotational.

iii) Obtain the expression for velocity potential function in case the flow is irrotational.

Q2) a) State the major steps in deriving Navier - stokes' equations. **[8]**

b) Starting from Navier - stokes' equations, obtain an equation for velocity distribution in the case of flat plate suddenly set in motion in its own plane. **[8]**

Q3) a) Derive Von karman's momentum integral equation for boundary layer. **[10]**

b) Find the power required to flow a plate 1.5 m wide and 3.2 m long at a velocity of 2.5 m/sec in water. Consider the boundary layer as partly laminar and partly turbulent. Take the kinematic viscosity of water as 1×10^{-6} m^2/s and mass density as 1000 kg/m^3. **[6]**

P.T.O.

Q4) Write short notes on any FOUR of the following. **[16]**

a) Circulation and vorticity.

b) Flow net;

c) Phenomenon of boundary layer separation.

d) Conformal mapping.

e) Laminar sub - layer.

SECTION - II

Q5) a) Explain the statistical theory of turbulence. **[5]**

b) Distinguish between isotropic and homogeneous turbulence. **[5]**

c) A rough pipe of diameter 10 cm carries water at 20°C, at the rate of 60 lps. If the average height of roughness protrusions on the pipe surface is 0.15 mm, Calculate the friction factor, maximum velocity, wall shear stress and shear velocity. Take the kinematic viscosity of water at 20°C as 1×10^{-6} m^2/s and the mass density as 1000 kg/m^3. **[6]**

Q6) a) Explain any Two of the following : **[8]**

i) Reynold's equation of motion.

ii) Probability density function.

iii) Prandtl's mixing length hypothesis.

b) A pipeline of diameter 30 cm carries oil of specific gravity 0.9 and kinematic viscosity 0.024 stokes at the rate of 600 lps. Determine **[10]**

i) Maximum permissible height of protrusions up to which the pipe will act as a smooth pipe and

ii) The height of protrusions beyond which it would become rough.

Q7) a) Show that the celerity C of a sound wave in a fluid medium is given as $C = \sqrt{\frac{dp}{d\rho}}$. Further show that for perfect gas $C = \sqrt{KRT}$ and for liquids $C = \sqrt{\frac{K}{\rho}}$ with usual notations. **[8]**

b) Air flows isentropically around a submerged body. At section 1, in the approaching flow, the pressure, density & velocity respectively are $p_1 = 101.24$ kN/m^2, $\rho_1 = 1.23$ kg/m^3 & $V_1 = 140$ m/sec. At point 2 near the body, the pressure was observed to be 40 kN/m^2. Calculate

i) Temperature ratio $\frac{T_1}{T_2}$;

ii) Mach Nos. at each of the points

Take K = 1.4 and R = 287 J/kg K. **[8]**

Q8) Write short notes on any FOUR of the following : **[16]**

a) Velocity and discharge measurement in compressible flow.

b) Normal shock wave.

c) Moody's diagram.

d) Mach cone and Mach angle.

e) Hydrodynamically smooth & rough boundaries.

♦♦♦♦

Total No. of Questions : 6]

SEAT No. : ____

P1813

[Total No. of Pages : 2

[4165] - 431

M.E. (Civil) (Hydraulics)

HYDRO POWER

(2008 Course) (Elective - II(c)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain potential of hydropower in India. **[8]**

b) Why it is necessary to predict future load demand? What are the methods of load forcasting? Explain it. **[9]**

c) The electricity consumption for an upper middle class family having six rooms is as follows. Calculate monthly electricity bill in terms of units. **[8]**

i) In each room there are two lights (totaling 100 W & usage 4 hrs. per day) and one fan of 50 W (usage 9 hrs. per day)
ii) One mixer of 50 W & usage is 1 hr. per day.
iii) One refrigerator of 220 W & usage is 21 hrs. per day.
iv) One AC of 1400 W and usage is 8 hrs. per day.
v) One TV of 160 W and usage is 5 hrs. per day.
vi) One electric iron of 500 W and usage is 1 hr. per day.
vii) One geyser of 2000 W & usage is 1 hr. per day.

Q2) a) Explain historical development process, advantages and disadvantages of hydropower? **[10]**

b) Explain in detail run of river plant & its arrangements with neat sketches. **[8]**

c) Write note on 'Tidal Power Plant'. **[7]**

Q3) a) What are the advantages & disadvantages of underground power house? **[8]**

b) Explain with neat sketch typical power house & its all components with functions. **[10]**

c) What are the safety requirements of power house? Explain in detail. **[7]**

P.T.O.

SECTION - II

Q4) a) What is the significance of surge tank? Explain its advantages in detail. **[8]**

b) Give the classification of penstocks and explain it. What is the design criteria for penstocks? **[10]**

c) Write note on 'Canal surges'. **[7]**

Q5) a) A turbine generates 22,000 kw power at the head of 200 m with 2 jets. If the overall efficiency of turbine is 80% and the velocity of water in jet is 95% of theoretical velocity. Determine

i) Quantity of water in cumec.

ii) Size of jet.

Assume C_d = 0.98 & speed ratio = 0.45 **[8]**

b) Explain cavitation in turbine in detail. **[7]**

c) What is draft tube? Give its importance. Explain different types of draft tubes with figures in detail. **[10]**

Q6) a) Explain the design aspects of micro hydel power plants. **[10]**

b) What is water hammer phenomenon? Explain it in case of penstocks. **[7]**

c) According to size, how hydropower plants are classified? Compare them. Explain microhydel power plant in detail. **[8]**

♦♦♦♦

Total No. of Questions : 6] **SEAT No. :**

P1817 **[Total No. of Pages : 2**

[4165] - 440

M.E. (Civil - Structures)

STRUCTURAL DESIGN OF STEEL BRIDGES

(2008 Course) (Elective - II(b)) (Sem. - I)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any two questions from Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***If necessary, assume suitable data and mention clearly.***
6) ***Use of nonprogrammable electronic pocket calculator, relevant IS codes and steel table are allowed.***

SECTION - I

Q1) a) Write a short note on steel bridges. **[9]**

b) Explain with neat sketches, through type, deck type and semi through type steel. **[8]**

c) Explain any one method for erection of steel bridges. **[8]**

Q2) A deck type plate girder railway bridge of span 20 m is to be provided for a single broad gauge track. The self - weight of stock rails and check rails are 0.60 and 0.50 kN/m respectively. The self - weight of sleeper is 3.15 kN/m. Design the cross section of the plate girder and the connections between flange plate and web plate. The EUDL for B.M. is 2067.5 kN, for S.F. is 2272.2 kN. The impact factor is 0.458. Draw neat design sketches. **[25]**

Q3) A through type railway truss girder bridge consists of two pratt trusses as shown if Fig. 3. The bridge supports an equivalent uniformly distributed live load 170 kN/m. The dead load transmitted to each truss inclusive of self - weight is 16 kN/m. Design the central top chord and bottom chord members using channel sections only. Consider the impact factor as 0.40. **[25]**

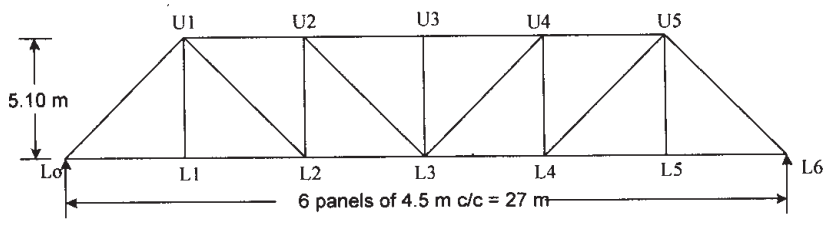

Fig. 3

P.T.O.

SECTION - II

Q4) Design a deck type plate girder highway bridge for a span of 27 m. The bridge consists of two lanes with a reinforced concrete slab of 200 mm thick inclusive of the wearing coat. Two foot paths of 1.5 m are to be provided on either side of the carriage way. Design the plate girder for IRC class A loading shown in Fig. 4 and also sketch the details. **[25]**

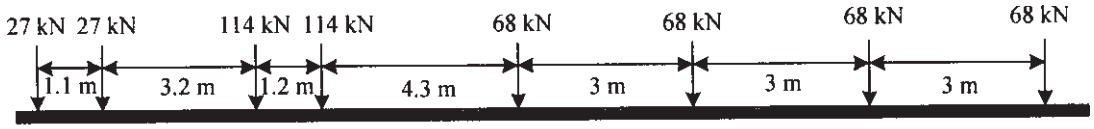

Fig. 4.

Q5) The effective span of through type truss girder highway two lane bridge is 30 m. The reinforced concrete slab is 300 mm thick inclusive of the wearing coat. Two foot paths of 1.5 m width are to be provided on either side of the carriage way. The highway bridge is to carry IRC class A loading. Suggest a suitable truss girder for the bridge. Design the central top chord and diagonal members of the central panel and sketch all the details. **[25]**

Q6) a) Write a short note on bridge bearings. **[7]**

b) The effective span of truss girder through type bridge for a single broad gauge track is 36 m. The reaction due to dead load, live load and impact load is 1800 kN. The vertical reaction due to wind is 270 kN. The tractive force is 1030.05 kN and the breaking force is 735.75 kN. Design a suitable bearing and sketch the details. **[18]**

♦♦♦♦

Total No. of Questions : 8] **SEAT No. :**

P1825 **[Total No. of Pages : 2**

[4165] - 481

M.E. (Civil) (Environmental Engg.)

OCCUPATIONAL SAFETY & HEALTH

(2008 Course) (Elective - II(a)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the rights to know laws related to occupational safety and health? Explain. **[8]**

b) What are the OHSHAS 18001 Health & Safety Standards? **[8]**

Q2) a) What are the measures for preventing ergonomics hazards? Explain. **[8]**

b) What is a need of ergonomics program? Explain. **[8]**

Q3) a) Explain hazard analysis with example of any one type of an industry. **[8]**

b) How to control hazards in automobile industry. **[8]**

Q4) Write short notes on following. **[18]**

a) Occupational safety and health act.

b) Task analysis.

c) Fault tree analysis.

SECTION - II

Q5) a) What are the types of fire? Explain any two. **[8]**

b) Explain fire development and its severity. **[8]**

Q6) a) Comment on occupational health. Enlist personal safety equipments and explain uses of any two. **[8]**

b) Explain different investigation methods of accidents? **[8]**

P.T.O.

Q7) a) What are the health problems in steel industries? **[8]**

b) How to tackle health problems in pharmaceutical industry? Explain. **[8]**

Q8) Write short notes on following. **[18]**

a) Electrical safety.

b) Occupational health measures in operating anaerobic digester.

c) Models to control accidents.

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1828

[Total No. of Pages : 2

[4165] - 485

M.E. (Civil) (Environmental Engg.)

ENVIRONMENTAL CHEMISTRY & MICROBIOLOGY

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain stoichiometry of aerobic biological oxidation and biological nitrification. **[9]**

b) Explain colloidal chemistry and nuclear chemistry related to measurement of pollution parameters. **[9]**

Q2) Explain the chemical properties of organic pollutants and their entry in the soil and water medium. **[16]**

Q3) Give the principle and types of spectro - photometry and also discuss the application of spectro photometry in environmental analysis. **[16]**

Q4) Explain in detail High Performance Liquid Chromatography and give its limitations. How this limitation been overcome by Gas Chromatography?**[16]**

Q5) Discuss the selectivity of mobile phase in Gas Chromatography as well as HPLC in the wastewater treatment and analysis? **[16]**

SECTION - II

Q6) Explain role of microorganism, its cell structure, metabolism and nutrient required for its growth in wastewater treatment and in various biological processes. **[16]**

Q7) Compare the principle and application of Compound Microscopy and Micrometry used in Environmental Engineering? Explain measurement and isolation of microorganisms. **[16]**

P.T.O.

Q8) Explain different Cultures, Media and Techniques of Staining and Enumeration of microorganism used in wastewater analysis and treatment. **[16]**

Q9) What is 'Bioremediation of contaminated soil' and explain its principle and microbiology. **[16]**

Q10) Compare the principle, design of Sequencing Batch Reactor (SBR) process and Activated Sludge Process (ASP) to treat industrial wastewater. **[18]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. : ____

P1836

[Total No. of Pages : 2

[4165] - 504

M.E. (Mechanical) (Heat power Engg.)

MEASUREMENT TECHNIQUES & DATA ANALYSIS

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain classification of measuring instruments. **[8]**

b) Explain static characteristics of an instrument. **[8]**

Q2) a) Explain different types of correlations. **[8]**

b) Find the most likely production corresponding to a rain fall 40" from the following data. **[8]**

	Rain fall	Production
Average	30"	500 kg
Standard deviation	5"	100 kg

Co - efficient of correlation = 0.8

Q3) a) What are properties of regression co - efficients? **[6]**

b) Obtain the lines of regression from the data given. **[12]**

X	:	4	5	6	8	11
Y	:	12	10	8	7	5

Verify that the co-efficient of correlation is geometric mean of two co - efficients of regression.

P.T.O.

Q4) a) Explain the working of ultrasonic flow meter stating its merits & demerits. **[8]**

b) A copper resistor at 20°C is used to indicate the temperature of bearing, of machine. What resistance should not be exceeded if maximum bearing temp. is not to exceed 150°C. The resistance temperature co-efficient of copper is 0.00393 /°C at 20°C. **[8]**

SECTION - II

Q5) a) Explain the principle construction and working of temperature measuring device of a furnace. **[8]**

b) A Laser Dopper anemometer employs a He - ne laser , $\lambda = 632.8$ nm to measure velocity of flow at a point in a dusty gas. A 160 mm focussing lens having $\theta = 12°$ is used to operate LDA in dual beam mode. Find the velocity of flow if the average Doppler shift in frequency was found to be 1.62 MHz. **[8]**

Q6) a) Explain the working double beam - U - V spectrophotometer. **[8]**

b) A disc mounted on the shaft of a machine has 12 pattern points. The number of flashes projected on the disc by a stroboscope is 6000 per minute. **[8]**

i) Find the speed of the machine if the disc appears stationary and has a single image of 12 points.

ii) If the disc appears to move forward in the direction of rotation at 10 rpm. Find the speed of the disc.

Q7) a) If r = 0.6, N = 64, find probable error of coefficient of correlation and determine limits of population. r. **[4]**

b) Explain P + I + D controller. **[8]**

c) A miniature pitot tube is used to measure the velocity of blood and differential pressure gauge records a pressure of 1 Torr. Take density of blood = 1020 kg/m^3 Compute the blood velocity. **[4]**

Q8) Write short notes on any THREE **[18]**

a) Vibration Measurement Instrument.

b) Electromagnetic flowmeter.

c) Thermistors.

d) Humidity measurement.

e) Thermal conductivity gauges.

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P1846

[Total No. of Pages : 4

[4165] - 524

M.E. (Mechanical) (Design Engineering)

RELIABILITY ENGINEERING

(2008 Course) (Elective - III(a)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of non - programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Define Reliability. Calculate the reliability for the system shown in Fig. 1. The number in each block shows the reliability of individual component. **[10]**

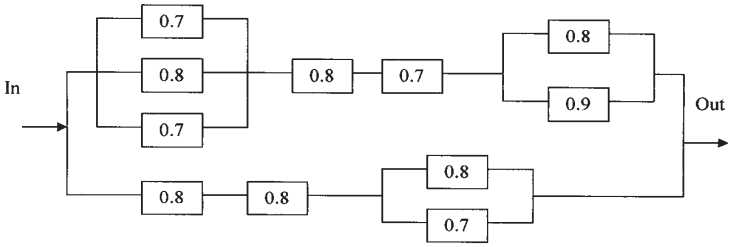

Fig.1

b) Explain Hazard Rate and Failure rate. Draw Hazard rate curve against life, showing various regions. **[6]**

Q2) a) What is Bay's rule? Find the reliability of the system shown in figure 2 using Bay's theorem when the system requires that at least one of the path AD, CE or BE is good. **[8]**

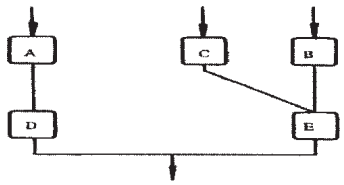

Fig. 2

b) How the probability density and probability distribution functions are related? What is the significance of probability distribution function. **[8]**

P.T.O.

Q3) a) It is sometimes claimed that increasing quality and reliability beyond levels that have been achieved in the past is likely to be uneconomic, due to the costs of the actions that would be necessary. Present the argument against this belief. Illustrate it with an example from your own experience. **[8]**

b) Define availability and maintainability for the system from the following data collected at a plant :
Mean time before failure : 95 Hrs.
Mean time to repair : 20 Hrs.
Administrative logistic time : 175% of MTTR
Calculate operational availability and inherent availability of the plant.**[8]**

Q4) a) Three components with weibull time to fail distributions are placed in parallel. The weibull parameters are : **[8]**

Component	Shape parameter	Scale parameter
A	4	120
B	2	80
C	3.5	100

What is the system reliability at time = 200.

b) How the probability density and probability distribution functions are related? What is the significance of probability distribution function?**[8]**

Q5) Write the short note on following (Any Three) **[18]**

a) Risk Priority Number (RPN)

b) Safety factor and safety margin.

c) Reliability Engineering and Robust Design.

d) Reliability Engineering Tools.

e) Redundancy.

SECTION - II

Q6) a) A system consists of three units connected in series, with reliabilities $R_1 = 0.70$, $R_2 = 0.80$, and $R_3 = 0.90$. It is desired that the reliability of the system be 0.65. How should this be apportioned among the three units?**[8]**

b) Explain the designing for maintainability. **[8]**

Q7) a) The system in the figure 3 is made of 13 components. Components 3, 4 and 5 are unequal and have reliability R_3, R_4, and R_5, respectively as indicated. Components 6 and 8 have reliability R_6 and components 7 and 9 have reliability of R_7 Components 10 through 13 are having reliability of R_8

In component group III, it is required that, at least two of the four components function satisfactory for group III success. What is the reliability of the system in terms of individual R's? **[10]**

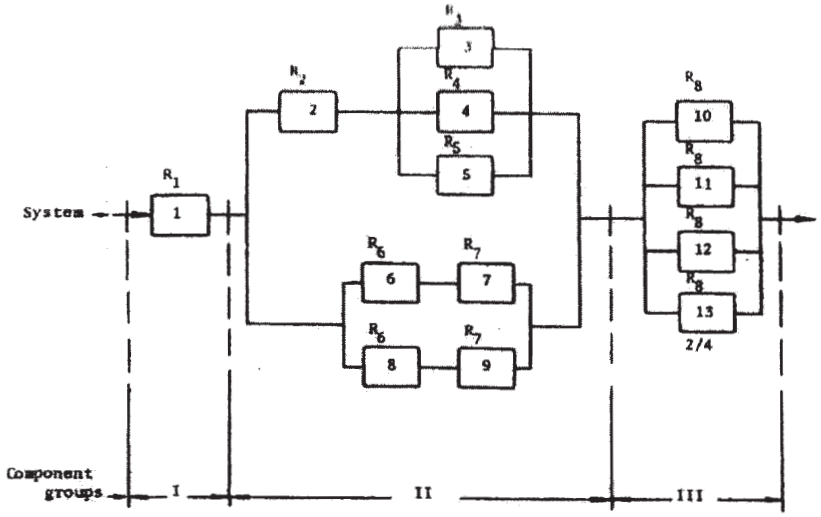

Fig. 3

b) Explain the procedure for reliability testing to improve this quality and reliability of products and systems. **[6]**

Q8) a) Consider the automatic air pump system shown in figure 4. In this system the tank is filled for 10 minutes and then empties for 50 minutes. After the switch is closed, the timer is set to open the contacts in 10 minutes, and then to close the contacts in another 50 minutes and so on. If in the process of filling the tank the contacts cannot be opened in 10 minutes the alarm horn sounds and the operator opens the switch to prevent a tank rupture due to overfilling. Prepare the fault tree for this air pumping system. **[10]**

b) State and explain the steps in completing the FMECA table. **[6]**

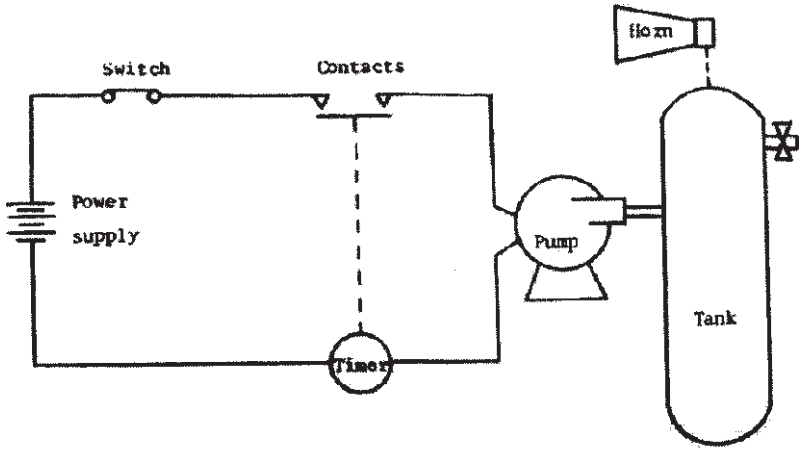

Fig. 4

Q9) a) For the system represented in fig. 5, Calculate the reliability using the tie - set and cut - set methods. Assume R be the reliability of each component. **[8]**

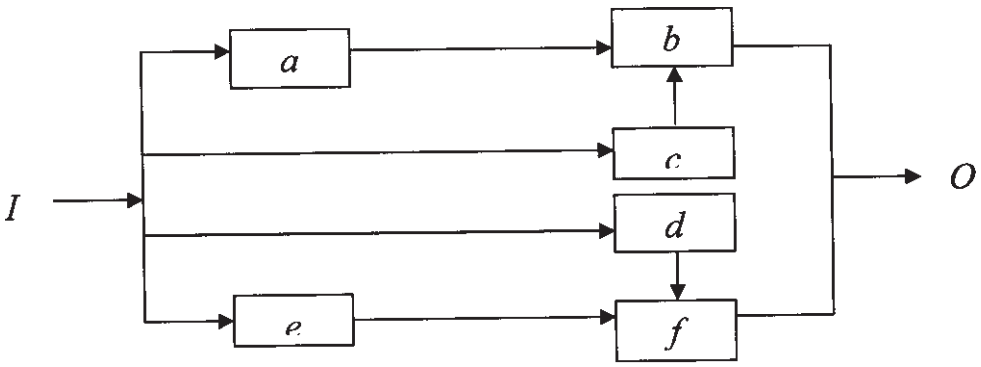

Fig. 5

b) What is 'Redundancy' in a system? Explain the active and standby redundant system. **[8]**

Q10) a) A type of beam is normally distributed with a mean strength of 40 and a variance of 0.8. This beam is subjected to a stress which is normally distributed with an average of 38 and a standard deviation of 1.1. What percentage of beam will fail? **[8]**

b) Write the short note on following (Any TWO) **[10]**

i) AGREE method of reliability allocation.

ii) Markov models.

iii) Reliability management by objectives.

iv) Methods of finding reliability of complex systems.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. : ____

P1847

[Total No. of Pages : 3

[4165] - 525

M.E. (Mechanical) (Design Engineering)

ENGINEERING FRACTURE MECHANICS

(2008 Course) (Elective - III(b)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the plastic zone shapes for plane stress and plane strain conditions according to **[10]**

i) Von Mises criterion.

ii) Tresca criterion.

b) What are the different mechanisms of fracture? Explain any two mechanisms with neat diagrams? **[8]**

Q2) a) Discuss the significance of the following : **[10]**

i) Crack tip opening displacement.

ii) Stress intensity factor.

b) Determine the fracture and collapse stresses in a double edge crack for a panel (Fig. 1) assuming $\frac{a}{w} = 0.4$, panel width $2w = 20$ mm and plane strain fracture toughness of 70 MPa$\sqrt{m}$. The yield strength of the panel material is 250 MPa and the geometric correction factor for the panel is 1.11. **[6]**

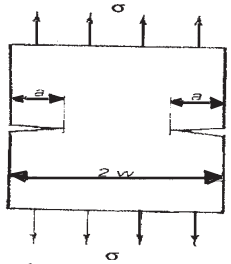

Fig. 1: Double edge crack in a finite width panel

P.T.O.

Q3) a) The welding process in a plate in a bridge structure has developed residual stresses as shown in Fig. 2. Subsequent inspection detects a through crack of length 10 mm. The plate is fabricated from tempered 4130 steel with a plane strain fracture toughness of 120 MPa$\sqrt{m}$ and a yield strength of 1100 MPa. What is the maximum applied tensile stress the plate can withstand? **[6]**

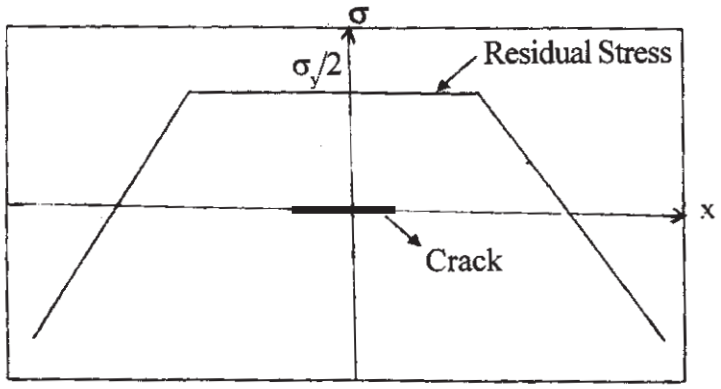

Fig.2: Description of residual stresses and crack

b) Explain the Griffith's energy balance approach to identify catastrophic failure of a material. **[10]**

Q4) a) Explain the procedure to evaluate the Irwin's plastic zone correction factor for elastic perfectly plastic materials (Assume the plastic zone has a circular shape). **[10]**

b) A thin steel plate of width 2.b = 40 mm contains a central crack of length 2.a = 20 mm, and is subjected to a stress of 500 MPa normal to the crack plane. Plot the yield stress distribution directly a head of the crack according to the Irwin's model. The yield stress of the material is 2000 MPa. The value of k_I for the centre crack can be evaluated as **[6]**

$$K_I = \sigma\sqrt{\Pi.a}\left[1.0 + 0.128\left(\frac{a}{b}\right) - 0.288\left(\frac{a}{b}\right)^2 + 1.323\left(\frac{a}{b}\right)^3\right]$$

SECTION - II

Q5) a) Define J - integral. Discuss the significance and limitations of J - integral as a fracture parameter. **[10]**

b) A bearing pedestal of a rotating equipment has a martensitic steel semi infinite plate with an edge crack. The plate is subjected to a cyclic load in tension due to very high rotor vibrations. Estimate the rate of crack growth on the premise that the applied maximum and minimum stresses on the plate in fatigue are 400 MPa and 125 MPa, respectively. The approximate crack size for this case can be assumed to be 12 mm. The

stress intensity factor fluctuation is given by $\Delta K_I = 2(\Delta\sigma)\sqrt{a}$ and the crack growth is dictated by the equation $\frac{da}{dN} = 0.42 \times 10^{-11}(\Delta K)^3$, where $\frac{da}{dN}$ is expressed in *m*/*cycle* and ΔK_I in MPa$\sqrt{m}$. **[6]**

Q6) a) Discuss the crack growth rate for various ranges of stress intensity factor variation. Explain the significance of 'Paris' equation. **[8]**

b) Describe in brief any two testing methods used for the determination of fracture toughness. **[8]**

Q7) a) Catastrophic fracture occurred in a thick steel plate during proof testing, at an applied stress of 700 MPa. The initiating defect was an embedded sharp penny - shaped flaw with a radius of 2.5 cm. Calculate the fracture toughness of this steel.
It is desired to check this value by determining the plane strain fracture toughness from standard tests. The yield strength of the steel is 1100 MPa. A sheet of nominally similar steel, 7.5 mm thick, is available. Is this sufficiently thick to obtain a valid K_{IC} value? If not, what thickness of steel should you order? **[6]**

b) Explain in brief the mechanisms of creep deformation. **[10]**

Q8) Write a short note on any three of the following : **[18]**

a) Effect of stress concentration on fatigue.

b) Use of clip gauges in K_{IC} tests.

c) Photo - elasticity method for evaluating fracture toughness

d) S-N diagram.

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1853

[Total No. of Pages : 3

[4165] - 540

M.E. (Mechanical) (Mechatronics)

INDUSTRIAL AUTOMATION

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain timer instruction overview and On delayed timer with suitable example. **[9]**

b) Explain in brief the concept and applications of SCADA. **[9]**

Q2) a) Explain the concept of sourcing and sinking terminals of PLC. **[8]**

b) Explain Direct addressing and Indirect addressing in PLC programming with suitable example. **[8]**

Q3) Develop ladder program for the following industrial objective. Given START & STOP buttons as NO, Push - to - on momentary switches. LUP and LE are level switches of NO type. The valves VIN & VOUT are on off valves. Figure Q 3 shows the details. **[16]**

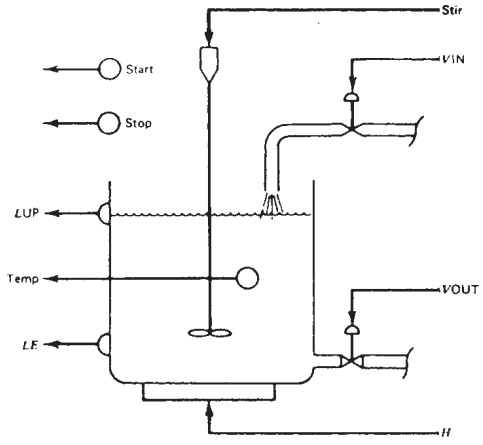

Figure Q3

P.T.O.

a) When START button is pushed the process starts until STOP button is pressed.

b) The VIN opens when process STARTed and LE is OFF.

c) When LUP is ON and Temp is OFF, VIN is closed, Stir (Stirrer) is ON, H (Heater) is on.

d) When Temp is ON, Stir is OFF, H is OFF, VOUT is opened till LE is OFF.

Write the PLC program for objectives (a) to (d) individually and then write the complete program.

Q4) a) Explain with one industrial application, Count Up and Count Down Timer instruction with all status bits. **[8]**

b) Figure Q 4 (b) shows a Digital circuit. Write digital equation, simplify using Boolean algebra and write a ladder rung for this simplified equation. **[8]**

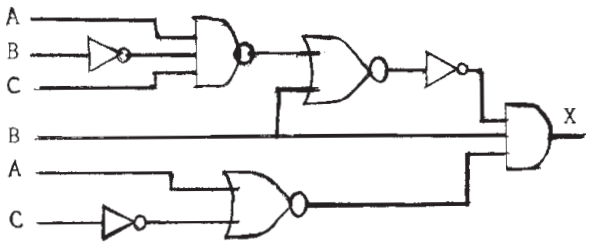

Figure Q 4(b)

Q5) Figure Q 5 shows a PLC controlled drilling process. Identify the objectives of conveyor system alone and prepare PLC ladder program for individual objectives and compile all rungs for conveyor only. **[16]**

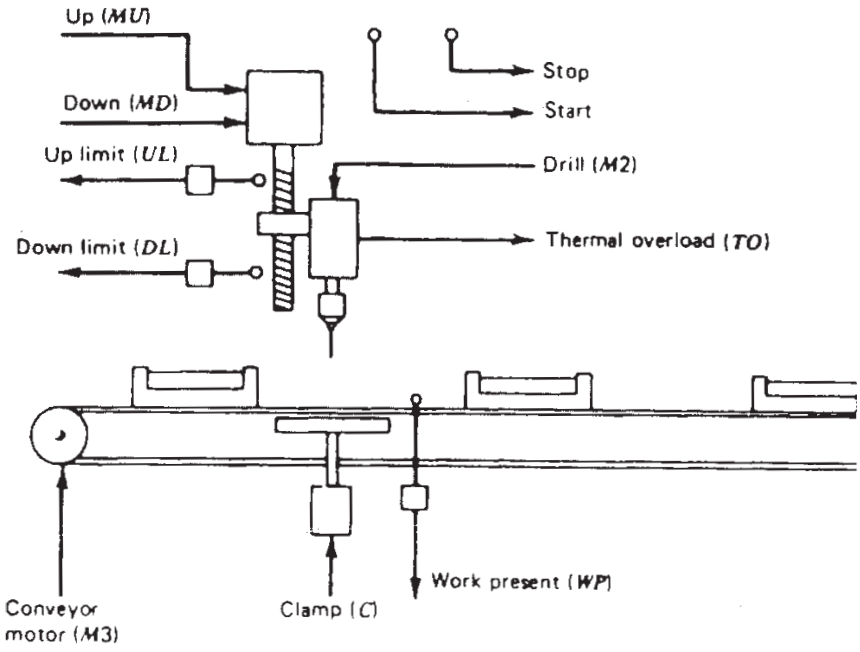

Figure Q 5

SECTION - II

Q6) a) Explain significance of Machine Zero & Work Zero in CNC program with suitable examples. **[9]**

b) Explain Modal and Non Modal Commands in NC part program with two examples each. **[9]**

Q7) Figure Q 7 shows a job profile for milling. Prepare a NC part program for the same. Write all the assumptions including raw material dimensions. Write the program in TAB sequential format. **[16]**

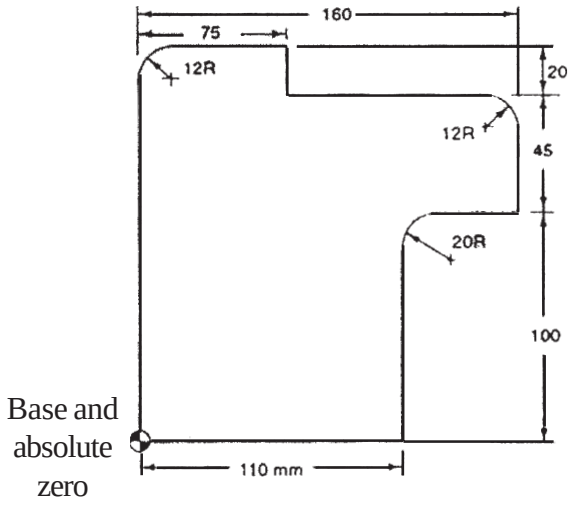

Figure Q7

Q8) a) Explain two configurations i.e. switching network and LAN of DNC. **[8]**

b) Compare Incremental positioning and absolute positioning in NC part programming with suitable job profile. **[8]**

Q9) a) Explain significance G94, G95, G98 and G99 with suitable example. **[8]**

b) Compare APT part programming and NC part programming with simple example. **[8]**

Q10) a) Enumerate characteristics of NC operation. **[8]**

b) Explain any two geometry statements and motion commands used in APT. **[8]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P1857

[Total No. of Pages : 3

[4165] - 549

M.E. (Mechanical) (Automotive Engineering)

AUTOMOTIVE ENGINE DESIGN

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of design data handbook, logarithmic tables, slide rule and non - programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the operating variables that affect performance of SI engine. **[8]**

b) In a CI engine cycle the pressure and temperature are 1 bar and 33°C respectively. The maximum pressure in the cycle is 46.5 bar and the heat supplied during the cycle is 535 kJ/kg. Determine **[8]**

i) The compression ratio.

ii) The temperature at the end of compression.

iii) The temperature at the end of constant pressure combustion and

iv) The air - standard efficiency. Assume $\gamma = 1.4$ and $C_p = 1$kJ/kg K for air.

OR

Q2) a) Explain the general engine design procedure using flowchart. **[8]**

b) In a SI engine pressure and temperature at the beginning of compression are 1.1 bar and 37°C respectively. Peak temperature during the cycle is 1550°C and the pressure at the end of the adiabatic compression is 13.5 bar. Calculate **[8]**

i) theoretical thermal efficiency.

ii) heat supplied per kg of air.

iii) the work done per kg of air and

iv) the pressure at the end of adiabatic expansion. Take $C_v = 0.717$ kJ/kg K and $\gamma = 1.4$.

P.T.O.

Q3) a) A multi - cylinder engine is to run at a constant load at a speed of 715 rpm. Determine suitable dimensions for cast iron flywheel with a rim whose breadth is twice its radial thickness and mass is 155 kg. The density of cast iron is 7355 kg/m^3, and its working stress in tension is 7.5 MPa. Consider only the tensile stress due to centrifugal force. **[8]**

b) List advantages and limitations of using aluminum alloy pistons. **[8]**

OR

Q4) a) Explain how fatigue life of automotive components subjected to fluctuating loads is estimated using stress life approach. **[8]**

b) A four - cylinder automotive spark - ignition square engine is being designed to provide a maximum brake torque of 135 N-m in the mid - speed range (= 2650 rev/min). Estimate the required engine displacement, bore and stroke, and the maximum brake power the engine will deliver. Assume bmep at the maximum engine torque point is 850 kPa and maximum mean piston speed, 12.5 m/s. **[8]**

Q5) Write short notes on – **[18]**

a) Design of Connecting Rod.

b) Thermodynamic analysis of CI engine cycle.

c) Selection of bore to stroke ratio.

SECTION - II

Q6) The design diagram of a camshaft can be considered as a free two - support beam loaded where the follower exerts maximum force of 2.5 kN on the cam at distance of 3 cm from left support. Length of camshaft span in 10 cm, outer diameter of camshaft is 3.5 cm and inner diameter is 1 cm. Find maximum deflection of camshaft. Take E = 210 GPa. **[16]**

OR

Q7) a) What are torsional vibrations? Explain the causes of it. **[8]**

b) Explain firing order and balancing of in - line three cylinder four stroke engine. **[8]**

Q8) A 4 - Cylinder engine and flywheel coupled to a propeller are approximated to a 3- rotor system in which the engine is equivalent to a rotor of moment of inertia 800 kg- m^2, the flywheel to a second rotor of 320 kg - m^2 and the propeller to a third rotor of 20 kg - m^2, The first and the second rotors being connected by 50 mm diameter and 2 m long shaft and the second and the third rotors connected by a 25 mm diameter and 2 m long shaft. Neglecting the inertia of the shaft and taking its modulus of rigidity as 80 GPa, determine **[16]**

a) natural frequencies of torsional oscillation and

b) the positions of the nodes.

OR

Q9) A four cylinder vertical engine has cranks 150 mm long. The planes of rotation of the first, second and fourth cranks are 400 mm, 200 mm and 200 mm respectively from the third crank and their reciprocating masses are 50 kg, 60 kg and 50 kg respectively. Find the mass of the reciprocating parts for the third cylinder and the relative angular positions of the cranks in order that the engine to be in complete primary balance. **[16]**

Q10) Write short notes on **[18]**

a) Damping of torsional vibrations.

b) Dynamics of crank mechanism.

c) Effect of valve timing on engine performance.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1860

[Total No. of Pages : 2

[4165] - 555

M.E. (Mechanical - Automotive Engineering)

AUTOMOTIVE SAFETY AND REGULATIONS

(2008 Course) (Elective - II(b)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you understand by Safety Assessment of Vehicles? What are various provisions of it? Explain. **[8]**

b) With a suitable sketch describe the design features used on a vehicle structure for protection of occupants in frontal crash. **[8]**

Q2) a) Explain various types of crash for a vehicle and explain what regulatory requirements for it. **[8]**

b) Compare the sequence of events in frontal and side impacts. Identify the injury mechanisms. **[8]**

Q3) a) Explain the term active safety system and passive safety system with three examples for each. **[8]**

b) Explain with neat sketch anthropometry data for a passenger compartment of modern day's car. **[8]**

Q4) Write short note on the following (Any three) : **[18]**

a) Seat belt system with pre - tensioner and load limiter.

b) Role of seat in protection against whiplash Injury.

c) Indian Passive safety regulatory tests.

d) Hybrid III dummy.

e) Instrumentation in Crash Testing.

P.T.O.

SECTION - II

Q5) a) Explain the types of safety glasses? What are the requirements of it? **[8]**

b) Explain role of bumpers during impacts. Describe damageability criteria in bumper designs. **[8]**

Q6) a) Describe the devices used for measuring the absolute luminous flux of lamps and luminous flux for industrial and regular lamps? **[8]**

b) Explain briefly the construction and working principle of head lamp, its testing procedure as per CMVR rule. **[8]**

Q7) a) Define LEDs. What are the merits and demerits of LEDs? Explain. **[8]**

b) Describe luminance meter and its principle. **[8]**

Q8) Write short note on the following (Any three) : **[18]**

a) Optics of Human eye.

b) Door locks and retention systems.

c) Under run protection devices.

d) AFLS

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P1861

[Total No. of Pages : 2

[4165] - 558

M.E. (Mechanical) (Automotive Engineering)

AUTOTRONICS

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) What are types of speed sensors, shapes of speed sensors and essential features of speed sensors used in modern automobiles? **[9]**

b) Discuss antilock breaking systems in passenger cars. **[9]**

Q2) a) Discuss the safety and comfort features of Airbag and Belt tensioners. **[8]**

b) Explain with neat block diagram the Common Rail Diesel injection system. **[8]**

Q3) a) Explain in brief Oxygen concentration sensor (lambda sensor) **[8]**

b) Explain fuel metering, vehicle speed sensors and detonation sensors. **[8]**

Q4) a) Enlist the locations where pressure is required to be measured and range of pressure to be measured in luxury cars. **[8]**

b) Discuss power windows developments in luxury cars. **[8]**

Q5) a) Explain in brief the procedures to monitor input signals, output signals, and internal control unit functions such as used in on board diagnosis. **[8]**

b) Explain Crank angle position sensor and throttle position sensor with important specifications. **[8]**

P.T.O.

SECTION - II

Q6) a) List the locations where temperature is measured and design variations of temperature sensors in automobiles. **[8]**

b) Discuss preheating system as start assist system in direct injection of diesel engines. **[8]**

Q7) a) Discuss recent trends in headlight systems. **[8]**

b) Explain functions, components of locking system. What are advantages of electrical locking in modern automobiles? **[8]**

Q8) a) Discuss in brief steering system requirements, Classification of steering systems, and Electric power assisted steering. **[9]**

b) Explain in brief the characteristics of batteries. **[9]**

Q9) a) Explain in brief internal control unit functions and control unit communications such as used in on board diagnosis. **[8]**

b) Explain electronic spark timing control in petrol engines. **[8]**

Q10) a) Define Open loop and Closed loop system with suitable example in automobiles. **[8]**

b) Describe four main components of engine management system. **[8]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. : ____

P1865

[Total No. of Pages : 2

[4165] - 566

M.E. (Electrical) (Control System)

ADVANCED MATHEMATICAL TECHNIQUE FOR CONTROL SYSTEM

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer Q. No. 1 or 2, 3 or 4, 5 or 6 from Section - I & Q.No. 7 or 8, 9 or 10, 11 or 12 from Section - II.***
2) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Define and explain the concept of convex function and vector space. **[9]**

b) Write the concept of local and global extrema. **[9]**

OR

Q2) a) What do you understand by optimization write two theorems provide necessary condition for relative minimum of function of single variable. **[9]**

b) Use analytical method to investigate for extremum point $= -3x^4 + 10x^3 - 20$. **[9]**

Q3) Explain the method of optimization of multivariable function with constraints. **[16]**

OR

Q4) Use a Lagrangian multiplier to minimize the function.

$f(x) = 4x_1^2 + 5x_2^2$ subject to $g(x) = 2x_1 + 3x_2 - 6 = 0$ **[16]**

Q5) By using dual simplex method, minimize function $f = 20x_1 + 16x_2$ subject to

$x_1 \geq 2.5, x_2 \geq 6,\ 2x_1 + x_2 \geq 17,\ x_1 + x_2 \geq 12,\ x_1 \geq 0,\ x_2 \geq 0$. **[16]**

OR

Q6) a) Explain step by step procedure of revised simplex method. **[8]**

b) Write steepest descent method of optimization of a prob. **[8]**

P.T.O.

SECTION - II

Q7) Explain what do you understand by unimodel function? Explain the methods search with fixed size and search with accelerated size. **[18]**

OR

Q8) Locate the minimum point of function $f(x) = x^5 - 5x^3 - 20x + 5$ in the interval of (0, 5) within accuracy of 0.1 by fibonaci method. **[18]**

Q9) Explain the method of conversion of non serial system to serial system problem. **[16]**

OR

Q10) Explain the concept of suboptimization and principle of optamility used in multistage decision problem. **[16]**

Q11) Explain what do you understand by dynamic programming. **[16]**

OR

Q12) a) Explain what do you understand by zero one programming. **[8]**

b) Explain integer linear programming. **[8]**

♦♦♦♦

Total No. of Questions : 6] **SEAT No. :**

P1866 **[Total No. of Pages : 2**

[4165] - 567

M.E. (Electrical) (Control System)

PROCESS CONTROL MANAGEMENT

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Solve any two questions from each section.***

2) ***Answers to the two sections should be in separate books.***

SECTION - I

Q1) Solve any three :

a) Write short note on Motivation and Leadership in process control management. **[9]**

b) Explain conflict management & stress management. **[8]**

c) What are formal & informal groups? Describe each with giving example. **[8]**

d) Define management strategies for solving destructive conflicts with suitable example. **[8]**

Q2) a) Describe your views about requirements of process control in Industry regarding; safety, production, specification, Environmental regulations, operational constraints & Economics. **[15]**

b) What is Linearization? Why are the linearized approximation models useful for process control purposes? **[10]**

Q3) a) What are the basic hardware components of a feedback control loop? Explain in detail. **[9]**

b) Describe with suitable example liquid level control & temp. control. Draw the appropriate diagrams. **[8]**

c) Explain Zigler - Nichols Empirical Tunning method with proper block diagram. **[8]**

P.T.O.

SECTION - II

Q4) a) Draw block diagram of digital control system & explain each block. Also give advantages and disadvantages of digital control system. **[15]**

b) Discuss the new design problems raised by the use of a digital computer for process control. **[10]**

Q5) a) Develop a feedforward control system for heat exchanger & explain it with neat diagram. **[15]**

b) Explain block diagram of cascade control system with advantages and disadvantages. **[10]**

Q6) a) What is one way decoupling of two control loops? Why could it be acceptable? **[9]**

b) Describe the Relative Gain Array (RGA) process with its properties. **[8]**

c) Explain the effect of Interaction on the stability of process control system. **[8]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. :

P1869

[Total No. of Pages : 3

[4165] - 574

M.E. (Electrical) (Control Systems)

MULTIVARIABLE AND OPTIMAL CONTROL SYSTEMS

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) For feed back control system with forward transfer matrix.

$$G_1(s) = \begin{bmatrix} \frac{1}{s+2} & \frac{1}{s+1} \\ \frac{1}{s+1} & \frac{s}{s+2} \end{bmatrix}$$

and feed back path transfer matrix

$$G_2(s) = \begin{bmatrix} \frac{1}{s+5} & \frac{1}{s+1} \\ \frac{1}{s+2} & \frac{1}{s+3} \end{bmatrix}$$

Find overall transfer function, characteristic polynomial of the system and state space representation of the system. **[16]**

OR

Q2) a) Explain the representation and advantages of multivariable control system into **[9]**

i) Differential operator form.

ii) Transfer Matrix form.

iii) State space form.

P.T.O.

b) Differential equations of multivariable control system are given by

$$2\frac{d^2y_1}{dt^2}+\frac{dy_2}{dt}+y_1(t)=u_1(t)$$

$$\frac{d^2y_2}{dt^2}+2\frac{dy_1}{dt}+y_2(t)=u_2(t)$$

Where $y_1(t)$ & $y_2(t)$ are outputs and $u_1(t)$ & $u_2(t)$ are inputs. Obtain state space representation of the system. **[7]**

Q3) a) Explain full state controllability for multivariable system. **[8]**

b) Determine observability of multivariable control system represented by the state space form with. **[10]**

$$A=\begin{bmatrix}2&1&0\\0&1&0\\2&3&1\end{bmatrix}\quad B=\begin{bmatrix}-1&0\\-1&1\\0&1\end{bmatrix}\quad C=\begin{bmatrix}1&1&0\\1&1&1\end{bmatrix}$$

OR

Q4) a) Explain complete observability for multivariable system. **[8]**

b) Determine full state controllability for the given multivariable control system as **[10]**

$$A=\begin{bmatrix}1&0&0\\0&2&0\\0&0&3\end{bmatrix}\quad B=\begin{bmatrix}1&1\\1&0\\-1&1\end{bmatrix}\quad C=\begin{bmatrix}1&1&1\\1&0&1\end{bmatrix}$$

Q5) a) Explain with block diagram pole allocation using Linear state variable feed back in multivariable control system. **[8]**

b) Explain the following design aspects of multivariable control system. **[8]**

i) Model matching control.

ii) Decoupling control.

OR

Q6) What is the necessity of observer? Explain with neat block diagram state estimation problem using observer. **[16]**

SECTION - II

Q7) a) Explain the design of controller depending upon the factors. **[6]**

i) Characteristic of plant.

ii) Requirement of plant.

b) Discuss the state regulator problem for obtaining the optimal control law for infinite time linear state regulator problem. **[10]**

OR

Q8) a) Derive the expression for the solution of Matrix - Riccati equation. **[8]**

b) Derive the performance index for optimal control of **[8]**

i) Minimum time problem.

ii) Minimum energy problem.

Q9) Define Hamiltonian. Also explain the procedure for solving the optimal control problem using Hamilton method. State its advantages and limitations. **[18]**

OR

Q10) Explain pontryagin's minimum/ maximum principle with detail procedure for solving optimal control problem. **[18]**

Q11) Explain Bang - Bang control strategy. Explain the procedure for solving the optimal control problem using Bang - Bang method. State advantages and limitations of this controller. **[16]**

OR

Q12) a) Explain optimization by dynamic programming based on : **[10]**

i) The imbedding principle.

ii) The optimality principle.

b) Discuss briefly the relation between Dynamic Programming and Pontryagin's minimum principle. **[6]**

♦♦♦♦

Total No. of Questions : 6] **SEAT No. :**

P1871 **[Total No. of Pages : 2**

[4165] - 579
M.E. (Electrical) (Control System)
LARGE SCALE SYSTEM
(2008 Course) (Elective - III (c)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 2 questions from each section.***
2) ***Answers 2 questions from Section - I and 2 questions from Section - II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Q1) a) Discuss improved davison's technique for modal order reduction. Does it take care of accuracy in steady state error? **[13]**

b) Discuss chidambara technique to get reduced order model. Also give an approval to central law reduction. **[12]**

Q2) a) Discuss the basic concept of aggregation of system. **[10]**

b) Find the reduced order model by modal aggregation. **[15]**

$$\dot{x} = \begin{bmatrix} 0.5 & 0.9 & 0 \\ 0 & 1 & 0 \\ 1 & -2 & -0.5 \end{bmatrix} x + \begin{bmatrix} 0.5 \\ 1 \\ 2 \end{bmatrix} u$$

Q3) Explain the technique of moment matching and apply it to the following system to obtain the reduced order modal for **[25]**

$$G(s) = \frac{s^2 + 4s + 4}{s^3 + 4s^2 + 6s + 5}$$

P.T.O.

SECTION - II

Q4) a) Explain the procedure for obtaining pade approximation for SISO system. **[10]**

b) Give the following 6th degree model **[15]**

$$G(s) = \left[\frac{s^4 + 3s^3 + 4s^2 + 5s + 3}{s^3 + 4s^2 + 3s + 4} \right]^{-1}$$

Q5) Explain the technique of singular value decomposition along with its properties. **[25]**

Q6) a) Explain the generalized Routh algorithm. **[10]**

b) If $G_1(s) = \frac{1}{s^2 + 2} \begin{bmatrix} 2s - 3 & 2 \\ s - 2 & s - 2 \end{bmatrix}$ find D_1, D_2, F_1 and F_2. **[15]**

♦♦♦♦

Total No. of Questions : 6]

SEAT No. : ____

P1872

[Total No. of Pages : 2

[4165] - 580
M.E. (Electrical) (Control system)
INTELLIGENT CONTROL
(2008 Course) (Elective - IV(a)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How ANN is inspired from Biological Neuron? **[5]**

b) Solve the following classification problem with the perceptron rule. Apply each input vector in order. Draw a graph of the problem only after you have found a solution. **[20]**

$$\left\{p_1 = \begin{bmatrix} 2 \\ 2 \end{bmatrix}, t_1 = 0\right\} \left\{p_2 = \begin{bmatrix} 1 \\ -2 \end{bmatrix}, t_2 = 1\right\}$$

$$\left\{p_3 = \begin{bmatrix} -2 \\ 2 \end{bmatrix}, t_3 = 0\right\} \left\{p_4 = \begin{bmatrix} -1 \\ 1 \end{bmatrix}, t_4 = 1\right\}$$

Use the initial weights and bias

$W(0) = [0 \quad 0]$ $b(0) = 0$

Q2) a) Explain multilayer feed forward neural network. State generalized delta rule . **[10]**

b) Give the effect of learning rate and Explain back propagation algorithm. **[15]**

Q3) a) Explain in detail ART - 1 and give it's architecture diagram. Also write paradigm of associative memory. **[15]**

b) Explain vector contization and Energy function for BAM. **[10]**

P.T.O.

SECTION - II

Q4) Define Fuzzy logic, Fuzzy control, fuzzy linguistic variables, membership function and hence explain typical membership functions. **[25]**

Q5) a) Explain Mamdani and Zadeh implications also explain different fuzzy implication rule. **[15]**

b) Define universal fuzzy set and empty fuzzy set. **[5]**

c) Let $A = \left\{\frac{0}{1}, \frac{1}{2}, \frac{0.5}{3}, \frac{0.3}{4}, \frac{0.2}{5}\right\}$

$$B = \left\{\frac{0}{1}, \frac{0.5}{2}, \frac{0.7}{3}, \frac{0.2}{4}, \frac{0.4}{5}\right\}$$

Find $\overline{A}, \overline{B}, A \cup B, A \cap B, A|B, B \cap \overline{A}$. **[5]**

Q6) a) Apply ANN for the load dispatch problem. **[10]**

b) Give descriptive and notational fuzzy rules for air conditional controller. Give the various fuzzy set and de - fuzzyfication of fuzzy output. **[15]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. : ____

P1873

[Total No. of Pages : 3

[4165] - 581

M.E. (Electrical) (Control System)

ADVANCED DRIVES AND CONTROL

(2008 Course) (Elective - IV(b)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Classify and compare the a.c. and d.c. drives on the basis of **[6]**

i) Main motor and available supply.

ii) Type of controller.

iii) Load on the drive, its characteristics, and user's requirement.

b) Explain with reference to multiquadrant operation of drive, the following **[6]**

i) Reversible operation.

ii) Plugging operation.

iii) Regenerative braking operation.

c) Explain the steady - state operation of the drive. Prove the steady - state stability criterion. State the assumptions. **[6]**

OR

Q2) a) Explain in detail the thermal consideration and the thermal model of the electric motor while heating as well as cooling of the drive. **[6]**

b) Write a note on the evaluation of the time and energy consumed during starting transient of the electric drive. State its importance. **[6]**

c) Write down the transfer function of the armature controlled d.c. motor. Discuss the effect of the following in the closed loop control system. **[6]**

i) Tacho feed back.

ii) Armature current feed-back.

P.T.O.

Q3) a) A 2.2 kW, 220 volts, 15 Amp, D.C. motor has its rated speed of 1500 rpm and rated torque of 14 N-m. The armature is supplied by a single phase, fully controlled full wave converter controller connected across 230 volts 50 Hz supply. The field is separately excited by a chopper controller connected across 220 volts D.C. The motor is driving a constant torque load demanding half the rated torque and running at 3000 rpm.

Neglecting armature resistance and inductance calculate the triggering angle of the converter and the duty cycle of the chopper. **[6]**

b) With reference to the performance of a chopper fed d.c. motor, discuss the cause, control and the effect of the following **[10]**

i) Continuous / discontinuous conduction of armature current.

ii) Current ripple / Torque pulsation.

OR

Q4) a) With the help of the detail block diagram of the field. Controlled d.c. motor derive the transfer function of a variable speed drive. How is the field weakening achieved? Draw the modified speed torque characteristics of the motor for selected various voltages. **[6]**

b) The following converters are used one by one to drive a d.c. motor on no - load, at variable speed below normal speed. In each case, discuss the effect of the wave form of the armature current, on the performance of the drive. **[10]**

i) Single phase half wave converter.

ii) Single phase full wave converter.

iii) Three phase half wave converter.

iv) Three phase full wave converter.

Q5) a) Write a note on spatial MMF distribution in the airgap of a 3- phase inverter fed induction motor. Discuss the effect of space harmonics and production of torque/ torque pulsations. **[6]**

b) Compare the performance of VSI fed induction motor with CSI fed induction motor. Also discuss the following in each case. **[10]**

i) Magnitude variation and control of voltage/current as well as frequency.

ii) Circuit complexity of the controller.

iii) Suitability of load on the motor.

OR

Q6) a) Explain the role of pulse width modulation technique in the control of the generation of the time harmonics in the output voltage of the inverter supplying the induction motor. Explain the effect of time harmonics. **[8]**

b) Draw the simplified equivalent circuit diagram of a 3 - phase induction motor running at steady state, offered to the seventh harmonics voltage of the inverter write down the equations for the currents and corresponding torques developed by the motor. Comment on the performance of the motor. **[8]**

SECTION - II

Q7) a) Explain the slip power recovery scheme of the induction motor. How does it employed in the static kramer drive? Discuss the control strategy to result speed variation of the drive. **[8]**

b) In connection with Induction motor drive. Explain the small signal model and D-q dynamic model. **[8]**

OR

Q8) a) Explain the following in reference to the vector - control method of torque and speed of the induction motor. **[8]**

i) Flux vector determination.

ii) Parameter Algorithm.

b) Write a detail note on the Direct - torque control of electric drive. **[8]**

Q9) a) Explain with reference to permanent magnet synchronous motor drive. **[8]**

i) Sinusoidal back emf pattern.

ii) Trapezoidal back emf pattern.

b) Explain the solid state controller for permanent magnet synchronous motor drive. **[8]**

OR

Q10) Explain the following :

i) Switched reluctance motor drive. **[8]**

ii) Wound field machine drive. **[8]**

Q11) a) State and explain the modern trends in the industrial applications of the electric drive and explain the role of micro computers in the closed - loop system as a current controller. **[8]**

b) Explain in detail the role of the following in the closed loop control system of the electric drive. **[10]**

i) Proportional and integral controller.

ii) PID controller.

OR

Q12) a) Explain the principle of phase lock in the PLL system and discuss the applications of PLL in the closed loop controlled drive. **[9]**

b) Explain the effect of RMS voltage variation on the performance of the solid state controlled drives. **[9]**

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Total No. of Questions : 6] **SEAT No. :**

P1881 **[Total No. of Pages : 2**

[4165] - 596

M.E. (Electrical) (Power Systems)

PARTIAL DISCHARGES IN ELECTRICAL POWER APPARATUS

(2008 Course) (Elective - IV(b)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Discuss partial discharges in electrical power apparatus. Draw neat sketches of typical electrode configuration, explain. **[25]**

a) Corona discharges.

b) Surface or sliding discharges.

c) Discharges in laminated material.

d) Cavity discharges.

e) Treeing channels.

Q2) With reference to fundamentals of PD measuring techniques discuss -

a) Selectively wideband system. **[8]**

b) Narrow band system. **[8]**

c) PD measuring circuits. **[9]**

Q3) Write shortnotes on

a) Design of screens. **[8]**

b) Design of filters. **[9]**

c) Need for screening. **[8]**

SECTION - II

Q4) a) Explain the effects of PD on gaseous insulating materials. **[13]**

b) Discuss various factors considered for understanding the effects of PD on solid insulating materials. **[12]**

P.T.O.

Q5) With reference to evaluation of partial discharges discuss the following -

a) Relation between measured and actual charge. **[12]**

b) Relation between the time - dependent occurrence of PD and the extent of damage due to it. **[13]**

Q6) Write short notes on -

a) Measurement and location of partial discharges in cables. **[12]**

b) PD location according to pulse spacing method. **[13]**

♦♦♦♦

Total No. of Questions : 6] **SEAT No. :**

P1890 **[Total No. of Pages : 2**

[4165] - 613

M.E. (Electrical) (Power Electronics and Drives)

SPECIAL TOPICS IN POWER ELECTRONICS AND DRIVES

(Elective - IV(b)) (2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from Section - I and any two questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer sheet.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain 180° conduction mode of VSI with its power circuit output phase and line voltage waveforms and switching sequence. Derive output voltage equation. **[15]**

b) What is selective harmonic elimination technique? How it is applied to eliminate particular frequency of VSI? **[10]**

Q2) a) Explain trapezoidal PWM control and hysteresis control applicable to CSI. **[10]**

b) What are 4 basic types of switching mode regulators? Explain them with necessary diagram and waveforms. **[15]**

Q3) a) Explain operation of Fly back converter. **[10]**

b) Explain how power factor is controlled using thyristorised converter. Explain any one method in detail. **[15]**

SECTION - II

Q4) a) Explain concept of active power filtering. Show in detail implementation of single phase active filter and associated output. **[15]**

b) What are IEEE standards for power quality? **[10]**

Q5) a) Explain how harmonics are generated in power Electronics equipment? **[10]**

b) What is Model reference adaptive control? Explain how it is applicable for control of induction motor. **[15]**

P.T.O.

Q6) a) What is sensor less control? How it is applied to induction motor control explain with any one technique. **[15]**

b) Explain with necessary block diagram cycloconverter fed synchronous motor drive. **[10]**

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Total No. of Questions : 8] **SEAT No. :**

P1899 **[Total No. of Pages : 2**

[4165] - 634
M.E. (E&T/C) (Microwave)
DIGITAL SIGNAL COMPRESSION
(2008 Course) (Elective - IV(b)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Figures to the right indicate full marks.***
3) ***Answer any three questions from each section.***
4) ***Assume suitable data if necessary.***
5) ***Use of scientific calculator is allowed.***

SECTION - I

Q1) a) Define self information associated with the event. What is a prefix code? Explain how to check if a code is a prefix code using a root tree. **[8]**

b) Consider a source emitting 5 letters with probabilities given as $P(a_1) = P(a_2) = 0.1$, $P(a_3) = 0.4$, $P(a_4) = P(a_5) = 0.2$. Find the Huffman code for each alphabet and find average value of the code length. Also find the minimum variance Huffman code for the same source. **[10]**

Q2) a) Compare Huffman coding with arithmetic coding? **[8]**

b) Consider a source with symbol probabilities $P(a_1) = 0.8$, $P(a_2) = 0.02$ and $P(a_3) = 0.18$. Find the tag using arithmetic coding for a sequence a_1, a_3, a_2. **[8]**

Q3) a) Explain the operation of backward adaptive quantizer with the help of block diagram. **[6]**

b) Explain different methods of music compression. What is MIDI? **[10]**

Q4) a) Explain Linear predictive coding of speech. How to select the order of the predictor? **[8]**

b) Explain rate - distortion theory. How it is utilized for coding? **[8]**

SECTION - II

Q5) a) Explain the use of DCT for image coding. How to quantize the DCT coefficients? Explain how it leads to compression of data. **[8]**

b) Explain data structure used in EZW coder. Explain the method of scanning wavelet transform coefficients for encoding using EZW algorithm. **[8]**

P.T.O.

Q6) a) Explain use of wavelets for image coding. Explain properties of a mother wavelet. **[8]**

b) What is streaming video? How is it achieved? **[8]**

Q7) a) Explain any one motion estimation algorithm. **[8]**

b) Compare the performance of DFT, DCT and KLT. Which is the optimal transform? Why? **[8]**

Q8) a) Explain how to generate SPIHT charts. **[8]**

b) What are advantages of ADPCM over PCM? Explain with block schematic. **[10]**

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Total No. of Questions : 8]

SEAT No. : ____

P1913

[Total No. of Pages : 2

[4165] - 667
M.E. (E & TC) (Signal Processing)
DIGITAL SIGNAL COMPRESSION
(Elective - III(b)) (2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain Short Time Fourier Transform (STFT). What are the drawbacks of STFT? How these drawbacks are overcome by wavelets? **[8]**

b) What is multiresolution analysis (MRA)? How Discrete Wavelet Transform (DWT) is used for MRA. Explain how image compression is achieved through multilevel decomposition of the image data. **[8]**

Q2) a) For the seven - level wavelet decomposition shown below

26	6	13	10
–7	7	6	4
4	–4	4	–2
2	–2	–3	0

Find the bit stream generated after first and second pass by SPIHT coder. **[10]**

b) With the help of suitable block diagram explain the encoding and decoding process in JPEG 2000. **[8]**

Q3) a) What is Vector Quantization (VQ)? How image or signal is compressed using VQ. What are the advantages and disadvantages of VQ? **[9]**

b) Explain mean removed Vector Quantization technique. **[7]**

P.T.O.

Q4) a) The probabilities of the source symbols are given below

P(a1) = 0.1 P(a2) = 0.4

P(a3) = 0.06 P(a4) = 0.1

P(a5) = 0.04 P(a6) = 0.3

Generate optimal Huffman code and find the average bit length. **[10]**

b) Compare lossless and lossy data compression. **[6]**

SECTION - II

Q5) a) Explain discrete cosine transform and its properties. How the image compression is achieved by coding of DCT coefficients. **[8]**

b) What is adaptive quantization? With the help of suitable block diagram explain the forward adaptive quantizer. **[8]**

Q6) a) Explain in context with video compression the different sampling formats of YCbCr color space. **[8]**

b) Explain block based motion estimation and motion compensation technique. What are the advantages of block based motion compensation. **[8]**

Q7) a) What is fractal? Explain encoding process of image compression based on the fractals. **[8]**

b) What are the features of MP3? Explain with suitable block diagram the structure of MP3 audio coder. **[10]**

Q8) a) With the help of block diagram explain the process of lossless predictive encoding and decoding. **[8]**

b) What is Linear Predictive Coding (LPC)? How LPC is used in speech coding? **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1916

[Total No. of Pages : 2

[4165] - 672

M.E. (Electronics) (Digital Systems)

MICROELECTRONICS

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicates full marks.***
3) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) a) Explain the Voltage Transfer Characteristics (VTC) of CMOS inverter. Cleary label the VTC indicating operating region (cut - off, linear, saturation) of the transistors. **[10]**

b) With the help of detailed equivalent circuit diagram explain the parasitic capacitances involved in a MOSFET. **[6]**

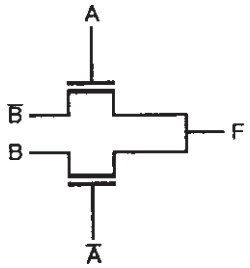
Q2) a) Draw the stick diagram and layout for, **[8]**

i) Inverter.

ii) Two input NAND gate.

b) What are the components that account for the power dissipation in a CMOS VLSI Circuit? Calculate approximate dynamic power dissipation in a chip operating with V_{DD} of 5 V at 100 MHz with an internal switched capacitance of 300 pF. **[8]**

Q3) a) Determine the logic function implemented by the circuit shown in figure. Design the logic circuit using complementary CMOS and find out the difference in transistor count of both the designs. **[8]**



P.T.O.

b) Use combination of CMOS gates to generate the following functions. **[8]**

i) $Z = A.$

ii) $Z = AB + \overline{A}\overline{B}$.

iii) $Z = A\overline{B}\overline{C} + \overline{A}\overline{B}C + \overline{A}\overline{C}B + ABC$

iv) $Z = A\overline{B} + \overline{A}B$

Q4) Write short notes on (any three) **[18]**

a) Technology Scaling.

b) Ultrafast VLSI circuits.

c) Mixed signal design issues.

d) Floor planning methods.

SECTION - II

Q5) a) Implement following circuits using transmission gates. **[10]**

i) 2 : 1 multiplexer.

ii) 4 : 1 multiplexer.

iii) XOR gate.

iv) OR gate.

b) Draw the circuit diagram for following dynamic logic gate, **[6]**

$f = \overline{a(b + c + d)}$

Q6) a) What is difference between differential output amplifier and single ended output amplifier? Draw and explain Cascode topology of the differential amplifier. **[8]**

b) What is Domino logic? Explain the differences between the Domino logic and NORA logic. **[8]**

Q7) a) With reference to VHDL explain the following terminologies, **[8]**

i) Synthesizable and non - synthesizable statements.

ii) data objects and data types.

iii) subprograms and packages.

iv) configuration and attributes.

b) What are the differences between Moore and Mealy finite state machines. Write VHDL code for both the state machines. **[8]**

Q8) Write short notes on (any three) **[18]**

a) Signal Integrity.

b) Clock distribution.

c) VITAL.

d) VHDL modeling styles.

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Total No. of Questions : 8] **SEAT No. :**

P1920 **[Total No. of Pages : 2**

[4165] - 681

M.E. (Electronics) (Digital Systems)

EMBEDDED SYSTEMS

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with the help of suitable example Tightly constrained characteristics of an embedded system. **[8]**

b) Explain the following Integrated circuit technologies which are used in Embedded system and compare them. **[8]**

i) ASICs.

ii) CPLDs.

iii) FPGA

Q2) a) Why ARM processors are mostly used in Embedded system design? Explain with block diagram the five stage pipeline of ARM9 processor. **[10]**

b) Explain I2C bus protocol with its timing diagram and list out its features. **[6]**

Q3) a) What is the need for communication interface in Embedded system. Explain IEEE 802.11 protocol with its data transfer mechanism. **[8]**

b) List the different variants of ARM processor. Explain Debug, Multiplication and DSP extension variant in detail. **[8]**

Q4) Write short notes on any three **[18]**

a) CAN BUS protocol.

b) IDE tools used in Embedded Systems.

c) ARM processor modes.

d) Hardware architecture of Embedded System.

P.T.O.

SECTION - II

Q5) a) Draw and explain waterfall model used in Embedded System development. **[8]**

b) Explain the software architecture of Embedded System. **[8]**

Q6) a) With suitable example. Explain how shared data problem can be solved using semaphores. **[8]**

b) What are the features of μCOS - II. Explain the following with respect to μCOS - II. **[8]**

i) Task Releted Functions.

ii) Mutex.

Q7) a) Explain the necessity of code optimisation in Embedded System design. Explain important code optimisation guidelines? **[8]**

b) Compare Conventional Operating System and Real Time operating System. List different RTOS and compare its features. **[8]**

Q8) Write short notes on any three **[18]**

a) Intertask communication in μCOS - II.

b) Memory management in μCOS - II.

c) Round Robin architecture with interrupt.

d) Debugger and Emulators.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. : ____

P1924

[Total No. of Pages : 2

[4165] - 686

M.E. (Electronics - Digital System)

EMBEDDED VIDEO PROCESSING

(2008 Course) (Elective - III(C)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write an expression of 2 - D FDCT & IDCT. Explain each term used in these expressions. What are the DC & AC coefficients in DCT computations? **[8]**

b) Explain the different methods of video quality measurement. **[8]**

Q2) a) Explain the different coding modes of JPEG. **[8]**

b) Using neat diagram explain the six layered syntax video coding model suggested in MPEG - I. If the data is corrupted what care has been taken to recover in the MPEG decoder. **[10]**

Q3) a) Evaluate computational complexity of full search method of motion compensation for 'MAD' criterion. How does 'PDC' measure save the computations? **[8]**

b) Estimate the computational complexity for broadcast TV with resolution 720 × 480, frame rate 30 frames / sec when the following algorithms are used. **[8]**

i) Full search.

ii) 2 - D logarithmic search.

P.T.O.

Q4) Write detailed notes on - **[16]**

a) Arithmetic coding.

b) JPEG - 2000

c) HVS

d) MPEG - 4

SECTION - II

Q5) a) Draw a neat block diagram of H.261 encoder & explain function of each block. **[8]**

b) What are the QoS requirements for coded video? **[8]**

Q6) a) State the different design goals of hardware & software CODEC. **[6]**

b) Explain the steps to test the different blocks of hardware CODEC. **[6]**

c) Explain the different filters used for post filtering. **[6]**

Q7) a) Discuss the different issues in video CODEC interface with a suitable example. **[8]**

b) Explain the important features of - **[8]**

i) Embedded & media processor.

ii) Video signal processor.

Q8) a) With respect to motion estimation explain the following terms - **[8]**

i) Sub - pixel accurate motion estimation.

ii) Multi - picture motion estimation.

b) Explain the following terms wrt to H.261. **[8]**

i) Intra - frame compression.

ii) Inter - frame compression.

♦♦♦♦

Total No. of Questions : 8] **SEAT No. :**

P1927 **[Total No. of Pages : 2**

[4165] - 690

M.E. (E & TC) (Communication Networks)

CODING AND MODULATION TECHNIQUES

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain need of compression in detail? Explain in detail video compression? **[8]**

b) With neat diagram explain in detail CDMA? **[8]**

Q2) a) Explain in detail PN Code Properties? **[8]**

b) Define MPEG? & Explain in detail different MPEG standards? **[8]**

Q3) a) Compare B/W and color Television standards with suitable examples? **[8]**

b) Explain following The Principles of OFDM, Advantage of OFDM:, Disadvantage of OFDM, Application of OFDM. **[8]**

Q4) Write Short Notes on (Any Two) : **[18]**

a) Automatic Frequency Control.

b) Wireless Multipath Channel AWGN.

c) JPEG standards and its modes.

SECTION - II

Q5) a) Explain in detail Wideband Rake Receiver? **[8]**

b) Explain with neat diagram Modulation Detection Techniques? **[8]**

Q6) a) What is JPEG? Explain JPEG standard and its modes? **[8]**

b) Explain IS-95 in detail with its generation? **[8]**

P.T.O.

Q7) a) What is Frequency Selective Fading? Explain in detail? **[8]**

b) Explain Frequency Domain Equalization in detail? **[8]**

Q8) Write Short Notes on (Any Two) : **[18]**

a) Transform based lossy coding.

b) Modulation Impairments.

c) Quantization.

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P1933

[Total No. of Pages : 4

[4165] - 708

M.E. (Production Engg.)

MATHEMATICS AND STATISTICS

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Non - programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Determine the analytic function f(z) such that $\mathrm{Re}[f'(z)] = 3x^2 - 4y - 3y^2$ and $f(1 + i) = 0$ **[6]**

b) If $f(z) = u + iv$ is analytic show that $g(z) = -v + iu$ is also analytic. Also show that u and –v are conjugate harmonic. **[5]**

c) Find Laurent series of $f(z) = \dfrac{1}{z^2 + 1}$ about its singular points. Determine the region of convergence. **[6]**

Q2) a) Evaluate $\int_C \mathrm{Re}(z)\,dz$ where C is **[6]**

i) Shortest path from 1 + i to 3 + 2i.

ii) Along the straight line from (1, 1) to (3, 1) and then (3, 1) to (3, 2).

b) Determine and graph the image of $|z - a| = a$ under $W = Z^2$ **[5]**

c) Find the bilinear transformation that maps z = 0, – i, 2i on to $W = 5i, \infty, -i/3$ respectively. **[5]**

Q3) a) Solve the initial boundary value problem $\dfrac{\partial f}{\partial t} = 2\dfrac{\partial^2 f}{\partial x^2}$, with $f(0, t) = 10$, f(6, t) = 18 and $f(x,0) = \dfrac{x^2}{2}$ with h = 1 and $k = 1/8$ by explicit method **[8]**

P.T.O.

b) Solve the wave equation $25\frac{\partial^2 f}{\partial x^2} = \frac{\partial^2 f}{\partial t^2}$ with boundary conditions $f(0, t) = 0$, $f(5, t) = 0$ and with initial conditions $f(x, 0) = 20x$ when $0 \le x \le 1$ and $f(x,0) = 25\left(1 - \frac{x}{5}\right)$ when $1 \le x \le 5$, $\left(\frac{\partial f}{\partial t}\right)_{t=0} = 0$. **[9]**

Q4) a) Using contour integration, show that $\int_0^{\infty} \frac{dx}{(1+x^2)^2} = \frac{\pi}{4}$ **[8]**

b) The function f satisfies the equation $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} + 2 = 0$ at every point inside the square bounded by the straight lines $x = \pm 1, y = \pm 1$ and is zero on the boundary. Calculate a finite difference solution using a square mesh of side ½. **[8]**

Q5) a) Find the curves on which the functional $\int_1^2 \frac{1}{x}\sqrt{1 + \left(dy/dx\right)^2}\,dx$ with $y(1) = 0, y(2) = 1$. **[8]**

b) Show that the functional $\int_0^1 \left[2x + \left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2\right] dt$ such that $x(0) = 1, y(0) = 1, x(1) = 1.5, y(1) = 1$ is stationary for $x = 1 + \frac{t^2}{2}, y = t$. **[8]**

SECTION - II

Q6) a) Show that **[6]**

i) $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \sin x$

ii) $J_{-1/2}(x) = \sqrt{\frac{2}{\pi x}} \cos x$

b) Show that $\int_{-1}^{1} x P_n(x) P_{n-1}(x)\,dx = \frac{2n}{4n^2 - 1}$ **[6]**

c) Express $J_4(x)$ interms of $J_0(x)$ and $J_1(x)$ **[4]**

Q7) a) A news paper boy estimates the daily demand with a probability as given below :

Daily Demand	:	0	10	20	30	40	50
Probability	:	0.02	0.18	0.15	0.50	0.10	0.04

Use the following sequence to simulate the demand next 10 days :

25 65 39 76 05 70 12 81 32 43

Also estimate the daily average demand for news paper on the basis of simulated data. **[8]**

b) The probability that a pen manufactured by a company will be defective is 1/10. If 12 such pens are manufactured, find the probability that **[8]**

i) Exactly two pens will be defective.

ii) At least two pens will be defective.

iii) None will be defective.

Q8) a) If 10% of the truck drivers on road are drunk determine the probability that out of 400 drivers randomly checked. **[9]**

i) At most 32

ii) More than 49.

iii) At least 35 but less than 47 drivers are drunk on the road.

b) Two shipments of computers are received. The first shipment contains 1000 computers with 10% defectives and the second shipment contains 2000 computers with 50% defectives. One shipment is selected at random. Two computers are found good. Find the probability that the two computers are drawn from the first shipment. **[8]**

Q9) a) The following data refers to the visual defects in the inspection of first 10 samples of size 100. Use the data to obtain upper and lower control limits for percentage of defective in samples of 100. Represent the first 10 sample results in chart that you prepared to show the central line and control limits. **[8]**

Sample No.	:	1	2	3	4	5	6	7	8	9	10
No. of defectives	:	1	1	3	2	2	3	4	2	2	0

b) Fit a binomial distribution to the data **[9]**

x	:	0	1	2	3	4	5
y	:	38	144	342	287	164	25

and test for goodness of fit at the level of significance 0.05.

Q10) a) A sale man's territory consists of 3 cities A, B, & C . He however sells in the same city on successive days. If he sells in city A , then the next day he sells in city B. However, if he sells in either B or C, then the next day he is twice as likely to sell city A as in other city in the long run, how often does he sell in each of the cities. (Use Markovchain). **[8]**

b) For a markov chain, the transition matrix $P = \begin{pmatrix} 1/2 & 1/2 \\ 3/4 & 1/4 \end{pmatrix}$ with initial distribution $P^{(0)} = (1/4 , 3/4)$ Find **[8]**

i) $P_{21}^{(2)}$

ii) $P_{12}^{(2)}$

iii) $P^{(2)}$

iv) $P_{1}^{(2)}$

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P1934

[Total No. of Pages : 3

[4165] - 709

M.E. (Production Engineering)

CAD / CAM / CIM

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non - programmable electronic calculators is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A triangular lamina has corners PQR. The coordinates are P(20,20), Q(40,25) and R (30, 40). The lamina is rotated about P through 30° in clockwise direction. Obtain **[10]**

i) The concatenated matrix for the transformation and

ii) Calculate new coordinates of the triangle.

b) Compare between CSG and B - Rep solid modeling technique. **[6]**

Q2) a) Given four control points A (4, 8), B (7, 9), C (8, 1) and D (10, 4), develop the cubic Bezier curve equation and draw the curve. **[10]**

b) Explain the steps of generating CNC program from a given part drawing.**[6]**

Q3) a) Write a NC program to drill and countersink the work piece as shown in Figure 1. Be sure to use the upper left corner as the work zero. **[10]**

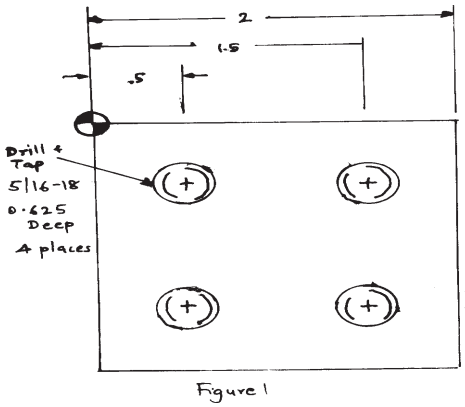

Figure 1

b) How to carry out assembly design using solid models? **[6]**

P.T.O.

Q4) a) Consider the bar shown in Figure 2. An axial load P = 20000 N is applied as shown. Using Finite Element Method, find the following **[10]**

i) Determine the nodal displacements.

ii) Determine stress in each material.

iii) Determine the reaction forces.

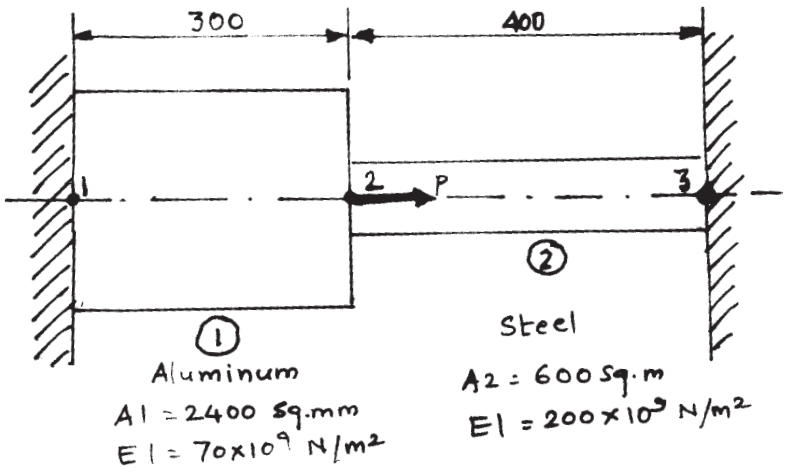

Figure 2

b) State and explain the approaches which should be considered in order to optimize overall efficiency and effectiveness of FMS. **[6]**

Q5) Write short notes on any three of the following **[18]**

a) Homogenous representation.

b) IGES

c) Control surfaces in APT programming.

d) Variational Design.

e) Bicubic Hermite Spline Surface.

SECTION - II

Q6) a) What is the role of feature recognition in Computer Aided Process Planning? **[6]**

b) State any five commonly used CAPP systems with their characteristics and programming languages used. **[5]**

c) What are the criteria for cell design evaluation in CMS? **[5]**

Q7) a) Explain with nest sketch, different layouts used in FMS **[6]**

b) Describe the use of barcode system for shop floor control **[5]**

c) Explain different ways of inputting part information into a process planning system. **[5]**

Q8) a) Consider the following part - machine incidence matrix. Apply the Rank Order Clustering (ROC) algorithm to it and identify the part families and machine groups. **[10]**

	P1	P2	P3	P4	P5	P6	P7	P8
M1			1	1	1	1		
M2	1		1		1		1	1
M3		1		1				
M4			1			1		
M5	1				1		1	
M6				1				
M7		1		1	1			
M8			1					1

b) Compare the advantages and suitability of various methods of work piece transport in FMS. **[6]**

Q9) a) A family of 150 parts is to be produced. A conventional fixture costs Rs. 6,500 and a fixture for group tooling costs Rs. 10,000. The adaptor for group tooling costs Rs. 800. Compute the tooling cost and unit tooling cost for conventional and group tooling for 1, 5 and 10 parts in a family. **[6]**

b) What is Production Flow Analysis? How does it help in Cell Formation? **[5]**

c) Discuss different types of guidance systems available for AGVs. **[5]**

Q10) Write short notes on any three of the following : **[18]**

a) Models of CIM.

b) Robot applications in industry.

c) Non - contact inspection methods.

d) Tool magazines in FMS

e) Criteria for selection of CAPP system

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1937

[Total No. of Pages : 2

[4165] - 719

M.E. (Production Engineering)

MATERIAL TECHNOLOGY

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Answer the following.

a) What is Work Hardening? Why it occurs? Explain the effects of it & how to eliminate them. **[6]**

b) Why solid solution is harder than parent metal? Explain the factors on which hardening of solid solution depends. **[5]**

c) What are Whiskers? Explain in detail. **[5]**

Q2) a) Discuss Age Hardening in detail with suitable example. How it differs from dispersion hardening? **[6]**

b) Establish the relationship between the stress required to propagate a crack in a brittle material & size of the crack. A relatively large plate of a glass is subjected to a tensile stress of 40 MPa. If the specific surface energy & modulus of elasticity for the glass are 0.3 J/m^2 & 69 GPa respectively. What is the maximum length of a surface flow that is possible without fracture? **[6]**

c) Explain super plasticity & Homologus temperature. **[4]**

d) What is Transition temperature? **[2]**

P.T.O.

Q3) a) What is Low cycle Fatigue? Draw typical S - N curve for steel & Aluminium. Explain the differences between the two. **[6]**

b) What are the factors that need to be taken into account for selecting material for high temperature applications. Give atleast one example of such material. **[5]**

c) How Fatigue life can be improved? **[5]**

Q4) Write short notes on (Any 4) **[16]**

a) Strengthening due to grain boundries.

b) Re crystallization.

c) Paris law.

d) Procedure for failure analysis.

e) Dislocations.

SECTION - II

Q5) a) What are dual phase steels? Explain in detail why they are used for car bumpers? **[6]**

b) Maraging steel contains negligible carbon still known as ultra high strength steel. Explain why? Give atleast 2 applications of maraging steel. **[6]**

c) Which factors need to be considered for material selection, to be used for human body part implant? **[4]**

Q6) Answer the following **[16]**

a) Explain one method of processing of ceramics. Also state it's applications.

b) What is metallic glass? How it is produced?

c) What are the various measures which you would like to take to avoid failure due to corrosion?

d) What are Nanomaterials? Explain in brief state 2 applications of nano materials.

Q7) a) What are cemented carbides? How they are produced? **[6]**

b) What are shape memory alloys? Explain with 2 applications. **[4]**

c) Explain Traditional & Engineering ceramics. **[6]**

Q8) a) How carbon fibers are produced? Why carbon fiber composites are used in aero - space applications. **[6]**

b) Explain Iso stress & Iso - strain condition. Calculate the modulus of Elasticity for a composite material consisting of 60% by volume of Aluminium matrix & remaining are Baron fibers in direction parallel to fibers.

E of Aluminium matrix = 60 GPa.

E of Baron fibers = 380 GPa. **[6]**

c) Explain MMC & Cladding. **[6]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. :

P1938

[Total No. of Pages : 3

[4165] - 724
M.E. (Production)
WELDING & JOINING
(2008 Course) (Elective - III(c)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Your answers will be valued as a whole.***
7) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
8) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Draw TTT diagram & explain effect of cooling rate on formation of different reaction products like pearlite, bainite and martengite. **[8]**

b) Explain in brief recrystalization and grain growth of HAZ - Heat Affected Zone. **[8]**

OR

Q2) a) Explain different methods of weldability testing in brief. **[8]**

b) With the help of diagram explain salute distribution for cellular & dentritic growth patterns. **[8]**

Unit - II

Q3) a) Define Arc efficiency. What are the different factors that affect arc efficiency? How arc efficiency is calculated. **[9]**

b) Explain with graphs electrical characteristics of an arc. **[9]**

OR

P.T.O.

Q4) a) In an argon shielded tungsten arc welding the cathode drop was found to be 10 volts for a welding current of 120 amp and arc voltage of 18 volts. Determine :-

i) The arc length, if arc efficiency be 55% with an arc temperature of 10000 kelvin. Assume column voltage drop is 1.2 volt/mm and that 20% of the heat of the column is transferred to the anode. **[5]**

ii) The arc efficiency if the same process parameters are applicable to GMAW process and the wire electrode is made the anode.

Take the function of tungsten at OK = 4.5 eV and Boltzman's constant $K' = 8.60 \times 10^{-5}$ eVK. **[4]**

b) Explain different types of welding Arcs. **[4]**

c) Explain in brief the role of electrode polarity. **[5]**

Unit - III

Q5) a) Discuss the role of surface tension on fusion welding. **[8]**

b) What is deposition rate? Make a brief comparison of deposition rates in Gas Tungsten Arc Welding (GTAW) process using hot wire & cold wire. **[8]**

OR

Q6) a) Explain different methods to improve metallurgical properties of electro slag welding. **[8]**

b) Discuss three dimensional geometric effect on residual stress and strain in Welding Process. **[8]**

SECTION - II

Unit - IV

Q7) a) Explain the constant current characteristics of power sources used in "Arc Welding Processes". **[8]**

b) Explain in brief solid state inverters used in welding process. **[8]**

OR

Q8) a) What are different power sources used to supply the electric current for arc welding? Explain different factors that influence on selection of power sources. **[8]**

b) Explain in brief what is Duty cycle? **[8]**

Unit - V

Q9) a) Discuss various forces affecting metal transfer. **[8]**

b) Describe and explain the classification of modes of metal transfer. **[8]**

OR

Q10) a) Discuss the 'droplet transfer frequency' for steel, using different welding processes. **[8]**

b) Explain in brief metal transfer in SMAW process. **[8]**

Unit - VI

Q11) a) Explain explosive welding with its advantages and limitations. **[9]**

b) Explain the difference between friction & inertia welding? List out different materials that can be friction welded. **[9]**

OR

Q12) a) Make a brief comparison of electron beam welding and laser beam welding. **[9]**

b) Explain High Energy Rate Welding Processes in brief. **[9]**

♦♦♦♦

Total No. of Questions : 8] **SEAT No. :**

P1967 **[Total No. of Pages : 2**

[4165] - 769

M.E. (Computer Engineering)

SOFTWARE PROJECT MANAGEMENT

(2008 Course) (Elective - IV(a)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the need for project management, activities involved in project management and benefits out of it. **[8]**

b) Enlist and explain in detail the characteristics associated with project. **[8]**

Q2) Explain the risks that regularly occur in software projects and the controls important in reducing the risks identified. **[16]**

Q3) a) List and explain the types of cost estimates. **[8]**

b) Using an example explain integrating schedule and critical path. **[8]**

Q4) Write short notes on ANY THREE **[18]**

a) Project management activities.

b) Tracking project progress.

c) Work breakdown structure.

d) Software Project teams.

SECTION - II

Q5) a) Who are the stake holders of an IT project? Elaborate the aspects to be considered for them while project management? **[8]**

b) Explain how project performance can be improved through qualitative analysis. **[8]**

Q6) a) Explain aspects helping in designing critical platforms for success story of projects. **[8]**

P.T.O.

b) Function point is an important parameter for software measurement? Elaborate the statement. **[8]**

Q7) Enlist and explain Fourteen general system characteristics used as basis in the calculation of value adjustment factor. **[16]**

Q8) Write Short note on ANY THREE. **[18]**

a) Assessing project viability.

b) Project controls.

c) Return on investment.

d) Configuration management.

♦♦♦♦

Total No. of Questions : 8] **SEAT No. :**

P1968 **[Total No. of Pages : 2**

[4165] - 770

M.E. (Computer Engg.)

INFRASTRUCTURE MANAGEMENT

(2008 Course) (Elective - IV(b)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the value of system management for Business. **[8]**

b) What are the benefits and potential problems of using IT service management? **[8]**

Q2) a) Explain in detail how an IT company structure evolves from a basic organization to an organization in which applications are aligned with business units. **[12]**

b) Enlist the order of preference of ten things users want most when they call the help desk. **[4]**

Q3) a) Explain in brief System context diagrams. **[8]**

b) Enlist and explain ITIL service delivery processes. **[8]**

Q4) Write short notes on ANY THREE **[18]**

a) Infrastructure management activities.

b) Recommended attributes of process owners.

c) Customer requirements.

d) Activities of Service Level Management.

SECTION - II

Q5) a) How can we achieve insight into the value creation process with the aid of financial management? **[8]**

b) Explain purpose, objectives and scope of IT Service Continuity Management. **[8]**

P.T.O.

Q6) a) Explain the steps in incident management process. **[8]**

b) Enlist and explain challenges, critical success factors and risk in release process. **[8]**

Q7) a) What is Access management? Explain components and benefits of Access management? **[8]**

b) What are the different redundancy types defined by ITIL increasing reliability and sustainability of systems? **[8]**

Q8) Write short notes on ANY THREE. **[18]**

a) Change Advisory Board.

b) Organizational structure of a service desk.

c) Space management.

d) Identity Management.

♦♦♦♦

Total No. of Questions : 8] **SEAT No. :**

P1969 **[Total No. of Pages : 2**

[4165] - 771
M.E. (Computer Engineering)
DATA WAREHOUSING AND DATA MINING
(2008 Course) (Elective - IV(c)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain how to index OLAP data with example. **[8]**

b) Briefly describe and give examples of each of the following approaches to clustering : partitioning methods, hierarchical methods, density - based methods and grid - based methods. **[8]**

Q2) a) Consider the following two dimensional data set as two dimensional data points : **[8]**

	A1	A2
X1	1.5	1.7
X2	2.0	1.9
X3	1.6	1.8
X4	1.2	1.5
X5	1.5	1.0

Given a new data point, x = (1.4, 1.6) as a query, rank the data base points based on similarity using

i) Euclidean distance.

ii) Manhattan distance.

b) In real - world data, tuples with *missing values* for some attributes are a common occurrence. Describe various methods for handling this problem. **[8]**

Q3) a) Using suitable example, explain the algorithm used for decision tree construction. **[10]**

P.T.O.

b) With suitable example explain following Data mining task. **[8]**

i) Regression.

ii) Sequence Discovery.

iii) Prediction.

iv) Summarization.

Q4) a) Explain in detail text mining. **[8]**

b) Compare : **[8]**

i) Fact constellation and starnet query model.

ii) Supervised and unsupervised learning.

SECTION - II

Q5) a) Write an algorithm for *k - nearest neighbor classification* given *k*, the nearest number of neighbors, and *n*,the number of attributes describing each tuple. **[8]**

b) A database has 5 transactions. Let *min sup* = 0.6 and *min conf* = 0.8. **[8]**

customer	date	items bought
100	10/15	{I, P, A, D, B, C}
200	10/15	{D, A, E, F}
300	10/16	{C, D, B, E}
400	10/18	{B, A, C, K, D}
500	10/19	{A, G, T, C}

i) List the frequent *k* - itemset for the largest *k*, and

ii) All the strong association rules (with support and confidence) for the following shape of rules :
$\forall x \in$ transaction , buys (x, item 1) $\wedge$ buys (x, item2) $\Rightarrow$ buys (x, item3)

Q6) a) Write short on web usage mining. **[8]**

b) What are outliers? Explain types of outliers. **[8]**

Q7) a) For the following group of data 200, 400, 800, 1000, 2000 **[8]**

i) Z - score nomalization

ii) Min - max normalization with min = 0 and max = 10;

b) Explain major issues of Data Mining. **[10]**

Q8) a) Write BIRCH clustering algorithm and explain it using example. **[10]**

b) What is cross validation? What is significance of validation test? **[6]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1989

[Total No. of Pages : 3

[4165] - 804

M.E. (Chemical)

MATHEMATICAL METHODS IN CHEMICAL ENGINEERING

(2008 Course) (Sem. - II) (Elective - III(c))

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Find eigen values and eigen vectors of following matrix. **[5]**

$$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$$

b) State the convergence criteria for Gauss Seidal method. **[4]**

c) Using Gauss elimination method to solve the following equations. **[7]**

$5x + 13y + 7z = 14$

$3x + 6y + 3z = 9$

$7x + 2y + 4z = 5$

Q2) a) Use multiple equation Newton Raphson method to determine roots of following equations. **[8]**

$x = y + x^2 - 0.5$

$y = x^2 - 5xy$

b) Determine the solution of following nonlinear equations using fixed point iteration method **[8]**

$x^2 + xy - 10 = 0$

$y + 3xy^2 - 57 = 0$

Q3) Solve the following using power series method **[18]**

a) $y'' + 9y = 0$

b) $y' + 2y = 0$

c) $y' = 2xy$

P.T.O.

Q4) a) Write short note on use of qualitative methods for discussing general behaviour of solutions of linear differential equations. Also write about its use in stability analysis. **[4]**

b) What are five types of critical points used in phase plane analysis. Discuss each in detail. **[12]**

SECTION - II

Q5) a) Derive the Laplacian equation using control volume approach for a heated plate with unequal grid spacing, two materials and mixed boundary conditions as shown in following fig. **[12]**

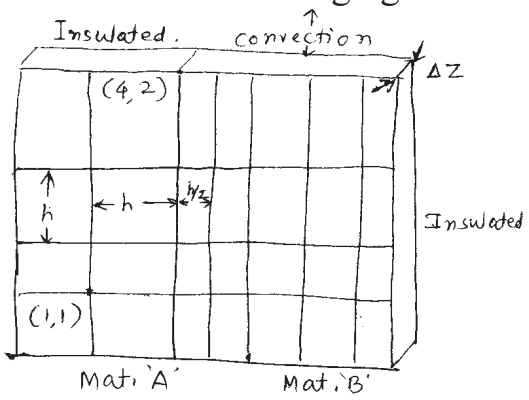

Fig. A heated plate with unequal grid spacing two materials and mixed boundary conditions.

b) Write short note on PDES and engg. practice. **[4]**

Q6) a) Use the explicit method to solve for the temp. distribution of a long, thin rod with a length of 10 cm, and the foll. values K' = 0.49 cal/ s.cm.°C $\Delta x = 2\text{cm}$ and $\Delta t = 0.1s$. At t = 0 the temp. of the rod is zero and boundary conditions are fixed for all times at T(0) = 100°C and T(10) = 50°C. Note that rod is of aluminium with C = 0.2174 cal/g°C and $\rho = 2.7$ gm/cm^3. Therefore K = 0.49/2.7 × 0.2174 = 0.835 cm^2/s and $\lambda = 0.020875$. Solve for two iterations. **[10]**

b) Differentiate between Explicit, Implicit and Crank Nicolson methods used for solving portial differential equations. **[8]**

Q7) Use Liebmann's method to solve for the temp. of a heated plate with lower edge insulated in fig shown below. **[16]**

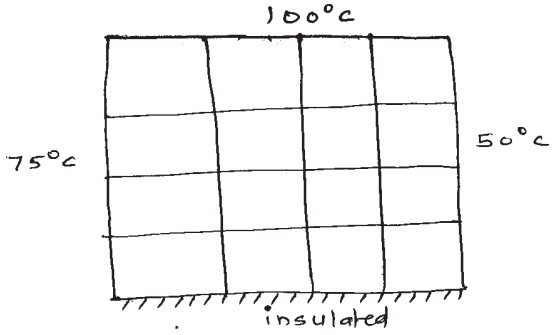

Fig. Heated square plate with lower edge insulated
Solve for two iterations

Q8) a) Write short note on the following. **[10]**

i) Finite difference method for solving PDES.

ii) Finite element method for solving PDES.

b) Discuss about convergence and stability of explicit method in detail. **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

P1990

[Total No. of Pages : 2

[4165] - 806
M.E. (Chemical Engg.)
CATALYSIS AND SURFACE PHENOMENA
(2002 & 2008 Course) (Elective - IV(a)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculators and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain what is active and supportive material in catalyst? **[6]**

b) What are the two types of surface acidities in a catalyst? **[6]**

c) What is meant by catalyst characterization? **[6]**

Q2) a) Derive the Elovich Equation. **[8]**

b) What is the LH model? **[8]**

Q3) a) How is surface area of a catalyst measured by BET method? **[8]**

b) What is the importance of pore size distribution? What is the gas adsorption method for estimating pore volume and pore radius? **[8]**

Q4) a) Surface area of a silica gel sample was measured by nitrogen adsorption and the following data was obtained :

Equilibrium pressure kPa	0.8	3.3	5.0	6.3	7.5	9.0	11.2	18.7	30.7
Volume adsorbed STP $V \times 10^6$ m^3	3.4	6.4	6.7	7.0	7.2	7.4	7.7	8.5	9.9

If the weight of the sample is 0.75 g calculate the specific area of the silica gel. The temperature is maintained at the normal boiling point of liquid nitrogen (77K) and the area occupied by a single nitrogen molecule is 16.2×10^{-20} m^2 **[12]**

b) What is Type A hysteresis? **[4]**

P.T.O.

SECTION - II

Q5) a) What is the effect of internal transport resistance in catalysis? **[6]**

b) What are poisons? **[6]**

c) Give the significance of Thiele modulus. **[6]**

Q6) a) Give the effect of external transport resistance on feasibility of isothermal parallel reactions. **[6]**

b) Explain the dusty gas model. **[10]**

Q7) a) Explain the steady state deactivation model. **[10]**

b) What are peroveskites? **[6]**

Q8) a) Explain the function of monolith catalyst. **[8]**

b) Write about the process for catalytic synthesis of methanol. **[8]**

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Total No. of Questions : 8] **SEAT No. :**

P2001 **[Total No. of Pages : 2**

[4165] - 11

M.E. (Civil) (Construction and Management)

ADVANCED CONSTRUCTION ENGINEERING

(2002 Course) (Elective - I(c))

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain function and method with neat sketches the following activities involved in construction of R.C.C. diaphragm wall. **[18]**

a) Bentonite Installation Plant.

b) Method of construction of Primary and Secondary panels of diaphragm wall.

c) Specifications and method of concreting, for concrete of M 200 in diaphragm wall.

Q2) a) Draw neat sketches and explain sequence of construction in "Natural draught cooling towers". **[8]**

b) Explain in detail measures adopted in ensuring "Full leak tightness" in nuclear containment structures. **[8]**

Q3) a) What are tools adopted in carrying out "Inspection of a bridge". **[6]**

b) Prepare a "checklist" for inspection of a bridge and a detailed "Inspection Proforma" for any one of the item from the checklist. **[10]**

Q4) Write short notes on any three of the following : **[16]**

a) Factors affecting the stability of the earth dam.

b) Use of Tower cranes in high rise buildings.

c) Use of Geosynthetics in river training works.

d) Safety measures in Metro Railway.

e) Rock anchors in Underground Power House construction.

P.T.O.

SECTION - II

Q5) a) What is "Maximum Credible Accident" in Nuclear Containment Structures, explain in detail. **[8]**

b) Explain why "prestressing systems" are preferred in construction of domes in Nuclear Containment Structures. **[8]**

Q6) Explain in details purpose and function of the following items in construction of "Multi Flue Chimney". **[18]**

a) Concrete Platforms at 10 m. interval.

b) Ash - hopper platform.

c) Wind Shield.

d) Construction of Flues.

Q7) a) Which are the "six modes of vibrations" applicable in machine foundation designs? Explain them in detail. **[8]**

b) Under what conditions "Pile foundations are preferred to resist the dynamic loads in designing machine foundations". **[8]**

Q8) Write short notes on any three of the following : **[16]**

a) Gabion walls in river training works.

b) Importance of "Braced Frames" in earthquake resistant structures.

c) Jet grouting technique in diaphragm walls.

d) Bridge Maintenance Policy.

e) Reverse Mud Circulation Method in construction of diaphragm walls.

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Total No. of Questions : 6] **SEAT No. :**

P2002 **[Total No. of Pages : 2**

[4165] - 34
M.E. (Civil/Structures)
PLATES AND SHELLS
(2002 Course)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Distinguish between thin and thick plate bending. Write assumption in small deflection theory of thin plate. **[5]**

b) Sketch the free body diagram of a plate element representing loads, moments and shears. **[5]**

c) Derive the relations between moments, curvature and deflection in pure bending of plates. **[15]**

Q2) a) Derive Levy's solution for deflection of plate for a rectangular plate of size a × b with four edges simply supported carrying a uniformly distributed load q per unit area. **[20]**

b) How energy methods are applied to the plate analysis? **[5]**

Q3) Develop from first principles, governing differential equation for circular plate under axisymmetric loading. Also obtain the expressions for radial moment at the center of clamped plate. **[25]**

SECTION - II

Q4) a) State the advantages and disadvantages of shell structures compared to plates. **[5]**

b) Classify thin shell into various types of based on shell geometry and curvature. **[5]**

c) Derive the expressions for displacements in symmetrically loaded shell having the form of a surface of revolution. **[15]**

P.T.O.

Q5) a) A horizontal cylindrical shell with closed ends is filled with liquid of density 'δ' is simply supported at ends. Derive the expressions for stress resultants along any meridian in the shell. **[20]**

b) What are the limitations of the membrane theory in the analysis of shells? **[5]**

Q6) a) Explain the need for the bending theory for the analysis of the shell structure. Also state the limitations of the theory. **[5]**

b) Using Lundgren's beam theory, analyze a semicircular cylindrical shell of 5 m radius, simply supported over a span of 7 m. It is subjected to uniformly distributed load, inclusive of the self weight of intensity 3.5 kN/m^2. Calculate the maximum compressive stress at the crown in the mid span section. **[20]**

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Total No. of Questions : 10]

SEAT No. :

P2034

[Total No. of Pages : 2

[4165] - 219

M.E. (Petroleum)

ARTIFICIAL LIFT AND STIMULATION TECHNIQUES

(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Question numbers One and six are compulsory. Out of the remaining solve 2 questions from section - I and 2 questions from section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Use the following data and decide depth for point of gas injection.
Prove that, for a continuous flow injection,
P_{wh} + Gfa.L + Gfb(D-L) = Pwf.
Given Data :

Depth = 8700 ft. Expected rate = 980 bbls/day. Tubing size = 2⅜ inch. P_{wh} = 150 psig, SBHP = 2900 psig. P.I. = 2.8, solution GOR = 275, SCF/STB, Sp. Gravity of injection gas = 0.68, S/C available pressure = 980 psig, °API = 40, S/C Temp. = 122 °F B.H. Temp. = 222°F. 275 psi /1000 ft = flowing gradient of FBHP. 22.5 psi/1000 ft = casing pressure gradient. Subtract 100 psi from point of balance. Also calculate the total injection gas necessary if, optimum GLR = 600 SCF/STB, while desired oil production (100% oil) is 980 bbls/day. **[18]**

Q2) Consider different reservoir properties, field requirements and write the merit and demerits of various artificial lift techniques. **[16]**

Q3) Explain ESP components and calculate TDH and total HP, if pump with 0.35 HP/stage is available and each stage can provide a head of 35 feet.

Given Data :

It is desired to produce oil of Sp. Gravity 0.94 (No gas) at the rate of 1400 bbls/day from 5800 ft deep well. The static liquid level = 1900 ft. Casing = 5½ inch O.D. Tubing = 2⅜ inch O.D. T = 154 °F. During the test

P.T.O.

on this water well it was seen that, it is producing 900 bbls/day with liquid level at 3000 ft in the casing., which then stabilized to above 2300 ft. Use 100 ft safety in setting pump. Tubing friction is given as 30.5 ft/1000 ft. At the surface there is 2300 ft of 2.0 inch flow line with an increase in elevation = 39ft., with friction = 30ft/ 1000ft. **[16]**

Q4) Draw the neat schematic sketch and explain in detail working of sucker rod pumping system and its components. **[16]**

Q5) Write any four workover problems for oil and gas wells and discuss the solution for them in brief to solve these problems. **[16]**

SECTION - II

Q6) Draw the graphs to demonstrate the following, **[18]**

a) Reservoir inflow Vs tubing outflow for increasing tubing diameters. Show three tubing sizes : Natural Flow conditions.

b) No flow conditions. Need of ALT in above case

c) Effect of no. of perforations on production rate.

d) Production rate Vs tubing diameter to demonstrate liquid loading conditions.

e) Choke performance curves.

Q7) Draw the schematic sketch of a Petroleum Production System. Indicate various features of it and explain in detail nodal analysis. **[16]**

Q8) Explain various PVT properties and draw their relationship with reservoir pressure and temperature conditions. **[16]**

Q9) a) Draw the neat schematic sketch of a typical multiple zone completion of a producing wellbore. Indicate casing, tubing, packers and other features. Show three productive formations in it. **[10]**

b) Explain hydraulic fracturing in brief. **[6]**

Q10) Describe in brief matrix acidization job. Write and explain chemical reactions and design considerations for matrix acidization of Sandstone in brief. **[16]**

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Total No. of Questions : 8]

SEAT No. :

P2039

[Total No. of Pages : 2

[4165] - 237

M.E. (Instrumentation and control) (Process and Bio - Medical)

APPLICATIONS OF DIGITAL SIGNAL PROCESSING

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Find the linear convolution of the two sequences given below using graphical method. **[10]**

$x(n) = \{1, 2, 1, 0\}$

$h(n) = \{2, 1, 1\}$

b) Write the short note classification of signals and systems. **[8]**

Q2) a) Explain in detail the phenomenon of Interpolation and Decimation. **[8]**

b) What is correlation? Give the different types of correlation and applications of correlation. **[8]**

Q3) a) Find the IFFT of the following sequence using DIF FFT algorithm :

$X(k) = \{1, 2j, 0, 0, 3, 4 + 2j\}$ **[8]**

b) What is zero padding? What is its necessity? Give the applications of DFT. **[8]**

Q4) a) Compare Fourier Transform, DTFT and DFT. **[8]**

b) Give the advantages of Digital Processor over Microprocessor and Analog Processor. **[8]**

SECTION - II

Q5) a) What do you mean by linear phase filters? Explain the concept on symmetric and anti - symmetric conditions in case of FIR filters. **[10]**

b) Write a short note on windowing method for designing FIR filters. **[8]**

P.T.O.

Q6) a) Explain in detail the basic block diagram of TMS 320c67XXDSP processor with neat diagram. **[8]**

b) Write the program for linear convolution using TMS 320c67XX DSP processor. **[8]**

Q7) a) Write short note on Image Restoration. **[8]**

b) Explain in detail the role of digitizer in digital image processing. **[8]**

Q8) a) Write the short note on sampling and quantization in image processing. **[8]**

b) Explain in detail the different methods for acquiring the images . **[8]**

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Total No. of Questions : 8]

SEAT No. : ____

P2042

[Total No. of Pages : 2

[4165] - 252

M.E. CSE (Information Technology)

MOBILE COMPUTING

(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any three questions from Section - I and three questions from Section - II.***
2) ***Answers to the both sections should be written in separate answer sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Non - programmable pocket calculator is allowed.***

SECTION - I

Q1) a) Calculate the Co - channel Reuse Ratio (Q) for the following **[8]**

i) i = 1 and j = 1

ii) i = 2 and j = 2

iii) i = 2 and j = 3

iv) i = 1 and j = 3

From the above results, justify or nullify the following statement "A small value of Q provides larger capacity since the cluster size N is small, whereas a large value of Q improves the transmission quality, due to a smaller level of co-channel interference".

b) List the five basic elements need to consider for calculating performance of Cellular Networks. Explain the significance of parameter. **[8]**

Q2) a) An urban area has a population of 2 million residents. Three competing trunked mobile networks (systems A, B, and C) provide cellular service in this area. System A has 394 cells with 19 channels each, system B has 98 cells with 57 channels each, and system C has 49 cells, each with 100 channels. Find the number of users that can be supported at 2% blocking if each user averages 2 calls per hour at average call duration of 3 minutes. Assuming that all three trunked systems are operated at maximum capacity, Compute the percentage market penetration of each cellular provider. **[8]**

b) Explain the procedure for call establishment to a mobile. What are the functions of RACH, AGCH, SDCCH and FACCH channels? **[8]**

P.T.O.

Q3) a) Give the comparison among AMPS, GSM, DAMPS and CDMA mobile technologies with respect to band allocated, multiplexing technique, base station slots and speech coding rate. **[8]**

b) if a normal GSM time slot consists of 6 trailing bits, 8.25 guard bits, 26 training bits, and 2 traffic bursts of 58 bits of data, find the frame efficiency. **[8]**

Q4) a) What are the reasons behind the popularity of GSM technology? Do you think in future GSM would be completely replaced by CDMA technology? **[10]**

b) Normally the shapes of individual cells are typically irregular. Give possible reasons why this might be? **[8]**

SECTION - II

Q5) a) How GSM provides 22.8 Kbps FEC coded speech rate? **[8]**

b) Why cellular networks and Wireless networks require spread spectrum technology? What is difference between Direct Sequence Spread Spectrum technology (DSSS) and FHSS (Frequency Hopping Spread Spectrum) technology? **[8]**

Q6) a) What is broadband? Is it possible to carry out telephone conversation while surfing the net with broadband technology? If yes, Justify your answer. **[8]**

b) With the help of diagram explain how the synchronization is achieved using beacon in ad - hoc mobile networks. **[8]**

Q7) a) What is the problem of hidden terminal and exposed terminal in mobile networks? **[8]**

b) Explain the architecture of SMS protocol. **[8]**

Q8) a) How Bluetooth makes the use of broadband technology? **[10]**

b) Give and explain the architecture of GPRS system. **[8]**

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Total No. of Questions : 8]

SEAT No. : ____

P2043

[Total No. of Pages : 2

[4165] - 253

M.E. CSE (Information Technology)

NET CENTRIC COMPUTING

(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any three questions from Section - I and three questions from Section - II.***
2) ***Answers to the both sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) How CSMA/CD protocol detects the collision and resolves it? **[8]**

b) What is the function of repeater? How it can be used to extend the diameter of network? **[8]**

Q2) a) State the importance of following parameters from network design point of view. **[8]**

i) Manageability.

ii) Network Architecture.

iii) Switching Mode.

iv) Node Placement and Sizing.

v) Link Topology and Sizing.

vi) Routing.

b) Which different mechanisms are used to find the fault in the networks? Suggest any two mechanisms two recover the semi - critical faults? **[8]**

Q3) a) What is the relation between queuing theory and the Poisson distribution from network performance point of view? **[8]**

b) The administrator of a campus LAN assigned a single class B IP address of 150.10.0.0. Assuming that the LAN comprises 8 subnets, each of which is connected to a Fast Ethernet switch using a subnet router. Each subnet can be required to support maximum 10 machines. Give the subnet mask and starting and ending address of each subnet. **[8]**

P.T.O.

Q4) Write short notes on (Any Three) **[18]**

a) DSL.

b) Network Planning.

c) IPX/SPX Protocol Stack.

Importance of Logical Addressing in Network.

SECTION - II

Q5) a) Why following functions are not explicitly supported in Frame Relay networks? **[8]**

i) Fixed Frame Size.

ii) Connectionless Service.

iii) Flow Control.

iv) Error Control.

v) Standards for Physical Interface.

b) Justify or nullify the following statement.

"Short Cell Length Limits Latency at Each Switch in ATM Networks". **[8]**

Q6) a) How SONET/SDH provides 50 Mbps or more bandwidth? **[8]**

b) What do you mean by malicious code attacks carried out on application layer? How they can be prevented? **[8]**

Q7) a) Compare between NFS and CIFS. **[8]**

b) Justify or nullify the following statement. **[8]**
"The complexity of DCT based compression is always high".

Q8) a) How many security levels are provided by RAID technology? Give the importance of each level provided. **[10]**

b) How quality of service is maintained in VoIP? **[8]**

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Total No. of Questions : 8] **SEAT No. :**

P2047 **[Total No. of Pages : 2**

[4165] - 261
M.E. CSE (IT)
DATA WAREHOUSING AND DATA MINING
(2002 Course) (Elective - II(b))

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Q. 1 and Q. 5 are compulsory. Of the remaining solve any two in Section - I and any two in Section - II.***
2) ***Draw labeled diagrams if necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Design of star schema for Olympic events. **[18]**

-- Consider particular example of attendance at Olympic events. Facts are numbers attending, value of ticket sales. Dimensions include Olympiad (year of Olympic), venue, sport, type (common match, semifinal, final), men's / woman's Venues are classified by location and type of building into central enclosed, central open, remote. Sports are subdivided into events.
Assume a report representing attendance at various events. State your assumed report before you solve the following :

a) Construct a fact table for this Olympic event.

b) What is the key of the fact table?

c) Design a star schema by using the fact table designed in a) and using dimension tables.

Q2) a) Explain in detail Projection Index and Bit Map Index with suitable examples, figures. **[10]**

b) Discuss issues in problems in storage and retrieval of data from DSS. **[6]**

Q3) a) Explain application and subject orientation with respect to Data Warehousing. **[6]**

b) With the help of a neat diagram explain the general architecture of a Data Warehouse. **[10]**

Q4) a) Discuss data warehouse life cycle. **[4]**

b) Explain data transformation and cleansing in a Data Warehouse with suitable examples. **[8]**

c) With an example explain Fact Tables. **[4]**

P.T.O.

SECTION - II

Q5) a) List all the major activities that are part of the ETL process. Which of these is time consuming? Explain in detail any four of them? **[12]**

b) Write a note on Text Data Mining. **[6]**

Q6) a) Which Indexing technique is best suitable for Data Warehouse? **[8]**

b) Explain an algorithm to find association rules. **[8]**

Q7) As the project manager for the development of the data warehouse for a domestic soft drinks manufacturer, your assignment is to write a proposal for providing meta - data. Consider the options and come up with what you think is needed and how you plan to implement a metadata strategy. **[16]**

Q8) Write Short notes on : **[16]**

a) Online Analytical processing system.

b) Information filtering techniques for exploring data in databases.

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Total No. of Questions : 8]

SEAT No. :

P2048

[Total No. of Pages : 2

[4165] - 262

M.E. CSE (IT)

ENTERPRISE RESOURCE PLANNING

(2002 Course) (Elective - II(c))

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written on separate answer books.***
3) ***Assume suitable data, if necessary.***
4) ***Draw sketches wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What are various resources that ERP needs to manage? Why are these resources difficult to manage? **[8]**

b) Define Enterprise and ERP. What are the facilities, which form "multifacility" environment of ERP? **[8]**

Q2) a) What is business process engineering? Explain role of IT in implementation of it. **[8]**

b) Discuss the application domains where ERP can be implemented. **[8]**

Q3) a) What are the steps in implementation of ERP? **[8]**

b) What are different core processes in education sector? Explain their importance in accordance with ERP for Institute management? **[8]**

Q4) Write short notes on :- **[18]**

a) Scope of ERP.

b) Role of consultants, vendors & users in implementation of ERP.

c) HR Management.

SECTION - II

Q5) a) What is gap analysis? What are post - implementation options? **[8]**

b) What are the key issues in determining the success of implementation of ERP? **[8]**

P.T.O.

Q6) a) Why is there a need to understand the markets to implement ERP solution? **[8]**

b) Describe the world market for ERP products with a suitable example. **[8]**

Q7) a) Explain ERP sales cycle in details. **[8]**

b) How is ERP package evaluated? Discuss with suitable examples. **[8]**

Q8) Write short notes on :- **[18]**

a) BAAN IV

b) Order - Winners and Qualifiers.

c) Material Management.

♦♦♦♦

Total No. of Questions : 12]

SEAT No. :

P2055

[Total No. of Pages : 2

[4164] - 461

B.E. (Mechanical Sandwich)

ENERGY MANAGEMENT AND INDUSTRIAL POLLUTION

(2008 Pattern) (Elective - IV) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Discuss the need and importance of energy conservation and management? **[6]**

b) Explain Energy security and energy strategy for the future of a nation. **[10]**

OR

Q2) a) Write a note on **[10]**

i) Energy efficient motors.

ii) Power factor improvement.

b) Discuss energy saving methods for a lighting system. **[6]**

Q3) a) What is preliminary audit? Explain stepwise procedure to carryout detailed energy audit. **[10]**

b) With the help of sankey diagram, explain heat balance for a boiler. **[8]**

OR

Q4) a) Explain the concept of Time value of money. **[6]**

b) Describe various financial analysis techniques for investments in energy efficiency project and their suitability of application. **[12]**

Q5) a) What are different energy conservation opportunities in boilers and steam systems. **[8]**

b) Write short note on **[8]**

i) Insulating materials and refractories.

ii) Economic thickness of insulation.

P.T.O.

OR

Q6) a) Enlist and discuss energy saving methods for HVAC and refrigeration systems. **[8]**

b) What are different energy conservation opportunities in pumping system. **[8]**

SECTION - II

Q7) a) What is fossil fuel? Write a note on fossil fuel related pollutants in the environment. **[8]**

b) Discuss the impact of industrial pollution on man and environment. **[8]**

OR

Q8) a) Explain in brief **[8]**

i) Emission trading.

ii) Clean Development Mechanism (CDM)

b) Define Ozone layer depletion and Global Warming. What are the effects of global warming on the environment and what are the means to combat it?**[8]**

Q9) a) Discuss environmental impacts due to conventional energy use. **[8]**

b) Discuss common air pollutants and their source. Also discuss noise pollution in brief. **[10]**

OR

Q10) a) How does industrial waste cause water pollution? Write a short note on treatment of industrial waste water. **[12]**

b) What is thermal pollution? What are its sources? **[6]**

Q11) a) Write note on **[8]**

i) E - Waste and

ii) Process of incineration.

b) Discuss control measures of industrial waste. **[8]**

OR

Q12) a) Explain the concept of waste heat recovery and cogeneration for pollution control. **[8]**

b) Define sustainable development? What are the objectives of Environmental Impact Assessment (EIA)? **[8]**

♦♦♦♦

Total No. of Questions : 6]

SEAT No. :

P2057

[Total No. of Pages : 2

[4165] - 32

M.E. (Civil) (Structures)

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(2002 Course)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the write indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Use of IS 1893 - 2002 (Part - 1) is permitted.***

SECTION - I

Q1) a) What is an earthquake? Explain in details the causes and classification of the earthquake? **[7]**

b) Describe in details the approaches of measurement of Magnitude and Intensity of an earthquake? **[8]**

c) Explain in brief some of the earthquakes occurred in India? what lessons are learnt from them? **[10]**

Q2) a) Classify and describe with suitable sketches the different types of waves generated by an earthquake and their effects on structures. **[7]**

b) Explain in brief some of the earthquakes occurred in India? What lessons are learnt from them? **[8]**

c) What is “Seismo - resistant Building Architecture”? Explain the major aspects involved to avoid adverse effects of architectural design on seismo - resistant building constructions? **[10]**

P.T.O.

Q3) A Three Storey RC frame OMRF building with storey height 3 m and live load 3 N/m^2 is to be constructed in Zone IV. Workout the seismic forces on the structure. The size of the columns are 400 mm × 400 mm on each floor. The exterior and interior beams are 230 mm × 550 mm and 230 mm × 500 mm respectively. The thickness of the roof and floor slab may be assumed 150 mm. The structure is resting on Type III soil and damping ratio 5%. Use Seismic Coefficient Method. Refer Figure 3.1 **[25]**

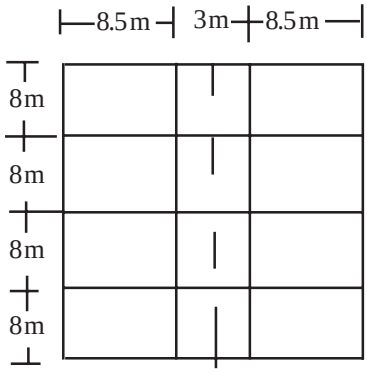

Figure 3.1

SECTION - II

Q4) a) Explain the ductility and ductility reduction factor? What is strong column - weak beam philosophy in earthquake resistant design of structures? Draw neat sketches of column - beam joint detailing? **[10]**

b) Design a rectangular RCC beam of 7 m span supported on a RCC column to carry a point of 15 kN/m load in addition to its own weight. The moment due to seismic force is 5 kN- m and shear force is 32 kN. Use M20 grade concrete and Fe 415 steel. **[15]**

Q5) a) Describe the phenomenon of Liquefaction? Explain the measures taken to reduce the effect of liquefaction? **[10]**

b) Explain the concept of Isolation and its need? Why the base isolation is effective? Explain Active, Passive and Hybrid protective systems of Isolation? **[15]**

Q6) a) What is Seismic Evaluation? Classify different retrofitting techniques. Explain conventional techniques of retrofitting for RC buildings. **[10]**

b) A Cantilever Slab 1 m × 1 m and 100 mm thickness projects from a 225 mm thick wall to the outside of the building. The slab is located 1 m above the roof of the building. Assuming that the weight of the roof slab is 8 kN per meter length of the wall, examine the stability of cantilever if it is situated in Zone III. Assume wall above cantilever supports the slab. **[15]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. : ____

P2061

[Total No. of Pages : 2

[4165] - 47

M.E. (Mechanical) (Heat Power Engineering)

ADVANCED FLUID MECHANICS

(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Assume suitable data, if required.***
2) ***Figures to the right indicate full marks.***
3) ***Answer 3 questions from Section I and 3 questions from Section II.***

SECTION - I

Q1) a) Derive the continuity equation in cartesian coordinates for two dimensional compressible flow. **[13]**

b) Deduce the continuity equation for 2 - dimensional incompressible flow. **[3]**

Q2) Consider the fully developed flow between two parallel plates, separated by a distance h, inclined at an angle θ to the horizontal. The bottom plate is stationary, while the top is moving with a speed U. Determine :

a) The velocity profile. **[10]**

b) Wall Shear Stress. **[4]**

c) Pressure Gradient which will produce zero wall shear stress. **[3]**

Q3) For compressible flows :

a) Derive expressions for $\frac{T_0}{T}$ and $\frac{P_0}{P}$, where T_0 and P_0 are the stagnation temperature and pressure respectively. **[6]**

b) Derive Bernoulli's equation for compressible flow starting from the differential form of the equation, or otherwise. **[6]**

c) What is the behaviour of T, T_0, p, p_0 and M across a shock. **[5]**

Q4) a) What are the first order Forward and Backward difference expressions for $\frac{\partial u}{\partial x}$? **[2]**

b) List the steps in solving

$$u_t + a u_x = 0$$

using the Mc Cormack method. What is the stability criterion? **[7]**

P.T.O.

c) Apply the Mc Cormack method to the continuity equation for two dimensional compressible flows. Show how the density is updated. **[7]**

SECTION - II

Q5) Let the velocity field be given as :

$u = x + y$,

$v = x - y$.

a) Is this a possible case of incompressible flow? **[2]**

b) If so, what is the stream function? **[4]**

c) Is the flow irrotational? **[2]**

d) If so, what is the velocity potential? **[4]**

e) Find the pressure at (1, 2). Assume $p = 0$ at (0, 0) and density = 1. **[5]**

Q6) A pipe has 300 mm diameter at the inlet. At the outlet, the diameter is 200 mm. The flow rate is 0.3 m^3 per sec. of water. The pipe has a 90 degree bend in the horizontal plane. The pressures at the inlet and outlet are 25 KPa and 20 KPa respectively.

Find

a) Velocity at inlet and outlet. **[5]**

b) Resultant Force on the pipe. **[8]**

c) Frictional Loss. **[3]**

Q7) a) List any 2 assumptions of the boundary layer theory. **[2]**

b) Assuming a linear velocity profile within the boundary layer, determine the boundary layer thickness δ as a function of x. **[10]**

c) Derive the expression for the skin friction coefficient C_f for the same linear velocity profile. **[5]**

Q8) a) Define substantial derivative. **[3]**

b) Derive inviscid momentum (Euler) equation in the x - direction for 2 dimensional flows, using the substantial derivative or otherwise. **[13]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. :

P2063

[Total No. of Pages : 3

[4165] - 62

M.E. (Mechanical) (Design Engineering)

DESIGN ENGINEERING

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, electronic pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain the term peaking & topping as applied to gear. **[6]**

b) Two 20° full depth gear of 20 and 30 teeth are to be designed on the extended centre distance system using the recommended values for clearance $f = (0.25/P_d)$. Make the calculations for $P_d = 1$. Find the following. **[10]**

i) Values of q_1 and q_2.

ii) The actual angle ϕ.

iii) The radius of actual pitch circle and centre distance.

iv) The tooth thickness on actual pitch circle.

Q2) a) What do you understand by ramp of cam? How is it taken into account while designing the cam profile? **[6]**

b) Find particular displacement, velocity and acceleration equations for a follower that returns 15 mm in 60° of cam rotation using 2-3 polynomial and sketch the curves. **[10]**

Q3) a) Derive an expression for maximum space efficiency of helical springs. **[8]**

b) A disc spring is made of 3mm sheet with an outside diameter of 125 mm and an inside diameter of 50 mm. The spring is dished 4.5 mm. The maximum stress is to be 560 N/mm^2. Determine, **[8]**

i) The load that may be safely carried.

ii) The deflection at this load.

iii) Stress produced at outer edge.

P.T.O.

Q4) a) What is the importance of the reliability in the modern engineering design? How it differs from the factor of safety? **[6]**

b) A shaft and a hole assembly have the following dimensions : **[10]**

Nominal diameter of shaft & hole	=	30 mm
Maximum shaft diameter	=	29.9 mm
Minimum shaft diameter	=	29.85 mm
Maximum hole diameter	=	30.1 mm
Minimum hole diameter	=	30 mm

i) What % of assemblies will have clearance less than 0.14 mm?

ii) What % of assemblies are likely to be rejected for having clearance greater than 0.212 mm?

Assume natural tolerances.

Use following data for area below the std. normal distribution curve.

Z	1.0	1.2	1.4	1.6	1.7	1.8	1.9	2.0	2.2
Area	0.3413	0.3849	0.4192	0.4452	0.4554	0.4641	0.4713	0.4772	0.4861

Q5) Write short note on the following. **[18]**

a) Novikov's gearing

b) Cycloidal cam.

c) Vibration & Surging of helical spring.

SECTION - II

Q6) a) What is difference between design for finite and infinite life problems? Explain modified goodman diagram. **[8]**

b) The work cycle of mechanical component subjected to completely reversed bending stress consists of following three elements.

i) $\pm$ 350 N/mm^2 for 85 % of time.

ii) $\pm$ 400 N/mm^2 for 12% of time and

iii) $\pm$ 500 N/mm^2 for 3% of time

The material for component is 50 C4 (Sut = 660 N/mm^2) and the corrected endurance limit of the component is 280 N/mm^2. Determine life of the component. **[8]**

Q7) a) Explain the following terms in context with creep. **[8]**

i) True stress and true strains.

ii) Estimated time to rupture.

b) A cantilever beam has a rectangular cross section 30 mm wide and 70 mm deep. The length is 2500 mm with 2000 N load at free end. The material is 0.35 carbon steel with n = 8 and B = 40×10^{-35} $(cm^2/N)^n$ per day. Find the permanent deflection after 10 years of service. **[8]**

Q8) a) What advantages can you claim in favour of following materials as against the metals? Give typical situations of the use of such material. **[6]**

i) Ceramics.

ii) Composites.

iii) Plastics.

b) A composite material is reinforced by continuous fibres. How would one estimate the strength knowing strength of fibres and matrix, against off axis loading?

Properties of such a composite along the axis (1) and across it (2) are as follows

E_{11} = 76 GPa; E_{22} = 5.5 GPa; G_{12} = 2.35 GPa;

$\sigma_{1'}$ (tension) = 1250 MPa; $\sigma_{2'}$ (tension) = 30 MPa;

$\sigma_{1'}$ (compression) = 1000 Mpa; $\sigma_{2'}$ (compression)100 MPa

τ_{12} = 50 MPa;

Find the permissible load /mm^2 when loaded at 5° to the axis '1'. What type of failure limits the permissible load? **[10]**

Q9) a) How do you identify the optimum solution in the simplex method. **[6]**

b) Minimize the following function with simplex method. **[10]**

$f = 2x_1 + 3x_2 + 2x_3 - x_4 + x_5$

Subject to the constraints,

$3x_1 - 3x_2 + 4x_3 + 2x_4 - x_5 = 0$

$x_1 + x_2 + x_3 + 3x_4 + x_5 = 2$

$x_i \geq 0$; i = 1 to 5

Q10) Write short note on the following. **[18]**

a) Exponential & Hyperbolic sine creep law.

b) Constrained minimisation techniques.

♦♦♦♦

Total No. of Questions : 8] **SEAT No. :**

P2078 **[Total No. of Pages : 2**

[4165] - 290

M.E. (Chemical Engg.)

ADVANCED MASS TRANSFER

(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are nodes and saddles? Explain with diagram and state what information can be obtained from them. **[8]**

b) Using two film theory, explain mass transfer with reaction. **[8]**

Q2) a) What are the topological rules for finding nodes and saddles? **[6]**

b) What is the standard procedure for drawing RCM and what is the minimum data required for that? **[8]**

c) What is the role of entrainer in azeotropic distillation? **[4]**

Q3) a) Draw the residual curve maps for the following system : **[10]**

Component	Boiling Point (°C)
C_1	80
C_2	100
C_3	120
$C_1 - C_2$ azeotrope	125
$C_1 - C_3$ azeotrope	107
$C_2 - C_3$ azeotrope	75
Ternary azeotrope	70

b) Using shortcut method derive an expression for minimum reflux ratio for multicomponent mixture. **[6]**

P.T.O.

Q4) Explain in detail the Lewis - Matheson method for calculating minimum number of trays for a multicomponent distillation process. **[16]**

SECTION - II

Q5) a) An absorber with 6 theoretical plates is to be to process a natural gas stream having the following composition. Gas is available at 3.5 MPa. If 60% of the propane from the feed gas is to be absorbed what will be the composition of gas leaving the absorber? Average absorber temperature 40°C. Assume proper solvent and feed rates. **[10]**

Component	Mole %
C_1	76.5
C_2	13.1
C_3	4.9
nC_4	2.2
nC_5	2.1
nC_6	1.2

b) Compare shortcut and tray to tray methods in absorption. **[8]**

Q6) Explain the method for finding number of stages in extraction with reflux and state the importance of using reflux. **[16]**

Q7) a) Explain how ammonia is recovered from waste water? **[8]**

b) How is hydrochloric acid recovered from inert waste gas? **[8]**

Q8) a) With a proper example explain distillation combined with adsorptiom. **[8]**

b) How does the combination of membrane permeation with distillation affect the overall separation process? **[8]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P2091

[Total No. of Pages : 2

[4165] - 443

M.E. (Civil) (Construction & Management)

CONSTRUCTION CONTRACTS ADMINISTRATION & MANAGEMENT

(2008 Course) (Sem. - II)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain the provisions made and the importance of the following contract conditions as per MOS & PI. **[18]**

a) Performance security and Retention Amount.

b) Price Escalation.

c) Advances to be paid and their recovery.

d) Variations, substitutions and extra items.

e) R.A. bills and final bill.

f) Force Majeure / Owner's Risks.

Q2) a) Explain the various good tendering practices implemented by MSRDC in the contracts signed with contractors for the execution of mumbai - Pune expressway. **[10]**

b) Draft a tender notice with pre - qualifications to execute a nuclear - power plant project of worth 800 crores to be completed within 30 calendar months. **[6]**

Q3) a) For the data given in Question 2(b) prepare on a 5 point scale a weighted point score system in order to evaluate the financial capability of the tenderer during the pre - qualification process. Also explain meaning of and importance of the term "Assessed Bid capacity" used in the above context. **[6 + 2]**

P.T.O.

b) Draft sample formats for the following contractual correspondences
   i) Letter of Acceptance. **[3]**
   ii) Bank Guarantee. **[5]**

Q4) a) Explain advantages of DRB over arbitration. **[4]**
b) Explain limitations of the Lump - Sum type of contract. **[4]**
c) Explain "Voidable" and "Void" contracts with examples from construction field. **[4]**
d) Discuss advantages of 2 stage tendering over single - stage tendering [First explain these types]. **[4]**

SECTION - II

Q5) Write in brief meaning / provision for following under FIDIC conditions - RED BOOK.
a) Employer's personnel & Contractors' Personnel. **[3]**
b) Mobilization period & defect liability period. **[3]**
c) Nominated subcontractor & Approved subcontractor. **[3]**
d) Provisional sum work & Daywork schedule. **[3]**
e) The contractor's Representative. **[3]**
f) Red book contract & yellow book contract. **[3]**

Q6) Under FIDIC REDBOOK contract Documents.
a) Explain in detail duties, Authorities, Responsibilities & obligations of the engineer. Whether replacement of the engineer is permitted? Who can do it? **[8]**
b) Responsibility of the contractor in engagement of staff and labour write in detail. **[8]**

Q7) a) Explain various important provisions / situations under which the contractor is entitled for extra money over agreed contract amount under RED book contract documents. **[8]**
b) Describe in detail the contractor's obligations in context with following. **[8]**
   i) Access for inspection.
   ii) Access route & its maintenance.
   iii) Right of Access Before & After taking over by the employer.

Q8) With respect to the Indian Contract Act, explain.
a) Formation of valid contract - essential conditions. **[4]**
b) Revocation of offer and revocation of acceptance. **[2 + 2]**
c) Valid excuses for non - performance. **[4]**
d) Consequences of breach. **[4]**

♦♦♦♦

Total No. of Questions : 8] **SEAT No. :**

P2092 **[Total No. of Pages : 3**

[4165] - 444

M.E. (Civil) (Construction & Management)

PROJECT ECONOMICS AND FINANCIAL MANAGEMENT

(2002 and 2008 Course) (Sem. - II)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) a) With an example, explain how the various tender conditions in a contract affect the construction project cash inflows and outflows and hence the investment decision on whether to bid for a project or not. **[10]**

b) Define any 4 financial ratios and with practical examples, explain their utility in financial management. **[8]**

Q2) Compare Ordinary Capital and Loan stocks on the following points in detail. **[16]**

a) Issue costs.
b) Servicing costs.
c) Obligation to pay interest.
d) Obligation to redeem capital / loan
e) Tax deductibility.
f) Effect on control and on freedom of action.

Q3) a) Prepare a balance sheet for a company based on the following data

i)	Current liabilities	Rs 10,00,000/-
ii)	Loans and advances	Rs 20,00,000/-
iii)	Fixed Assets	Rs 40,00,000/-
iv)	Investments	Rs 60,00,000/-
v)	Current Assets	Rs 15,00,000/-
vi)	Reserves and Surplus	Rs 1,25,00,000/-

What are uses of the balance sheet? Explain **[6 + 2]**

P.T.O.

b) Discuss basic objectives of financial management and role of finance manager on mega construction projects. **[4]**

c) Discuss role of "lenders engineer" on mega construction projects in various phases of the project. **[4]**

Q4) a) The expected cash flows from 2 alternatives are as follows :-

Year	Project A Rs in lakhs	Project B Rs in lakhs
0	(200)	(260)
1	(120)	120
2	(60)	40
3	(25)	50
4	(260)	60
5	460	80
6	600	100

For each alternative, determine

i) Pay - back period.

ii) NPV at 12% interest rate.

iii) IRR for Project 'A' (Approximate value)

Which investment alternative you would prefer and why? Justify. **[12]**

b) Explain the methodology adopted for the capital budgeting under risk.**[4]**

SECTION - II

Q5) Explain the following methods of capital budgeting stating their merits and limitations. **[18]**

a) ARR.

b) NPV.

c) IRR

d) PI

Q6) Your company is considering an investment of Rs. 2 lakhs capital outlay over a period of 5 years. The annual income before depreciation, but after considering all other charges is as follows. **[16]**

Year	Income (Rs)
1	1,00,000
2	1,00,000
3	80,000
4	80,000
5	40,000

After 5 years, the scrap value expected is Rs. 10,000/- . Depreciation is to be considered at 20% per year on a straight line basis. Consider cost of capital as 15%.

Determine

a) Pay back period.

b) Rate of return on average investment.

c) NPV for the proposal.

Q7) Explain the various methods by which the large investments were raised on the konkan railway project. Discuss the problems faced and the solutions envisaged. In your opinion was the project a case of financial / economic success or failure? Justify. **[10 + 4 + 2]**

Q8) Explain the following with examples.

a) Cash flow cycle. **[4]**

b) Basic Accounting Principles. **[5]**

c) CIDC - ICRA grading. **[3]**

d) Effect of escalation on capital budgeting. **[4]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. : ____

P2093

[Total No. of Pages : 3

[4165] - 458
M.E. (Civil) (Hydraulic Engineering)
HYDROLOGY
(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections to be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Use of calculators is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) State the forms of precipitation? Explain any three types of precipitation. **[10]**

b) Describe the principle of rainfall measurement using RADAR with neat sketch, also state its advantages over other rainguages. **[8]**

OR

Q2) a) What is evapotranspiration? Explain application of synthetic unit hydrograph in water Resources Engineering. **[10]**

b) The ordinates of a 4 h UH of a basin of area 300 Km^2 measured at 1 hour intervals are 6, 36, 66, 91, 106, 93, 79, 68, 58, 49, 41, 34, 27, 23, 17, 13, 9.6, 3 and 1.5 m^3/s respectively. Obtain the ordinates of a 3 h UH for the basin using the S - Curve technique. **[8]**

Q3) a) What is infiltration? Write the equations for infiltration indices. How will you separate the base flow? Explain in detail with neat sketch. **[8]**

b) What are initial abstractions? Explain interception and depression storage with sketch. **[8]**

OR

Q4) a) Explain what do you understand by return period? Give few formulae to determine return period. **[8]**

b) Explain extreme value (Gumbel's) distribution. **[8]**

P.T.O.

Q5) a) Write a note on Envelope curves. **[8]**

b) State Dickens and Ryves formulae to estimate flood and explain the terms in formulae. **[8]**

OR

Q6) a) State various methods of flood estimation and explain rational method in detail. **[8]**

b) Explain pumping and recuperation test. What should be the diameter of an open well to give safe yield of 4.8 lit/sec? Assume the working head at 3.75 m and the subsoil consists of fine sand. (For fine sand specific yield = 0.5/ hour). **[8]**

SECTION - II

Q7) a) Explain with neat sketch the Cooper and Jacob method of determining the aquifer parameters. **[10]**

b) Explain Chow's method of determining aquifer parameters using the pumping test data **[8]**

OR

Q8) a) Derive the expression for steady state discharge of a fully penetrating well into a confined aquifer with a neat sketch. **[10]**

b) In an artesian aquifer of 8 m thick, a 10 cm diameter well is pumped at a constant rate of 100 lit/minute. The steady state drawdown observed in two wells located at 10 m and 50 m distances from the centre of the well are 3 m and 0.05 m respectively. Compute the transmissivity and the hydraulic conductivity of the aquifer. **[8]**

Q9) a) Explain Dupits - Thiems theory and state the assumptions made for it also explain method of images in short. **[10]**

b) Enlist different types of tube wells and explain strainer type with a neat sketch. **[6]**

OR

Q10) a) Write notes on : **[12]**

i) Ground water budget.

ii) Ground water pollution.

iii) Pumping equipments for tube wells.

b) Describe any one method of artificial water recharge with sketch. **[4]**

Q11) a) State the standard form of two point boundary value problem and explain it with an example. **[8]**

b) What is meant by conformal mapping? State Riemann theorem. **[8]**

OR

Q12) a) Define simulation, what are the various characteristics necessary for simulation? Explain any two of them. **[8]**

b) Explain the criteria on which the choice of model depends. **[8]**

♦♦♦♦

Total No. of Questions : 6]

SEAT No. : ____

P2096

[Total No. of Pages : 2

[4165] - 465

M.E. (Civil - Structures)

FINITE ELEMENT METHOD

(2008 Course) (Sem. - II)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non programmable calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) For the rigid frame shown in fig. 1 determine the displacements and rotations of the nodes, the elementary forces and the reactions. All elements have E = 210 GPa, A = 1.0×10^{-2} m^2 and I = 2.0×10^{-4} m^4 **[17]**

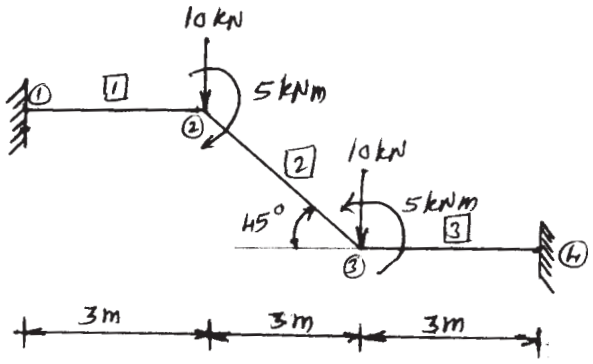

Fig. 1 (Q.1a)

b) Explain with examples different types of co - ordinates used in finite element method to define location of points in element. Hence obtain relation for natural co - ordinates for two noded element when range is –1 to +1. **[8]**

Q2) a) State and Explain 'Convergence Requirements of displacement function'. Examine whether the given displacement field for a plane stress rectangular element satisfy the convergence criteria. **[9]**

$u = a_0 + a_1x + a_2y + a_3xy$

$v = a_4 + a_5x + a_6y + a_7xy$

P.T.O.

b) Determine the shape function for Linear Strain Triangular (LST) element. Use natural coordinate system. **[8]**

c) Explain variational method used for formulation of element stiffness matrix with suitable example. **[8]**

Q3) a) A six noded rectangular element has 4 corner nodes and one node at the centre of the two edges parallel to x axis. The other two edges are parallel to y axis. Obtain the six shape functions using Lagrange interpolation. **[10]**

b) Explain the isoparametric concept and types of isoparametric elements in finite element analysis. Discuss their advantages over other elements. **[7]**

c) Explain Jacobian matrix in case of four noded isoparametric quadrilateral element. **[8]**

SECTION - II

Q4) a) For axisymmetric element write stress strain relations and hence obtain element stiffness matrix. **[10]**

b) Explain the method of finding shape function for a hexahedral element using natural coordinates. **[10]**

c) What are the applications of axisymmetric elements? **[5]**

Q5) a) What do you understand by C^0, C^1 and C^2 continuity? Explain with suitable examples. **[6]**

b) Write short note on – Conforming and non – conforming plate bending elements. **[6]**

c) Explain the term Midlin's C^0 continuity plate element and briefly explain stiffness matrix formulation for such elements. **[13]**

Q6) a) Explain the concept of degenerated solid elements by suitable examples. Write displacement fields in 4 noded degenerated shell element. **[15]**

b) Explain with neat sketches the various three dimensional elements used in the analysis of shells. How will you differentiate shell element with plate element. **[10]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P2110

[Total No. of Pages : 3

[4165] - 522

M.E. (Mechanical - Design Engineering)

ADVANCED MACHINE DESIGN

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A cantilever beam of rectangular cross - section is required to carry an axial load of 120 N and a transverse load of 50 N at free end. It is to be designed to avoid failure by yielding and buckling and for minimum weight. Formulate the optimization problem by assuming that the beam can bend only in vertical plane and solve it.
Beam material is steel with specific weight 7800 kg/m^3, Young's modulus of 2×10^5 MPa, and a yield strength of 225 MPa. Length of the beam is 1.2 metres. The width of the beam is required to be at least 12 mm and not greater than twice the depth. The axial buckling load is given by **[10]**

$$P_{critical} = \frac{\pi^2 EI}{4l^2}$$

b) Explain the concept of 'Geometric programming'. **[6]**

Q2) a) Explain the method of least squares used for linear regression. **[10]**

b) Explain the specific symbols used in fault tree diagram. What are the applications of fault tree analysis? **[6]**

Q3) Design a connecting rod for an I.C. engine using following data : **[16]**
Cylinder bore = 125 mm
Length of connecting rod = 300 mm
Maximum gas pressure = 3.5 MPa
Length of stroke = 125 mm
Mass of reciprocating parts = 1.6 kg.
Engine speed = 2200 rpm.
Assume suitable data and state the assumptions you make.

P.T.O.

Q4) a) What are profile modification methods adopted for gears? **[8]**

b) What is fracture toughness? How is the influence of cracks on failure predicted? **[8]**

Q5) Write short notes on **[18]**

a) Analysis of variance.

b) Design for assembly

c) Design of piston.

SECTION - II

Q6) a) Discuss load deflection characteristics for "Belleville spring". State the advantages of these springs. **[6]**

b) A semi - elliptic spring used for automobile suspension, consists of two extra full - length leaves and eight graduated - length leaves, including the master leaf. The centre - to - centre distance between the two eyes is 1m. The leaves are made of steel 55Si2Mo90 (S_{yt} = 1500 N/mm^2 and E = 207000 N/mm^2) and the factor of safety is 2. The maximum spring load is 30 kN. The leaves are pre - stressed so as to equalize stresses in all leaves under maximum load. Determine the dimensions of the crosssection of the leaves and the deflection at the end of the springs. **[10]**

Q7) a) Describe the mechanism of fatigue failure in machine components. Discuss the effect of any two factors on the fatigue strength. **[8]**

b) A solid circular shaft, 15 mm in diameter, is subjected to torsional shear stress, which varies from 0 to 35 N/mm^2 and at the same time, is subjected to an axial stress that varies from – 15 to + 30 N/mm^2. The frequency of variation of these stresses is equal to the shaft speed. The shaft is made of Fe E400 steel (S_{ut} = 540 N/mm^2 and S_{yt} = 400 N/mm^2) and the corrected endurance limit of the shaft is 200 N/mm^2. Determine the factor of safety. **[8]**

Q8) a) Explain the term 'relaxation' in the context of creep. **[6]**

b) The stressed length of the bolts holding together two flanges can be considered constant. For the bolt material, n = 7 and B = 40 × 10^{-35} (cm^2/N)^n per day. E = 2 × 10^5 MPa. Find the required value of the initial stress such that the stress at the end of two years will be equal to 0.8 times initial stress. **[10]**

Q9) a) Discuss in brief the classical lamination theory (CLT). Using the assumptions of CLT, derive relations for the force and moment resultants in terms of mid - surface strains and curvatures, in a multilayered laminate. **[8]**

b) For a graphite epoxy unidirectional lamina, find the following : **[8]**

i) Compliance matrix.

ii) Minor Poisson's ratio.

iii) Strains in the 1-2 coordinate system, if the applied stresses are σ_1 = 2 Mpa, σ_2 = –3 MPa, τ_{12} = 4 MPa.

The engineering elastic constants of the unidirectional graphite/epoxy lamina are E_1 = 181 GPa, E_2 = 10.3 GPa, v_{12} = 0.28, G_{12} = 7.17 GPa.

Q10) Write short notes on **[18]**

a) Transverse shear effects in composite laminates.

b) Low cycle and high cycle fatigue.

c) Surge in springs.

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Total No. of Questions : 8]

SEAT No. :

P2112

[Total No. of Pages : 3

[4165] - 536
M.E. (Mechanical) (Mechatronics)
CONTROL SYSTEMS
(2008 Course) (Sem. - I) (Elective - II(a))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, whenever necessary.***

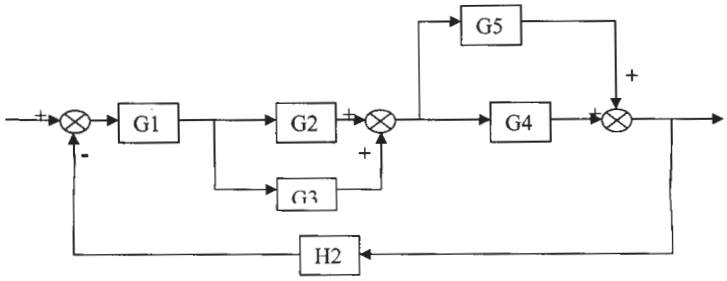
SECTION - I

Q1) a) Distinguish between the following. **[8]**

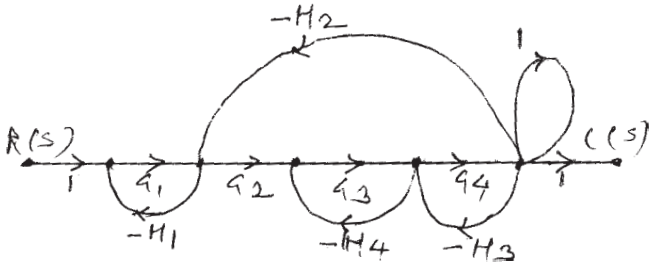
i) Linear and nonlinear control systems.

ii) Open loop and closed loop control systems.

b) Reduce the following block diagram of the system shown in following figure into a single equivalent block by block diagram reduction technique. **[8]**



Q2) a) Obtain the closed loop transfer function C(S)/R(S) using Mason's gain formula. **[8]**



b) Explain standard test signals and state clearly the difference between steady state and transient response of a system. **[8]**

P.T.O.

Q3) a) A system has open loop transfer function as **[10]**

$$G(S)H(S) = \frac{10}{S(S+5)}$$

Find the under damped natural frequency, the damping ratio, the damped natural frequency, rise time, peak time, peak overshoot, and settling time with 2% criterion.

b) Examine the stability by Routh's criterion for the characteristics equation. **[8]**

$$S^5 + S^4 + 2S^3 + 2S^2 + 3S + 15 = 0$$

Q4) a) Write short notes on **[8]**

i) Controllability.

ii) Observability.

b) Write short note on comparison of time and frequency domain analysis. What is the advantage of state variable analysis over conventional control systems? **[8]**

SECTION - II

Q5) a) Explain the following terms. **[6]**

i) State

ii) State variable.

iii) State vector.

b) The loop transfer function of a unity feedback control system is

$$G(S)H(S) = \frac{k}{S(S+2)(S+5)}$$

Sketch the root locus of the system. Determine the value K for marginal stability from the root locus. **[10]**

Q6) a) A unity feedback control system has

$$G(S)H(S) = \frac{100}{S(1+S)(1+0.2S)}$$

Sketch bode plot. Determine from it **[10]**

i) Gain crossover frequency.

ii) Phase crossover frequency.

iii) Gain margin.

iv) Phase margin.

v) Stability of system.

b) Write short note on self tuning regulators. **[6]**

Q7) a) What are adaptive control systems? With neat block diagram explain its operation. What are its application areas? **[8]**

b) Write short note on state space model and how it is useful than conventional control system. **[8]**

Q8) a) Give the classification of controllers and explain the characteristics of on - off, P, I, D, PID controllers. With a suitable example. Explain how proportional controller produces offset? Which control action can eliminate this? **[10]**

b) Sketch and comment on the outputs of P, PI, PD and PID controllers for a step input. **[8]**

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Total No. of Questions : 6]

SEAT No. : ____

P2115

[Total No. of Pages : 2

[4165] - 571

M.E. (Electrical) (Control System)

ADVANCED TOPICS IN CONTROL SYSTEMS

(2008 Course) (Elective - II(a)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain clearly the term 'Adaptive controller'. Draw the block diagram of an adaptive system and explain the function of each block. **[10]**

b) Explain briefly the Model Reference Adaptive Control (MRAC) system. What are the different methods generally being used in connection with 'MRAC'? **[15]**

Q2) a) Explain the concept of Sliding mode control and Variable structure control. **[8]**

b) Discuss with suitable example the terms 'Sliding Surface' and 'Dynamic Sliding Surface'. **[9]**

c) State and explain the uncertainties in system matrix and input matrix. **[8]**

Q3) a) What are the conditions for arbitrary pole placement in closed loop control system? Explain with block diagram the method of pole - placement using Linear State Variable Feedback. **[10]**

b) Given a linear time - invariant control system in state space form :

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 5 & -1 & -3 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$

Design the linear state variable feedback to place the poles at desired locations : $S = -2, (-3 + j3)$, and $(-3 - j3)$. **[15]**

P.T.O.

SECTION - II

Q4) a) Explain the structure and function of a biological neuron. What is Neural Network? State the reasons for using neural networks. **[10]**

b) With appropriate diagram, explain the deterministic model of artificial neuron, Explain with mathematical formula and graphical representation the activation functions. **[15]**

Q5) a) Sketch multiple input neuron model and derive its activation function. **[8]**

b) Define and explain the Generalization of Neural network. **[5]**

c) Draw the neat diagram of Recurrent network and explain supervised, unsupervised, rain forced and Hebbian learning. **[12]**

Q6) Discuss briefly the following :

a) Multirate output feedback control. **[8]**

b) Fast output sampling feedback control (FOSF) **[9]**

c) Periodic output feedback. (POF) **[8]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. :

P2116

[Total No. of Pages : 3

[4165] - 572

M.E. (Electrical) (Control System)

COMPUTER AIDED CONTROL SYSTEMS DESIGN

(2008 Course) (Elective - II(b)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from section - I and three questions from section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define and explain the concepts of controllability and observability of a linear control system. **[6]**

b) Outline the procedure of determining the controllability and observability of the control system using computer method. Give its algorithm and flow chart. **[10]**

OR

Q2) a) Explain with algorithm the computer method of determining the stability of a control system represented in state space form. **[6]**

b) Explain the computer method for obtaining the solution of state and output equations of a closed - loop control system represented by :

$$\dot{x}(t) = Ax(t) + Bu(t)$$

$$y(t) = C\,x(t)$$

With usual notation. Give its algorithm. **[10]**

Q3) a) Explain the method of pole - placement using Linear state variable feedback. Draw the block diagram showing linear state variable feedback. **[8]**

b) A linear time - invariant control system is represented in state space form :

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 6 & -11 & 6 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$

Design the linear state variable feedback to place the poles at desired locations : S = (–3 + j3), (–3 – j3) and –4. **[10]**

P.T.O.

OR

Q4) a) What are the merits and demerits of an observer system? **[6]**

b) Draw appropriate block diagram showing the structure of a full order observer system and explain the procedure for designing full order observer. **[12]**

Q5) a) Explain with diagram the working of P, PI and PID controller. **[6]**

b) Outline the procedure to design tunable PID controller using Ziegler - Nichols method. Give its algorithm. **[10]**

OR

Q6) a) Draw the functional block diagram of a typical digital control system and explain the working of each block. **[6]**

b) Explain clearly the effect of sampling on stability of the discrete - data system. **[2]**

c) A discrete - time control system is represented by the difference equation:

$$x(k+1) = Fx(k) + Gu(k)$$

Where 'k' is the sampling instant. F and G are constant matrices of compatible dimensions. Explain with algorithm the procedure for computer method of obtaining the solution of system response. **[8]**

SECTION - II

Q7) a) State and explain the conditions for compensation. **[4]**

b) Derive the transfer function of simple phase Lag - Lead compensating network and draw the corresponding Bode diagrams. **[6]**

c) Define and explain the term 'Relative Stability'. Discuss the measures of relative stability using polar plot or Bode diagrams. **[6]**

OR

Q8) a) Compare feedback compensation with cascade compensation. **[4]**

b) A unity feedback control system

$$G(s) = \frac{K}{s(1+0.25s)(1+0.75s)}$$

Design a suitable compensator to have the following design specifications :

i) Phase margin $\phi_m \geq 50°$

ii) Velocity error constant $k_v \geq 5\,\text{sec}^{-1}$

Justify the choice of compensator and draw the Bode diagrams for compensated and uncompensated system. **[12]**

Q9) a) Describe the computer method for obtaining the polar plot of a typical linear control system. Draw the flow chart and write its algorithm. **[10]**

b) Explain how to reshape this polar plot to obtain the desired performance. **[6]**

OR

Q10) a) Explain with algorithm, the computer method for obtaining the root - locus plot of a linear closed loop control system. Draw its flow chart.**[10]**

b) How to choose the optimum parameters for desired performance using the above method? **[6]**

Q11) a) Discuss the various singular points in phase - plane technique. How to predict the stability from phase plane trajectory? **[6]**

b) Explain with suitable example the phase - plane technique for simulating nonlinear control system with dead - zone as nonlinearity. Give its algorithm. **[12]**

OR

Q12) a) State the merits and demerits of describing function method for the design and analysis of nonlinear control system. **[6]**

b) Explain with algorithm the computer method for simulating the nonlinear control system containing 'saturation' nonlinearity using describing function method. Comment on the stability determination of nonlinear control system using this method. **[12]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P2137

[Total No. of Pages : 2

[4165] - 821

M.E. (Chemical) (Environmental Engineering)

SOLID WASTE MANAGEMENT

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the objectives of solid waste management and discuss the Sources, types, composition and properties of solid waste. **[8]**

b) Explain the hierarchy of integrated solid waste management. **[8]**

Q2) a) Discuss the guidelines for sorting of solid waste and material recovery. **[8]**

b) Define the Solid waste generation rate and give the typical values for Indian cities. **[4]**

c) What are the factors affecting the storage & collection of solid waste? **[4]**

Q3) Discuss the following in details **[18]**

a) Fundamentals of Thermal processing for composting of solid waste.

b) Performance characteristics of size reduction equipments used for solid waste.

Q4) Explain the principle, construction and design details of the following with neat diagrams **[16]**

a) Waste Heat Boilers.

b) Incineration.

SECTION - II

Q5) a) Define landfill. What are the types of landfills? Explain the essentials components of landfilling. **[8]**

b) Discuss the modified landfill design for sustainable waste management. **[8]**

P.T.O.

Q6) What are the various elements of financial management plan for solid waste system? **[16]**

Q7) a) A solid waste container system costs $.037/ton. minute. A transfer station costs $.023/ton. minute +$2.03/ton. Find the round trip haul trip at which a transfer station becomes economical. Present the result graphically. **[10]**

b) Give the expression for the Hauled Container System. **[6]**

Q8) Write short notes on **[18]**

a) Fluidized bed combustion.

b) Indian scenario of solid waste management.

c) Site selection for landfilling.

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Total No. of Questions : 7] **SEAT No. :**

P2147 **[Total No. of Pages : 2**

[4165] - 840

M.E. (Petroleum Engg.)

ENVIRONMENTAL MANAGEMENT TECHNOLOGY AND SAFETY MEASURES

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Attempt any two questions from Section - I and Section - II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of semilog paper and graph paper is allowed.***

SECTION - I

Q1) What are the sources of land air and water pollution during production of oil and gas? What are the precautionary measures taken to avoid such pollution by the petroleum industry? **[25]**

OR

Q2) a) Give an overview of environmental impact of various processes related to drilling and production operations with respect to varieties of wastes generated. **[10]**

b) Write a detailed note on CO_2 sequestration. **[15]**

Q3) Answer the following : **[25]**

a) Toxicity of petroleum products and treatment chemicals

b) Chemical methods to control offshore oil spills

c) Abandonment of oil wells and structures

d) Safety in H_2S environment

e) Difference between a point source and dispersed source of pollutants? Give examples of each.

SECTION - II

Q4) Write notes on the following : **[25]**

a) Petroleum site assessment for environment impact

b) Disaster management in offshore installation.

OR

P.T.O.

Q5) a) What are the Indian Standard norms for tolerance limit for wastewater disposal? **[15]**

b) Explain the method of sludge for removal of heavy metals form wastewater. **[10]**

Q6) Describe various types of audits involved in environment management of oil industry. How do they incorporate legal, ethical, social, and political issues? **[25]**

OR

Q7) What are the causes of major marine oil spills? How do they affect marine environment? Explain in details short term and long term remedial measures taken to clean - up coast lines and restore environmental balance. **[25]**

♦♦♦♦

Total No. of Questions : 8] **SEAT No. :**

P2163 **[Total No. of Pages : 2**

[4165] - 893

M.E. (Instru. & Control) (Process Instru. & Biomedical Instru.)

COMMUNICATION PROTOCOLS FOR INSTRUMENTATION

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the steps involved in calibration of the HART Field devices. **[10]**

b) Explain the role of DD files in HART networks. Also explain the physical layer of HART. **[8]**

Q2) With neat diagrams wherever necessary, explain in detail the Control Net Protocol based on the following points :

a) Architecture or Communication profile. **[4]**

b) Role of each layer in the protocol. **[8]**

c) MAC cycle time and Protocol Data Unit. **[4]**

Q3) a) Discuss any four advantages and disadvantages of Fieldbus. **[8]**

b) Explain the different grounding schemes for IC 61158 - 2 segment. **[8]**

Q4) Write short notes on : **[16]**

a) Z - wave.

b) ISO - OSI seven layer model.

SECTION - II

Q5) With neat diagrams, explain the hybrid method used for regulating media access in Profibus DP systems. Also explain the essential technical data for Profibus DP. **[16]**

P.T.O.

Q6) a) Discuss the advantages and limitations of Open Networks. **[8]**

b) Discuss the architecture and advantages of Data Highway Plus. **[8]**

Q7) a) Compare the MODBUS ASCII and MODBUS RTU protocol. **[8]**

b) What is Link Active Scheduler (LAS)? Explain the role of LAS in Fieldbus systems. **[8]**

Q8) Write short notes : **[18]**

a) Frequency Hopping Spread Spectrum in Bluetooth devices.

b) Building blocks of a network.

c) Wi - Fi.

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P2171

[Total No. of Pages : 3

[4165] - 917

M.E. (Polymer Engg.)

POLYMER PROCESSING AND TESTING

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Q.No. 1 from Section - I and Q. No. 6 from Section - II are compulsory. Answer any other two questions from Section - I and answer any other two questions from Section - II.***
2) ***Answers to the two sections should be written in two separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of statistical charts, scientific calculator, and graph paper is allowed.***
5) ***Assume suitable data, if required.***

SECTION - I

Q1) Answer any four **[20]**

a) What do you understand by "autogenous speed" in extrusion?

b) Explain why heating by external heaters is inefficient method of increasing enthalpy of material in extrusion.

c) Explain the effect of plug travel and plug speed on product in case of plug assist thermoforming.

d) Explain the term "Draw down ratio". What will be the effect of change in draw down ratio on film made by blown film extrusion?

e) Explain how grid strain analysis can be used to asses product quality in thermoforming. Explain how does it help in tool and process design.

Q2) Explain the effect of changes or fluctuations in following injection moulding process parameters on product quality and explain also what measures are required for maintaining the product quality. **[15]**

a) Barrel temperature.

b) Melt cushion.

c) Injection speed / rate.

d) V - p switchover position.

e) Refill end or plasticizing end position.

P.T.O.

Q3) a) Explain First in First out (FIFO) and Last in first out (LIFO) type of accumulator designs in extrusion blow moulding. How does it affect quality of the product? **[7]**

b) Explain the concept of close loop and adaptive control system with reference to injection moulding. **[8]**

Q4) a) Discuss the general chemical kinetics of step growth polymerizations in reactive extrusion. Explain also the influence of devolatisation in polycondensation reactions. **[8]**

b) Explain how acetaldehyde content in PET bottles can be influenced by process parameters in injection stretch blow molding? **[7]**

Q5) a) Discuss any one external calibration system for pipe extrusion. **[5]**

b) Formulate design equations for end fed sheet die. Assume Newtonian viscosity and isothermal conditions. Assume manifold diameter as constant and formulate equations for uniform sheet thickness. **[10]**

SECTION - II

Q6) Answer any four **[20]**

a) Give schematic diagram of test apparatus for determination of flash and self ignition temperature.

b) What do you understand by gloss? Explain methods of measurement of gloss.

c) Why one of the specimens holding jaw/vice of tensile testing machine meant for testing anisotropic polymers and composites invariably has universal joint with complete degree of freedom?

d) Draw and analyze a typical torque rheometer trace for a thermosetting material.

e) Discuss various types of extensometers used in tensile testing.

Q7) a) Explain the specific situations where tensile impact test is used. Draw test arrangement for specimen in bed type Tensile Impact Test and explain how correction for loss of energy in tossing the cross head is determined. **[9]**

b) Explain acoustic emission non - destructive type of testing. **[6]**

Q8) a) Define surface resistivity. Discuss various forms of specimen and electrodes used. Give experimental arrangement for testing. **[9]**

b) Explain how “K” value for PVC is determined. **[6]**

Q9) a) Give schematic sketch of gas permeability test apparatus and discuss constant volume or constant pressure method of measurement. **[9]**

b) Explain test methods for determination of haze in plastic films. **[6]**

Q10) Write short notes on any three : **[15]**

a) Power factor and permittivity.

b) Three point bending flexural test method.

c) Heat aging of plastics.

d) Test methods for moisture and water absorption.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P2175

[Total No. of Pages : 2

[4165] - 925
M.E. (Polymer Engineering)
POLYMER STRUCTURE AND PROPERTIES
(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any three questions from Section - I and any three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What do you understand by barrier properties? Explain how various factors affect the barrier properties of the polymer. **[9]**

b) Does molecular weight effect the various transitions in polymer? How? **[8]**

Q2) a) Discuss the factors affecting electrical properties of the polymer. **[9]**

b) What is adhesion? Explain how chemical groups affect the adhesion process. **[8]**

Q3) a) What are spherulites? Explain the process of growth of spherulites. **[8]**

b) Discuss various factors affecting optical properties of polymers. **[8]**

Q4) a) Explain the relation between thermal properties and chemical composition, types of bonds and structure of polymer. **[8]**

b) Explain structural developments during blow molding. **[8]**

SECTION - II

Q5) a) What is the relation between molecular structure and processing technique. **[9]**

b) Compare various factors influencing orientation and crystallinity. **[8]**

Q6) a) Explain how additives and fillers affect the transition temperature in polymers. **[9]**

b) Do amorphous and crystalline regions in polymer behave differently? If yes, how? If no, why? **[8]**

P.T.O.

Q7) a) Write a note on structural requirements of a polymer for the formation of film. **[8]**

b) Discuss Thermodynamics and kinetic forces affecting polymer properties. **[8]**

Q8) a) Write a note on molecular structural requirements for blow molding. **[8]**

b) Write a note on effect of various processing parameters on properties and morphology of polymers. **[8]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P2185

[Total No. of Pages : 2

[4165] - 943

M.E. (Printing and Graphic Communication)

WEB HANDLING ON PRESS

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Solve Section - I and Section - II in separate answer books.***
2) ***Solve any three questions from each section.***
3) ***Figure on the right indicates full marks.***

SECTION - I

Q1) a) Explain purpose, working and functions of Web Viewing systems. **[8]**

b) What is Splicing? Explain any Splicing mechanism for web presses. **[8]**

Q2) a) What are different treatment systems on web? Explain measurements for treatments – dyne level requirements for different applications. **[10]**

b) What is corona treatment? Explain working & purpose of corona treatment. **[6]**

Q3) a) What is web tensions? Explain various factors influencing web tensions. **[8]**

b) Explain various web tensioning devices. **[8]**

Q4) Write short note on any three of the following : **[18]**

a) Stroboscope.

b) Preconditioning of web

c) Zonal concepts in web tension control.

d) Flame treatment and antistatic eliminators.

SECTION - II

Q5) Explain Register marks and its specification Comment on Explain Automatic register control by scanning register marks on moving web. **[16]**

Q6) a) What is Balancing of Rollers? Explain Static and Dynamic Balancing. **[8]**

b) Explain measurement and calculation of Imbalance of a roller. **[8]**

P.T.O.

Q7) a) What is deflection of roller? How is it measured and calculated? **[10]**

b) Explain the terms : lead - in - lead out rollers and Compensator roller. **[6]**

Q8) Write short note on any three of the following **[18]**

a) Lateral and circumferential register control.

b) Web guiding system and its correction mechanism.

c) Web transport roller.

d) Roller tolerances and wrap angles.

♦♦♦♦

Total No. of Questions : 6]

SEAT No. :

P2188

[Total No. of Pages : 2

[4165] - 590
M.E. (Electrical) (Power Systems)
POWER SYSTEM DYNAMICS
(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written on separate answer - books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***
5) ***Use of pocket electronic calculator is allowed.***

SECTION - I

Q1) a) Describe the different states of operation of power systems as per the classification proposed by Fink and Carlson. **[10]**

b) A single salient pole machine is connected to an infinite bus through an impedance $(r_e + jx_e)\ \Omega$. The bus voltage is $E_{bus}\angle 0°$. The synchronous machine is represented by the model 1.0 which neglects damper windings in both d and q - axes. Resistance of armature winding is negligible. The excitation system of the machine is represented by a single time - constant system. By carrying out small signal analysis, obtain the expressions for Δ_{vd} and Δ_{vq}. **[15]**

Q2) a) Derive the stator and rotor equations of an alternator represented by the model 1.1. **[15]**

b) A 50 Hz synchronous generator has an internal voltage 1.15 p.u. It is connected to an infinite bus through a double circuit line each having a reactance of 0.34 p.u. The generator is delivering 1.0 p.u. Power and the bus voltage is 1.0 p.u. The synchronous reactance of the generator is 0.42 p.u. and inertia constant H is 5.1 MJ/MVA. Determine the following:- **[10]**

i) Steady state operating angle;

ii) Maximum power transfer; and

iii) Natural frequency of oscillation, if damping is neglected.

Q3) Write short notes on the following :-

a) SVC model and its inclusion in the dynamics of SMIB; **[9]**

b) Factors affecting, voltage stability; **[8]**

c) Synchronous machine models. **[8]**

P.T.O.

SECTION - II

Q4) a) Describe the various steps in the investigation of dynamic stability of a multi machine power system. State any assumptions made. **[13]**

b) The AVR system of an alternator has the following data :-
Amplifier gain K_A and time constant $\tau_A = 0.1$ sec; Exciter gain $K_E = 1$ and time constant $\tau_E = 0.4$ sec, generator gain $K_g = 1$ and time constant $\tau_g = 1$ sec, sensor gain $K_R = 1$ and time constant $\tau_R = 0.05$ sec
Using Routh - Hurwitz criterion, determine the range of K_A for control system stability. **[12]**

Q5) a) Draw the block schematic diagram of a power system stabiliser. Explain the function of each block. State the guide lines for the selection of parameters of individual blocks. **[13]**

b) What is the necessity of islanding in power system? Describe the methods of islanding. **[12]**

Q6) Write short notes on the following :-

a) Concepts of synchronising and damping torques w.r.t. power system analysis; **[9]**

b) Swing equation and inertia constants; **[8]**

c) Equal area criterion and its applications. **[8]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P2194

[Total No. of Pages : 2

[4165] - 859
M.E. (Information Technology)
ADVANCED TRENDS IN DATABASE SYSTEM
(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Make suitable assumptions whenever necessary.***

SECTION - I

Q1) a) What is a distributed query and distributed update? How is it different from a remote query and a remote update? Explain with an example. **[8]**

b) Explain how replication and fragmentation is used for implementing a distributed database system. **[8]**

Q2) a) Discuss data Warehouse lifecycle? **[8]**

b) Given a multi dimensional data cube in a data warehouse, explain roll - up, drill - down, dicing, slicing, and pivoting operators. **[8]**

Q3) a) Define Data Mining. List the steps of the knowledge Discovery in Databases (KDD) and describe each of them. **[8]**

b) What's the difference between a Descriptive Model and a Predictive Model in Data Mining? Is it possible for a model to be both descriptive and predictive? If so, provide an example of a model that is both descriptive and predictive. If not, explain why. **[8]**

Q4) Write short notes on (any 3) : **[18]**

a) Neural Networks.

b) Three aspects of Distributed Database that define its architecture.

c) Semi - structured Data and XML

d) Classification, Regression, Clustering in Data Mining.

P.T.O.

SECTION - II

Q5) a) How are active databases different from normal / passive databases? Explain with example. Discuss the design and implementation issues in active database. **[8]**

b) Explain the ECA concept in active Database. **[8]**

Q6) a) Explain the following terms : **[8]**

- encapsulation.
- method
- inheritance.
- persistence with reference to object databases.

b) What are the drawbacks of a relational database? How does an object database overcome them? Explain OID and ODL. **[8]**

Q7) a) Describe the web crawler architecture with the help of a case study. **[8]**

b) How does a web crawler function? Explain any one algorithm. **[8]**

Q8) Write short notes on : (any 3) **[18]**

a) Information retrieval technique for exploring data in databases.

b) Implications of Web Mining for e - commerce.

c) Active Database Applications.

d) XML database.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P2197

[Total No. of Pages : 2

[4165] - 720
M.E. (Production)
MANUFACTURING MANAGEMENT
(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How will you enhance design efficiency to achieve manufacturing competence in a manufacturing environment? **[8]**

b) Enlist the contributions of following persons. **[8]**

i) Henri fayol.

ii) Edward Deming.

Q2) a) A small project is composed of activities whose time estimates are listed in the table below. Activities are identified by beginning (i) and ending (j) node numbers : **[8]**

Estimated duration (in days)

Activity (i - j)	Optimistic	Most likely	Pessimistic
1 – 2	1	4	7
1 – 3	5	10	17
2 – 4	3	3	3
2 – 6	1	4	7
3 – 4	8	15	26
3 – 5	2	4	8
4 – 5	5	5	5
5 – 6	2	5	8

P.T.O.

i) Draw the project network.

ii) Find the expected duration and variance of each activity and expected project length.

iii) What is the probability that would take 5 days more than the expected duration?

b) Explain the need for close co-operation between product design engineering and manufacturing. What will be effect if organization decides to implement concurrent engineering? **[8]**

Q3) a) What is OEE? How OEE is calculated in TPM organization. **[8]**

b) Explain the concept of just in time. What are the two types of JIT? Which is preferred and why? **[8]**

Q4) Write short notes on any THREE. **[18]**

a) Contributions of Peter Drucker.

b) Toyota production system.

c) Single minute exchange of Die.

d) Leach production system.

SECTION - II

Q5) a) What is organization behaviour? What are ways to induct a good organization behaviour in industry? **[8]**

b) Write the contributions of Elton Mayo in group behaviour. **[8]**

Q6) a) Explain the Maslow's theory of motivation. Why it cannot motivate all the people? **[8]**

b) What are the traits for a good leader? **[8]**

Q7) a) Job stress can have physiological, psychological and behaviour effects. Give an example of each and cite some research findings on the relationship between job stress and these outcomes. **[8]**

b) Enumerate some characteristics of good team work. How do you measure the team effectiveness? How can we make a team more effective? **[8]**

Q8) Write short notes on ANY THREE. **[18]**

a) The Gallop path.

b) Sources of conflicts & their resolutions.

c) Hertzberg's two factory theory of motivation.

d) Group dynamics.

♦♦♦♦

Total No. of Questions : 8] **SEAT No. :**

P2198 **[Total No. of Pages : 2**

[4165] - 505
M.E. (Mechanical) (Heat Power)
ADVANCED FLUID MECHANICS
(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic non - programmable pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Using a differential element approach, derive conservation of mass equation and further show that $\nabla.u = 0$ is also a valid form of continuity equation for a stratified fluid in which fluid particles slide along layers of distinct density. **[10]**

b) Comment onto the properties of the stress tensor in the context of expressing σ in terms of velocity components and thermodynamic pressure in the momentum equation. **[6]**

Q2) a) Flow between parallel plates is driven by movement of the top surface as well as a prescribed pressure gradient. Develop an expression and sketch the fully developed velocity profile. Determine the magnitude of the adverse pressure gradient that reduces the shear stress on the stationery wall to zero. **[8]**

b) A spherical ash particle of a erupted volcano, of diameter 60μm, falling in air whose temperature is –50°C and pressure 55 kPa, begins to settle to ground. The density of the particle is 1240 kg/m^3. Assume density of air 0.8588 kg/m^3 and viscosity, $\mu = 1.474 \times 10^{-5}$ kg/m.s. Verify the appropriate approximation of the fluid flow and Estimate terminal velocity of the particle at this altitude. **[8]**

Q3) a) Using Blasius flow over a flat plate, derive Falkner - Skan equation and calculate wall shear stress for wedge flows. **[8]**

P.T.O.

b) A small low speed wind tunnel is to be designed for calibration of hot specimens. The test section of the wind tunnel is 30 cm. in diameter and 30 cm in length. The wind speed in the tunnel ranges from 1 to 8 m/s and the design is to be optimized for air speed of 4 m/s through the test section. Assume steady and incompressible air flow with kinematic viscosity $\upsilon = 1.507 \times 10^{-5}$ m^2/s. The walls of the tunnel are smooth and disturbances and vibrations are minimum. Calculate accelerated centerline air speed at the end of the test section considering displacement thickness. **[8]**

Q4) Write short note on any three of the following **[18]**

a) Ideal fluid flow concepts.

b) Stream function.

c) Couette flow.

d) Drag, lift and flow separation.

SECTION - II

Q5) a) Derive the Orr - Sommerfeld equation for hydrodynamic stability. **[8]**

b) Explain in brief 'Prandtl's Mixing length hypothesis. **[8]**

Q6) a) Derive and explain the logarithmic law (universal velocity profile) for smooth and partially rough surfaces. **[8]**

b) How the velocity and pressure fluctuations produced, destroyed and transported in the turbulent flows? Explain. **[8]**

Q7) a) State and discuss Rankine - Hugoniot relations for normal shock in the context of second law of thermodynamics. **[8]**

b) An aircraft is flying at a speed of 250 m/s at an altitude of 5000 m where the atmospheric pressure is 54.05 kPa and ambient air temperature is 255.7 K. The ambient air is first decelerated in a diffuser before it enters the compressor. Assume both the diffuser and compressor to be isentropic. Determine the stagnation pressure at the compressor inlet. If stagnation pressure ratio of the compressor is 8, calculate the required compressor work per unit mass. **[8]**

Q8) Write short note on any three of the following **[18]**

a) Characteristics of turbulence.

b) K - epsilon model.

c) Converging diverging nozzle.

d) Compressible boundary layers.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P2200

[Total No. of Pages : 2

[4165] - 50

M.E. (Mechanical) (Heat Power Engineering)

ADVANCED THERMODYNAMICS

(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the generalized compressibility chart with suitable diagrams. **[8]**

b) How real gas behaviour is analysed? State the assumptions for an ideal gas behaviour. **[8]**

Q2) a) Explain :- **[8]**

i) Vander - Waal's equation of state.

ii) Irreversibility and availability.

b) Air expands through a turbine from 6 bar, 500°C to 1 bar and 220°C. During expansion 10 kJ/kg of heat is lost to the surroundings at 1 bar and 25°C. Determine per kg of air : **[8]**

i) Decrease in availability.

ii) Maximum work and Irreversibility.

Q3) a) Discuss the following : **[6]**

i) Triple point of water.

ii) Slope of fusion curve for water and other substances, with a suitable P - T curve.

b) With usual notations derive the following relations : **[10]**

i) $\left(\frac{\partial C_p}{\partial P}\right)_T = -T.v.\beta^2$

ii) $\left(\frac{\partial S}{\partial P}\right) = -\left(\frac{\partial v}{\partial T}\right)_p$

P.T.O.

Q4) Write short notes on (any three) : **[18]**

a) Clausius - Clayperon equation.

b) Gibb's phase rule.

c) Helmholtz and Gibb's function.

d) Third lane of thermodynamics.

SECTION - II

Q5) a) Discuss in brief : **[10]**

i) A magat's lane and Kay's rule.

ii) Entropy and probability.

b) Explain lane of mass action with a suitable example. **[6]**

Q6) a) Propane (g) is burned with 400% theoretical air. The pressure and temperature of propane and air are 100 kPa and 25°C. Determine the stoichiometric and actual air fuel ratio. Also find the volumetric and gravimetric composition of flue gases. **[12]**

b) Write a note on fugacity & activity. **[4]**

Q7) a) Explain with suitable energy equations :- **[10]**

i) Adiabatic flame temperature.

ii) Enthalpy and Internal energy of combustion.

b) Write a note on enthalpy of formation. **[6]**

Q8) Write short notes on (any three) : **[18]**

a) Bose - Einstein statistics.

b) Fermi - Dirac statistics.

c) Mass fraction and mole fraction.

d) Dalton's law of partial pressure.

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Total No. of Questions : 10]

SEAT No. :

P2204

[Total No. of Pages : 3

[4165] - 67
M.E (Mech.) (Design)
MECHANICAL VIBRATIONS
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Derive from first principal duhamel's integral for undamped system and hence find out response of the system to a resonating force. Sketch response of same. **[16]**

Q2) a) Find response of a damped spring mass system subjected to an impulsive force F_0. **[10]**

b) Give three examples of random i/p. How you will proceed to find their spectral density. **[6]**

Q3) An eccentric cam having eccentricity 'e' rotating with uniform angular velocity 'w' operated a roller follower of mass 'm' with push rod length 'L' and c/s area 'A' & youngs modulus 'E'. The push rod acts as spring has been compressed by an amount X_0 before Assembly determine. **[16]**

a) Equation of motion of a follower.

b) Force exerted on the follower.

c) Condition under which the follower loose contact with cam.

Q4) For the system shown in fig. (1) from stiffness & mass matrix using influence coefficients find natural frequency & mode shape. **[16]**

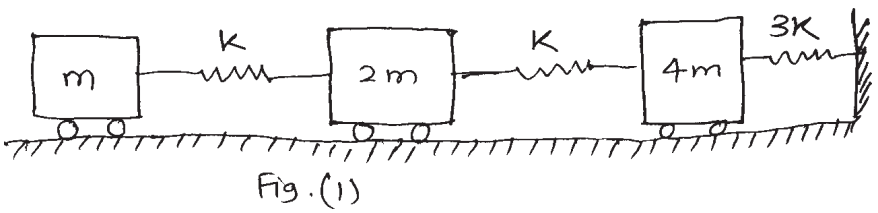

Fig. (1)

P.T.O.

Q5) Explain following : **[18]**

a) Eigen Values & Eigen Vector.

b) Modal analysis.

c) Holzors method.

SECTION - II

Q6) a) Explain wideband & narrow band random vibrations. **[6]**

b) Give three examples of random i/p. How you will proceed to find their spectral density.
Calculate autocorrelation function to ideal white noise & to the unit step function. **[10]**

Q7) A three degree freedom system has parameters m, k & c., it is subjected to a force of $e^{-\alpha t}$ find the response & sketch the same. **[16]**

Q8) a) What are self excited vibrations. **[4]**

b) Using Duffing's equation explain jump phenomenon for undamped & damped non linear system. **[12]**

Q9) a) Explain Rayleigh - Ritz method for finding natural frequencies of continuous beam. **[8]**

b) Explain in detail pertubation method. **[8]**

Q10) Write short notes on **[18]**

a) Phase - plane techniques.

b) Static & dynamic coupling.

c) Centrifugal pendulum.

Laplace Transform Pairs

	$f(t)$		$L[f(t)]$
1.	$f(t)$	—	$\int_0^\infty e^{-st} f(t)\,dt = F(s)$
2.	$x(t) \pm y(t)$	—	$X(s) + Y(s)$
3.	$Kf(t)$	—	$KF(s)$
4.	$u(t)$ *or* 1	—	$1/s$
5.	$\delta(t)$	—	1
6.	t	—	$1/s^2$
7.	t^n	—	$n!/s^{n+1}$
8.	$\sin \omega t$	—	$\dfrac{\omega}{s^2+\omega^2}$
9.	$\cos \omega t$	—	$s/s^2+\omega^2$
10.	e^{-at}	—	$1/s+a$
11.	$e^{-at} \sin \omega t$	—	$\dfrac{\omega}{(s+a)^2+\omega^2}$
12.	$e^{-at} \cos \omega t$	—	$\dfrac{s+a}{(s+a)^2+\omega^2}$
13.	$e^{-at} f(t)$	—	$F(s+a)$
14.	$u(t-a)$	—	$\dfrac{e^{-as}}{s}$
15.	$\delta(t-a)$	—	e^{-as}
16.	$\begin{bmatrix} 0 \text{ when } t<a \\ f(t-a) \text{when } t>a \end{bmatrix} = f(t-a)u(t-a)$		$e^{-as} F(s)$
17.	$\dfrac{d\,f(t)}{dt}$	—	$sF(s) - f(0)$
18	$\dfrac{d^2 f(t)}{dt}$	—	$s^2F(s) - s\,f(0) - \dfrac{d\,f(0)}{dt}$
19.	$\int_0^t f(t)\,dt$	—	$\dfrac{F(s)}{s}$

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P2205

[Total No. of Pages : 2

[4165] - 71
M.E. (Mechanical) (Design Engineering)
RELIABILITY ENGINEERING
(2002 Course) (Elective - II(a))

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic table and electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is reliability? Explain different reliability measures. How to select a particular reliability measure? **[8]**

b) Following table shows the test results of 1000 components, tested simultaneously. Evaluate : Hazard rate, failure density function and reliability. **[8]**

Operating Time (Hrs.)	0	100	200	300	400	500	600	700	800	900	1000
No. of surviving components	1000	870	790	740	650	560	480	440	400	384	370

Q2) a) Explain 'Bath tub' curve with reference to failure modes. **[6]**

b) What are the main objectives of a reliability engineering team working on an engineering development project? Describe the important skills and experience that should be available within the team. **[10]**

Q3) a) Explain total probability theorem. **[6]**

b) A cinema house gets electric power from a generator run by a diesel engine. On any given day, the probability that the generator is down is 0.035 and the probability that the diesel engine is down is 0.045. What is the probability that the cinema house will have power on any given day? Assume that the occurrence of the events are independent of each other. **[10]**

P.T.O.

Q4) a) Explain conditional probability analysis. **[6]**

b) Calculate the reliability of the system shown in Fig. No. 1. The values shows the reliability of individual components in the system. **[10]**

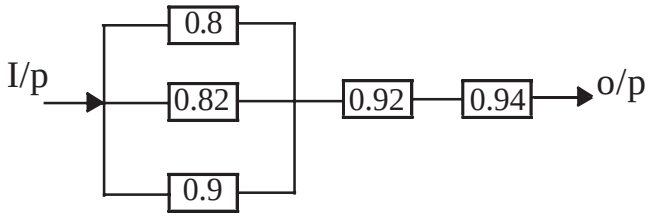

Fig. No. 1

Q5) Write the short notes of the following (Any two) **[18]**

a) MTTF & MTBF

b) Weibull distribution.

c) Bayes' Theorem.

SECTION - II

Q6) a) Explain Availability and maintainability with the help of suitable examples. **[8]**

b) Discuss the method of obtaining criticality of a component or a subsystem using Risk Priority Number (RPN) **[8]**

Q7) a) Draw the symbols used in construction of fault tree analysis. **[8]**

b) A room with two light bulbs is operated by a single switch. By assuming the 'No light' in the room as the top undesirable event, construct the fault tree diagram. **[8]**

Q8) a) Explain reliability based design of mechanical components systems. **[8]**

b) Explain AGREE method of reliability allocation. **[8]**

Q9) a) Explain HALT & HASS **[10]**

b) Define the term factor of safety with practical example. **[6]**

Q10) Write the short notes of the following (Any Two) **[18]**

a) TQM.

b) FMECA.

c) Strength based reliability.

♦♦♦♦

Total No. of Questions : 6] **SEAT No. :**

P2208 **[Total No. of Pages : 1**

[4165] - 134
M.E (E & TC) (VLSI & Embedded System)
FAULT TOLERANT SYSTEM DESIGN
(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***All questions are compulsory.***

SECTION - I

Q1) a) Write a brief note on errors and faults. Classify error types. **[8]**

b) Write a RTL model for a positive edge-triggered J - K flip flop. **[10]**

Q2) a) Explain with block diagram, the simulation process. Give 3 applications of simulation. **[8]**

b) Construct zoom table and 3 - valued table for universal gates and explain their significance. **[8]**

Q3) a) Write a short note on delay model. **[8]**

b) Write a short note on fault simulation technique. **[8]**

SECTION - II

Q4) a) Explain the role of logical redundancy in DFT. **[8]**

b) Explain with block diagram the working of compression technique. **[8]**

Q5) a) Explain different forms of testing and related test pattern generator in brief. **[8]**

b) Explain with neat diagram error-correction and detection ckt of self checking system. **[8]**

Q6) Write short note on : **[18]**

a) Berger Code.

b) Fault Modelling.

c) Bridge Fault Model.

♦♦♦♦

Total No. of Questions : 11]

SEAT No. : ____

P2240

[Total No. of Pages : 4

[4165] - 712
M.E. (Production Engg.)
RELIABILITY & FAILURE ANALYSIS
(2008 Course) (Elective - I(b)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of non - programmable electronic calculator is allowed.***

SECTION - I

Q1) a) A series of tests conducted under certain stipulated conditions on 800 electronic components, the total duration of tests is 15 hrs. The number of components that fail during each hourly interval is noted. The results obtained are tabulated as shown in table.

Time (t)	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
No. of failures	00	120	85	71	62	53	45	41	37	35	29	50	45	63	35	29

Based on the failure data or survival test results shown in table. Define & Calculate failure density (fd); failure rate (Z) and Reliability (R). **[12]**

b) Explain with neat sketch different failure modes of 'Bath tub' curve. **[4]**

OR

Q2) a) In order to test the strength of a new glue, ten similar structures constructed using the glue were subjected to a continuous vibratory load, and the duration of survival of each structure was noted, the values obtained the following.

Specimen Numbers	01	02	03	04	05	06	07	08	09	10
Hours of Survival	60	62	58	50	61	55	59	62	54	55

Calculate the mean time to failures (MTTF) from this data. **[6]**

P.T.O.

b) In a test involving continuous satisfactory performance of 110 electronic instruments under excessive vibration conditions, the following failure frequencies were observed, the total test period being 8 hrs.

Time interval	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8
Number of failures	3	16	22	42	11	09	04	03

Calculate the mean time to failures (MTTF) from this data. **[6]**

c) Define reliability & discuss in it details. **[4]**

Q3) a) Explain the concept of "Techno - Physico Constraints" with a conceptual system. **[6]**

b) Construct a fault tree from Fig. 1 such that the top event is a system failure and component failures are basic events. If Pr{A} = Pr{B} = 0.9, Pr{C} = Pr{D} = 0.8 and Pr{E} = Pr{F} = 0.75, compute the probability of the top event. **[10]**

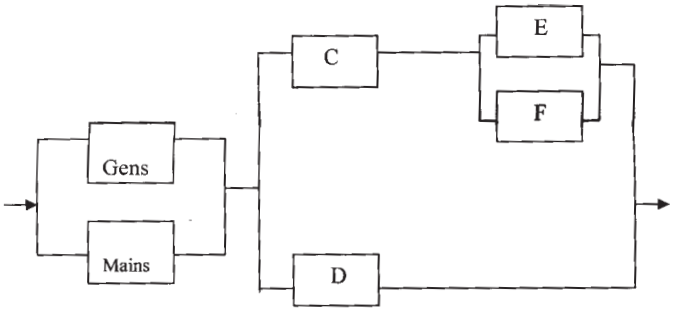

Fig.1

OR

Q4) a) Construct a reliability block diagram for given fault tree. Fig.2 **[8]**

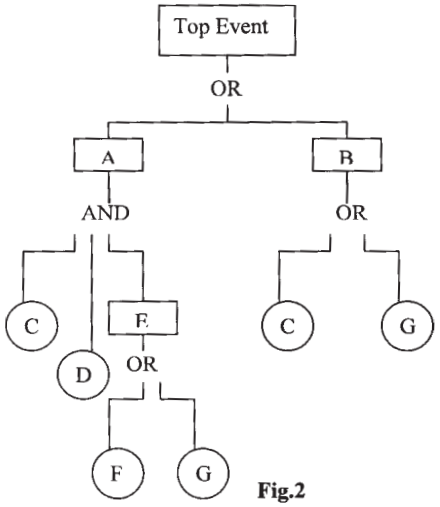

Fig.2

b) Differentiate between : Design FMEA and Process FMEA. Explain methodology of system analysis. **[8]**

Q5) a) Explain with neat sketch 1) Series Configuration 2) General Series - Parallel configuration. **[10]**

b) Find the system reliability of the configuration in Fig. 3 **[8]**

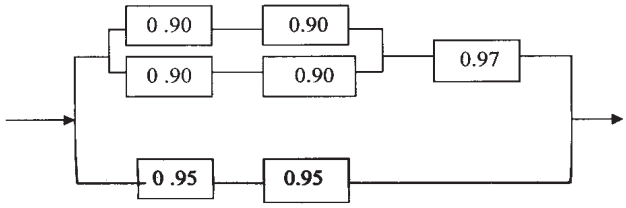

Fig.3

OR

Q6) a) Find the reliability of the configurations shown below in Fig. 4 **[8]**

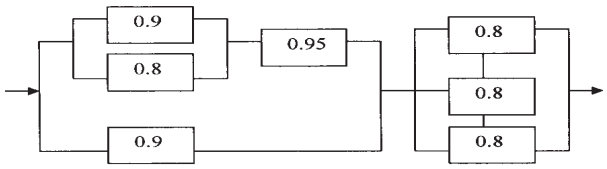

Fig.4

b) Explain with neat sketch 1) Parallel Configuration 2) General Parallel - Series configuration. **[10]**

SECTION - II

Q7) a) Define Tero - technology and state the importance of the same in evolving the "LCC" of an asset. **[8]**

b) A company is planning to acquire a truck. Two makes of trucks are available in the market. The cost of garaging and the driver's wages are same for both. The other data on cost are provided in the table.

Parameters	Truck A	Truck B
Capital cost	Rs. 5 Lakhs	Rs. 3 Lakhs
Annual Road Tax & Insurance	Rs. 8,000	Rs. 7,000
Operating Cost		
a) fuel consumption	20Km/Lit.	20Km/Lit.
b) oil consumption	2 lit/1000 km	2 lit/1000km
c) fuel cost	Rs. 3/lit.	Rs. 3/lit.
d) oil cost	25/lit.	21/lit.
Maintenance Cost		
a) service interval	Every 7,000 km.	Every 4,000 km.
b) cost of service	Rs.3,000	Rs. 5,000
c) random breakdown	Every 30,000 km.	Every 10,000 km
d) cost of breakdown	Rs. 9,000.	Rs. 6,000.
Expected life	10 yrs.	10yrs.

Calculate annual maintenance cost for a period of 30,000 km & find out which truck is advantageous? **[8]**

OR

Q8) a) Explain mean, median and mode ranking method. **[8]**

b) The following data refer to 'Mean time to failure' of a equipment used in electric power house installation :

No. of failure	1	2	3	4	5	6	7	8	9
MTTF/MTBF (Hrs)	31.3	45.9	78.3	22.1	2.3	4.8	8.1	11.3	17.3

Plot the reliability against time using the method median statistics. How will values changes with mean statistics? **[8]**

Q9) a) Explain 1) Inherent availability 2) Achieved availability 3) Operational availability. **[6]**

b) Derive an expression $Rp(t) = e^{-\lambda 1 t} + e^{-\lambda 2 t} - e^{-(\lambda 1 + \lambda 2)t}$ **[10]**

OR

Q10) a) What do you mean by the terms grouped, ungrouped and censored data. **[6]**

b) The following data have been collected at the plant : **[6]**

Mean time before failure = 30 hrs.

Mean time to repair = 15 hrs.

Administrative logistic time is 30% of Mean Down Time (MDT).

Calculate the operational availability and inherent availability of the plant.

c) Explain the term availability and maintainability of system. **[4]**

Q11) Write short note on (Any 3) **[18]**

a) Mixed configuration in system reliability.

b) Reliability & Quality.

c) k out of m systems.

d) Types of maintenance system.

e) Risk priority number in FMEA.

f) "Tie - set" & "cut set".

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1810

[Total No. of Pages : 3

[4165] - 402

M.E. (Civil) (Construction & Management)

MANAGEMENT & PROJECT PLANNING IN CONSTRUCTION

(2008 Course) (Sem. - I)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to each section should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) a) Explain Project Life Cycle. Justify its shape at different stages with examples. Also, explain the curves related to resources, creativity, project uncertainty project stake at different phases of project. **[10]**

b) Explain the Line of Balance Techniques (LOB) with example. Also, explain the procedure of crashing in LOB technique. **[8]**

Q2) Following table gives cost - duration data related to a project. **[16]**

Activity	Normal		Crash	
	Duration	Cost	Duration	Cost
1-2	4	4000	3	4500
1-4	5	5000	4	5200
2-3	9	3000	7	3500
2-4	8	2500	5	4000
3-6	5	3500	3	4000
3-5	7	5000	5	6000
4-5	0	0	0	0
4-7	6	6000	5	6200
5-6	2	8000	2	8000
5-7	4	4500	4	4500
6-8	8	7500	7	7750
7-8	9	9000	6	11400

P.T.O.

The indirect cost is Rs. 1500/- per day.

- Find normal duration and corresponding direct, indirect cost and total project cost.
- Carry out stage by stage compression and find the optimum duration and the corresponding costs.
- Find all crash solution.
- Plot a graph of costs verses Time.

Q3) a) How will you carry out site mobilization of a tunnel construction? **[8]**

b) Explain matrix structure of organization. How it is used for a multinational construction company? **[8]**

Q4) Write short notes on any two of the following. **[16]**

a) Role of Project Management Consultant (PMC)

b) Applications of network analysis softwares in construction

c) Development of scientific management

d) Project Feasibility reports.

SECTION - II

Q5) a) Explain in detail the importance of work study in construction. **[6]**

b) Explain one complete cycle of an excavator. What are the factors that affect the productivity of excavator? (make suitable assumptions). **[6]**

c) Give various training programmes conducted for construction managers. How are they useful from improving his efficiency? **[6]**

Q6) Explain in detail, any two of the following **[16]**

a) Two handed process chart

b) String diagram

c) Multiple activity chart

d) Flow diagram

(assume suitable data & explain with neat diagrams)

Q7) a) Find the production per day considering 8 hours per day for following data: **[4]**

i) Average observed time of fixing a time (1 ft x 1 ft) = 2.5 min

ii) Rating factor = 115

iii) Relaxation allowance = 20 %

iv) Contingency & interference allowance = 10%

v) Policy allowance = 12 %

b) What is job evaluation? State only the steps and explain any one step. **[6]**

c) You are the project manager on a multistoried commercial site involving malls, multiplexes and commercial spaces. Explain various activities involved and duties & responsibilities associated with it. **[6]**

Q8) a) What are the different allowances assumed for a given worker? **[4]**

b) Why the incentive schemes are created? What are the probable reasons of failure of incentive schemes? **[6]**

c) Describe the method of conducting work measurement studies. **[6]**

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Total No. of Questions : 8]

SEAT No. :

P1819

[Total No. of Pages : 3

[4165] - 457

M.E. (Civil - Hydraulic Engg.)

OPEN CHANNEL HYDRAULICS

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, and non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary and mention it.***

SECTION - I

Q1) a) Define the following terms: **[4]**

i) Section factor for uniform flow computations

ii) Section factor for critical flow computations

iii) Second hydraulic exponent

iv) First hydraulic exponent.

b) Waterflows in a channel having the shape of an isosceles triangle of bed width b and sides inclined at 45° with the bed. obtain the values of ratio $\frac{y}{b}$ for **[12]**

i) Maximum velocity condition and

ii) Maximum discharge condition. Use Manning's formula and note that $y < \frac{b}{2}$.

P.T.O.

Q2) a) Explain the classification of hydraulic jump based on pre-jump froude number. **[6]**

b) A rectangular channel is laid on a slope of 1V = 10H. A hydraulic jump occurs when a discharge of $12 m^3/s/m$ passes down the channel at a depth of 0.75m. Calculate the sequent depth, length of the jump and the energy loss in the jump. **[12]**

What would be the loss of energy if the channel was horizontal?

[Take $\frac{yt}{y_2} = 1.4$ for $\tan\theta = 0.1$ and $m_6 = 4.5$ for $\tan\theta = 0.1$].

Q3) A rectangular channel 12.0 m wide carries a discharge of 60 m^3/sec. If at a certain section, the depth of flow is 3.0m, how far upstream or downstream of this section would the depth of flow be within 10% of the normal depth from NDL. The bed slope of the channel is 0.0004 and Manning's roughness co-efficient is 0.015. Use direct step method taking at least 3 steps. Classify and sketch the resulting profile. **[16]**

Q4) Write short notes on any four of the following: **[16]**

a) Specific energy and specific force diagrams.

b) Water surface profiles in GVF analysis.

c) Control section in GVF computations.

d) Use of hydraulic jump as energy dissipator.

e) Design of standard lined canal sections.

SECTION - II

Q5) a) Derive the basic differential equation of spatially varied flow in open channel with increasing discharge. **[8]**

b) Explain the different methods of profile calculations for spatially varied flow with increasing discharge. **[8]**

Q6) a) What is stratified flow? Obtain the equation of motion for stratified flow. **[8]**

b) State and explain the different exchange co-efficients in detail. **[8]**

Q7) a) What do you understand by flood routing? Explain the graphical method and trial & error method of flood routing. **[10]**

b) Differentiate between channel routing and reservoir routing. **[6]**

Q8) a) The depth and velocity of flow in a rectangular channel are 1m and 1.6 m/sec respectively. If the inflow discharge at the upstream end is suddenly doubled, what will be the height and absolute velocity of the resulting surge and the celerity of waves? **[9]**

b) Write brief notes on any three of the following: **[9]**

i) Positive and negative surges

ii) Solitary wave

iii) Dam break problem

iv) Group velocity.

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Total No. of Questions : 6]

SEAT No. : ____

P1821

[Total No. of Pages : 2

[4165] - 464

M.E. (Civil) (Structures)

THEORY OF PLATES AND SHELLS

(2008 Course) (Sem. - II)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Starting from the first principles derive the 4^{th} order governing differential equation for a thin plate under bending. Find expressions for moments, shears using various boundary conditions. **[13]**

b) A thin square plate of size a × a with four edges simply supported carries a central patch load over area u × v. Using Navier's method, compute the deflection and principle moments at the center of the plate. **[12]**

Q2) a) Describe the stepwise procedure in the Levy's method for thin plate bending analysis. Apply the steps to obtain the maximum deflection in a square plate subjected to uniformly distributed load of intensity 'q' per unit area. **[16]**

b) For a simply supported isotropic plate subjected to uniform intensity of loading q, apply Ritz's method to obtain the expression for deflected shape of the plate. **[9]**

P.T.O.

Q3) A solid circular slab of concrete with radius 3.5 m and uniform thickness of 120 mm carries a uniformly distributed load of 6 kN/m. Assuming the edges of the slab as simply supported analyze the plate from basic principles and hence obtain the maximum deflection and bending moment at center of the plate. **[25]**

SECTION - II

Q4) Derive the equations of equilibrium of shell of revolutions with axisymmetric loading. Apply the equations to analyze a R.C.C hemispherical dome of radius of 9 m and thickness 120 mm for its self weight. The dome is supported on its lower edge by roller supports all along the periphery. Determine the membrane forces and plot the variation of internal forces along any meridian. Is there any bending effect to be considered near the lower edge? Comment on your answer. **[25]**

Q5) a) Differentiate between membrane theory and bending theory for analysis of shells. **[5]**

b) Using membrane theory obtain the expressions for membrane stresses N_x, N_φ and $N_{x\varphi}$ for a cantilever cylindrical open shell of length L, radius a, and half angle φ_o subjected to self weight. **[20]**

Q6) a) Discuss the advantages and limitations of the Lundgren's beam theory for cylindrical shells. **[5]**

b) Derive the equilibrium equation and hence equation for deflection using general cylindrical shell theory (considering bending action) for axisymmetric case. **[20]**

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Total No. of Questions : 8]

SEAT No. :

P1827

[Total No. of Pages : 2

[4165] - 484

M.E. (Civil) (Environmental Engg.)

INDUSTRIAL WASTE WATER MANAGEMENT

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the sources of water pollution? Explain. **[8]**

b) What are the biological characteristics of wastewater? Explain. **[8]**

Q2) a) Explain oil separation by floatation technique. **[8]**

b) Explain classifications of waste minimisation techniques. **[8]**

Q3) a) State methods of removal of nitrogen from industrial wastewater and explain any one. **[8]**

b) Explain any one absorption process for treatment of wastewater. **[8]**

Q4) Write short notes on the following: **[18]**

a) Disposal of Treated Waste.

b) Neutralization.

c) Membrane Separation Process.

P.T.O.

SECTION - II

Q5) a) Explain the manufacturing process of fertilizer industry. **[8]**

b) Draw a flow diagram of manufacturing process of dairy industry. State the sources of wastewater generated from the manufacturing process of dairy industry. **[8]**

Q6) a) Comment in detail on location and need of CETP? **[8]**

b) What are the economical aspects of CETP? **[8]**

Q7) a) Enlist different methods of treatment of industrial effluent. Explain trickling filter process. **[8]**

b) Which are the wastes generated from manufacturing process of sugar industry? Draw a flow diagram for treating wastewater of sugar industry. **[8]**

Q8) Write short notes on the following: **[18]**

a) Activated sludge process.

b) Characteristics of paper and pulp industry.

c) Treatability Index.

❄❄❄

Total No. of Questions : 10]

SEAT No. :

P1841

[Total No. of Pages : 4

[4165] - 512

M.E. (Mech.) (Common to Design Engg. & Automotive Engg.)

MATHEMATICAL MODELLING AND ANALYSIS

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Construct Linear Graph model for **[6]**

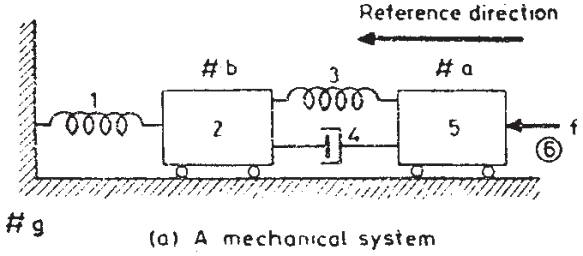

Figure Q 1 (a)

b) Apply block diagram algebra to deduce expression for c(t)/r(t) for the block diagram shown in Figure Q1 (b). **[12]**

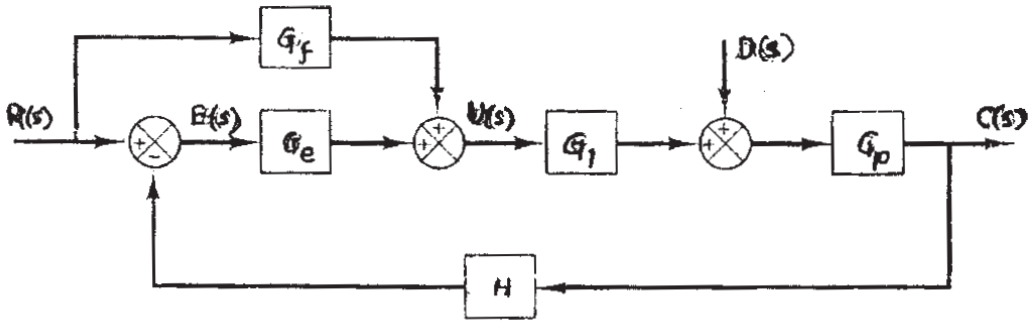

Figure Q 1 (b)

P.T.O.

Q2) a) Construct signal flow graph for **[8]**

$$\begin{Bmatrix} x_1 \\ x_2 \\ x_3 \end{Bmatrix} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \\ x_3 \end{Bmatrix} + \begin{Bmatrix} b_1 \\ b_2 \\ b_3 \end{Bmatrix} u$$

b) Compare static and dynamic systems with three points of comparison and one illustration of each. **[8]**

Q3) For Series Programming used in State Space Methods it follows that for **[16]**

$(D^3 + a_1D^2 + a_2D + a_3)\, y(t) = (b_1D^2 + b_2D + b_3)\, f(t)$

The matrix relationships are

$$\begin{Bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{Bmatrix} = \begin{bmatrix} -a_1 & 1 & 0 \\ -a_2 & 0 & 1 \\ -a_3 & 0 & 0 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \\ x_3 \end{Bmatrix} + \begin{Bmatrix} b_1 \\ b_2 \\ b_3 \end{Bmatrix} f(t)$$

and

$$y(t) = x_1$$

Apply to

$$y(t) = \frac{2(D+5)}{(D+2)\,(D+3)(D+4)}\, f(t)$$

to obtain matrix relationships. Draw block diagrams for these equations.

Q4) The block diagram of some system is represented in Figure Q4. Construct signal flow graph and obtain C(s)/R(s). **[16]**

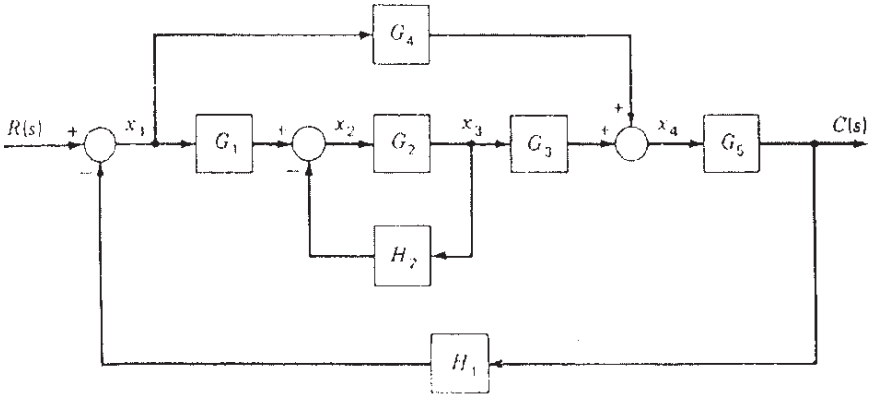

Figure Q 4

Q5) a) Describe cause variable and effect variables with two examples of each. **[8]**

b) Define System, Environment, and Variable in mathematical modeling. **[8]**

SECTION - II

Q6) For the transformed equation **[16]**

$$N_o(s) = \frac{3N_{in}(s) - 3sU(s)}{s^2 + 4s + 3}.$$

Determine the response when

a) $N_{in}(s) = \frac{1}{(s+1)}$ and $U(s) = 0$.

b) $N_{in}(s) = 0$ and $U(s) = \frac{1}{s+1}$.

Q7) a) Determine the z transform of $F(s) = \frac{1}{s+1}$ using Residue method. **[8]**

b) The z transform of a digital control system is. **[8]**

$$C(z) = Z\frac{z+2}{(z-0.5)(z-1)}$$

Determine the inverse z transform.

Q8) Figure shows a square mesh. The nodal values are given as shown in Figure Q8. Using Laplace Equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ and Libmann's method obtain the values of inside nodes. Compute three iterations with over relaxation ($\lambda = 1.5$), percent relative error ($\%\varepsilon_r$) and tabulate the result. **[18]**

Use

$$u^{\text{Relaxed}} = \lambda u^{\text{Current}} + (1 - \lambda)u^{\text{Previous}}$$

$$\%\varepsilon_r = \left|\frac{u^{New} - u^{Old}}{u^{New}}\right| * 100$$

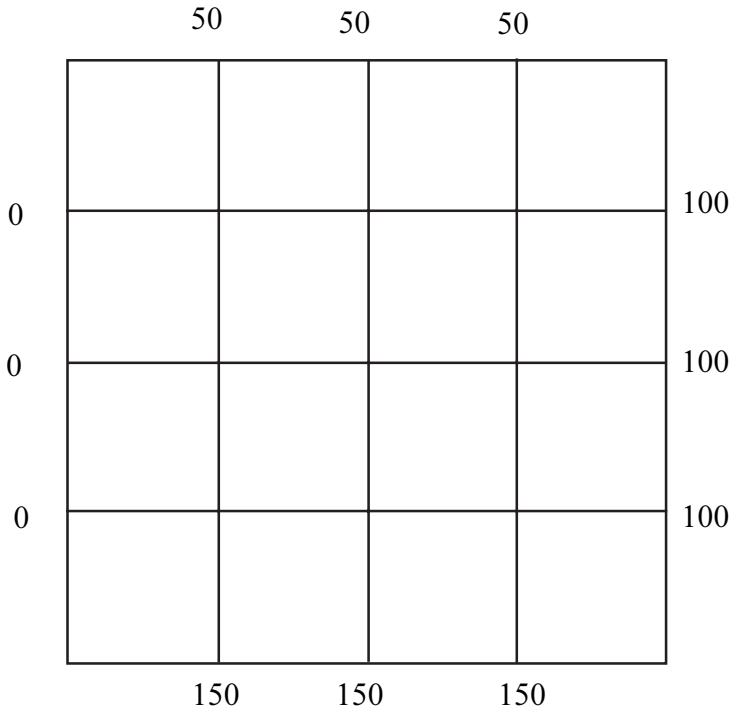

Figure Q 8

Q9) For $y = f(x) = 3x^2 + 2x + 5$, from $x = 1$ to $x = 4$, using 4th order RK method evaluate the integral with $h = 1.5$. **[16]**

Q10) a) Compare Over relaxation with Under relaxation employed in solving elliptic differential equations. **[8]**

b) Define z transform and find the z transform whose Laplace transform is $\frac{1}{s(s+5)}$. **[8]**

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Total No. of Questions : 10]

SEAT No. : ____

P1849

[Total No. of Pages : 3

[4165] - 530

M.E. (Mechanical) (Mechatronics)

APPLIED NUMERICAL METHODS & COMPUTATIONAL TECHNIQUES

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary but mention it clearly.***

SECTION - I

Q1) a) Compute $y(0.1)$ by Runge Kutta 4th order method for the differential equation. **[8]**

$$\frac{dy}{dx} = xy + y^2 \; with \; y(0) = 1$$

b) Fit a second degree parabola by taking x as the independent variable. **[8]**

x	0	1	2	3	4
y	1	5	10	22	38

Q2) Find Hermite interpolation polynomial for the following data. **[16]**

x	0	1	2
f(x)	1	0	9
f '(x)	0	0	24

P.T.O.

Q3) Solve the equations $x = x^2 + y^2$ and $y = x^2 - y^2$ using Newton Rapson method with the approximation (0.8, 0.4). **[16]**

Q4) a) Use Lagrange's interpolation formula to fit a polynomial to the data. **[9]**

x	0	1	3	4
y	–12	0	6	12

Find the value of y when x = 2.

b) Discuss the algorithm for LU Decomposition Method. **[9]**

Q5) a) Determine the largest eigen value and the corresponding eigen vector of the matrix . **[10]**

$$\begin{bmatrix} 1.00 & 3.00 & -1.00 \\ 3.00 & 2.00 & 4.00 \\ -1 & 4.00 & 10.00 \end{bmatrix}$$

b) Discuss the algorithm for double interpolation. **[6]**

SECTION - II

Q6) Using Adam's Bash forth method find $u(4.4)$ given $5x\ 'y + y^2 = 2$, $y(4) = 1$, $y(4.1) = 1.0049$, $y(4.2) = 1.0097$ and $y(4.3) = 1.0143$ **[16]**

Q7) Using suitable method obtain the second approximation to the solution of

$$\frac{d^2y}{dx^2} = x^3\frac{dy}{dx} + x^3 y \text{ with } y(0) = 1 \text{ and } y'(0) = 0.5.$$ **[16]**

Q8) a) Use Modified Eular Method to calculate y at $x = 4$ with step size $h = 2$ and initial conditions as $y = 0$ at $x = 0$ for the differential equation

$$\frac{dy}{dx} = 12x^2 - 20x + y^2.$$ **[9]**

b) Compare Simpson's One Third rule and Simpsons 3/8 rule used for numerical integration. **[9]**

Q9) a) Discuss line elements with two nodes and three nodes used in Finite Element method. **[8]**

b) Write a short note on Implicit method to solve partial differential equations. **[8]**

Q10) Temperature of heated plate is given by **[16]**

$$T(x, y) = 2xy + 2x - x^2 - 2y^2 + 72$$

The plate is 0.08 m (x dimension) and 0.06 m (y dimension). Compute average temperature using trapezoidal rule with two steps along x and y.

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Total No. of Questions : 8]

SEAT No. :

P1850

[Total No. of Pages : 2

[4165] - 531

M.E. (Mechanical) (Mechatronics)

MECHANICAL AND ELECTRONIC MEASUREMENTS

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer three questions from section I and three questions from section II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various characteristics of an instrument. **[8]**

b) Explain Volt standard **[8]**

Q2) a) Explain the properties of correlation co-efficient. **[8]**

b) Find out regression co-efficient of Y on X and X on Y from the following data: **[10]**

$\Sigma x = 50, \quad \bar{x} = 5, \quad \Sigma y = 60, \quad \bar{y} = 6,$

$\Sigma xy = 350,$ variance of $X = 4,$

variance of $Y = 9$

Q3) a) Explain the working of logic analyzer **[8]**

b) What is asynchronous timing mode and synchronous state mode. **[8]**

P.T.O.

Q4) a) Explain the working of thermal conductivity gauge with a neat sketch. **[8]**

b) For a Mc leod gauge with capillary of 1 mm diameter and effective bulb volume of 85ccs, find readings as indicated by Mercury column for 15 pascal pressure. **[8]**

SECTION - II

Q5) a) Explain the working of torque measuring device. **[8]**

b) Explain the difference between thermistor & thermocouple. **[8]**

Q6) a) Explain various methods of A to D convertors. **[8]**

b) Explain any one surface finish measuring device. **[8]**

Q7) a) Explain what do you mean by impedance matching. **[8]**

b) Explain spectrum analyzer with a neat sketch. **[8]**

Q8) Write short notes on any three: **[18]**

a) Stroboscope

b) Hall sensors

c) Operational amplifiers

d) Traceability

e) Materials of strain gauges.

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Total No. of Questions : 10]

SEAT No. : ____

P1945

[Total No. of Pages : 2

[4165] - 740

M.E. (Production) (CAD / CAM)

COMPUTER INTEGRATED MANUFACTURING

(2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe the need for CIM and the issues addressed by CIM. **[8]**

b) What are the different levels of Integration against evolution of CIM? Explain. **[8]**

Q2) a) How concurrent engineering will help to reduce product development time? **[8]**

b) Describe how the Taguchi technique can be used to evolve a robust design? **[8]**

Q3) a) What is a database? What are the objectives of a database? **[8]**

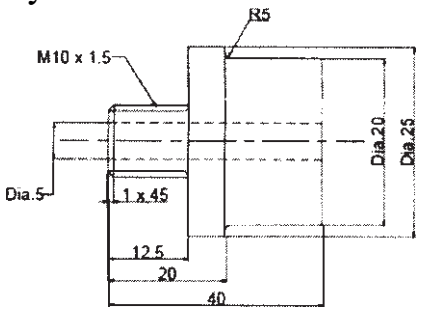
b) What is a relational database? Describe the architecture of database management system. **[8]**

Q4) a) 'PDM is an excellent tool for concurrent engineering'. Elaborate. **[8]**

b) What is SQL? What are the major types of query languages? **[8]**

P.T.O.

Q5) a) Explain OPITZ coding system? Determine the form code for following part in OPITZ system? **[9]**



b) Explain design of cellular manufacturing system. **[9]**

SECTION - II

Q6) a) Define FMS. Describe basic components of FMS. **[8]**

b) What are the different types of FMS layouts? State factors influencing FMS layouts. **[8]**

Q7) a) Describe AGV. What are the advantages of AGV systems in FMS? **[8]**

b) Explain the types of Automated storage and retrieval systems (AS/RS). **[8]**

Q8) a) Describe briefly the integration of industrial robot into CIM system with block diagram. **[8]**

b) Explain computer aided inspection using robots. **[8]**

Q9) a) Discuss the need and advantages of networking in a manufacturing shop. **[8]**

b) What are the communication interfaces used in computer-to-computer communication? Explain in brief. What are the commonly used interface cards? **[8]**

Q10) a) Discuss the significance of enterprise wide product visualization. **[9]**

b) Compare different CIM models with particular reference to the flow of information. **[9]**

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Total No. of Questions : 8]

SEAT No. :

P1952

[Total No. of Pages : 4

[4165] - 751

M.E. (Computer Engg.)

(Common to Network Engineering)

APPLIED ALGORITHMS

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the proof by contradiction or indirect proof of proof technique. Why do we need these proof technique? and with the help of proof by contradiction "prove that there exist 2 irrational numbers X and Y such that X^Y is rational. **[8]**

b) It has been claimed that 60% of all solar heat installations the utility bill is reduced by at least one third. Accordingly what is the probability that the utility bill will be reduced by at least one third in **[8]**

i) Four of five installation.

ii) At least four of five installation.

Q2) a) Explain the following algorithms with example: **[12]**

i) Iterative algorithm.

ii) Recursive algorithm.

iii) Serial algorithm.

iv) Parallel algorithm.

v) Deterministic algorithm.

vi) Approximation algorithm.

P.T.O.

b) Solve the following recurrence relations: **[4]**

$t_n = 0$ if $n = 0$

$t_n = 5$ if $n = 1$

$t_n = 3\ t_{n+1} + 4\ t_{n-2}$ otherwise

Q3) a) What is worst case, average case and best case time complexity of an algorithm? Write a the Linear search and Binary search algorithm and Analyze the same to find out its worst case, average case and best case complexity. **[8]**

b) Give an algorithm to detect whether a given undirected graph a cycle. If the graph contains a cycle, then your algorithm should output one. (it should not output all cycles in graph, just one of them) the running time of your algorithm should be O(m+n) for a graph with n node and m edged. **[8]**

Q4) a) What is time complexity and space complexity of an algorithm? How do we measure these complexities of an algorithms? Discuss the recursive and non - recursive version of finding the maximum value in the array of 10 elements and compare the time space complexity requirement in the same. **[8]**

b) Assume you have functions f and g such that f(n) is O(g(n)). For each of the following statement, decide whether you think it is true of false. **[10]**

And give a proof or counter example.

i) $\log_2 f(n)$ is $O(\log_2 g(n))$.

ii) $2^{f(n)}$ is $O(2^{g(n)})$.

iii) $f(n)^2$ is $O(g(n)^2)$.

SECTION - II

Q5) a) Find the optimal tour for the instance of travelling salesman problem given below in the matrix (8 * 8) by your own way. And then generate the tour by 2-approximation algorithm. Compare tour generated by your way and 2-approximation algorithm. **[10]**

0	19	14	16	17	13	18	20
19	0	17	12	11	19	15	15
14	17	0	18	16	12	16	16
16	12	18	0	10	20	11	20
17	11	16	10	0	16	10	14
13	19	12	20	16	0	18	15
18	15	16	11	10	18	0	17
20	15	16	20	14	15	17	0

b) Is P = NP ? prove it . why should we prove P = NP? **[6]**

Q6) a) Explain the traveling salesman problem as dynamic programming algorithmic strategy? Discuss the time and space complexities. Find out the solution for following example **[12]**

	City 1	City 2	City 3	City 4
Pers 1	0	10	15	20
Pers2	5	0	9	10
Pers3	6	13	0	12
Pers4	8	8	9	0

b) What is dynamic programming approach to solve the problem? Explain with suitable example. **[6]**

Q7) a) What is parallel algorithms? How does it different than its counterpart i.e. serial algorithm? Give suitable example. And Discuss various parallel computational model and how do they achieve the parallelism in the algorithmic design. **[8]**

b) Let there be n numbers (where $n = 2^l$) and there sum needs to be found out using multiple processor. Design the algorithm using parallel computation. **[8]**

Q8) a) Write a short note on "Prefix Computation". **[6]**

b) Solve the following problem of job sequencing with deadline using Greedy approach. Find out feasible and optimal solution. **[10]**

Let

N = 7, (p1, p2 ..... p7) = (3, 5, 20, 18, 1, 6, 30) and (d1, d2 ....., d7) = (1, 3, 4, 3, 2, 1, 2).

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Total No. of Questions : 8]

SEAT No. : ____

P2212

[Total No. of Pages : 2

[4165] - 404

M.E (Civil) (Construction & Management)

NEW CONSTRUCTION MATERIALS

(2008 Course) (Elective - I(a)) (Sem. - I)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Discuss types of flyash, manufacturing process, advantages and limitations as a construction material based on its physical, chemical properties. **[18]**

Q2) Explain in brief any 8 eco - friendly construction materials and where they are used. Explain concept of carbon credits. **[16]**

Q3) Explain any 4 smart materials in detail and explain their applications in construction. **[16]**

Q4) Explain manufacturing process of GFRC and explain various applications in construction. Explain properties of various types of glasses. **[4 + 6 + 6]**

SECTION - II

Q5) With neat sketches explain for SCC **[16]**

a) Flow table test.

b) J Ring test.

c) L box test.

d) All in one test.

Q6) Discuss various types of nuclear radiations, their effects, materials used to attenuate them (Properties required and the various types). **[5 + 3 + 8]**

P.T.O.

Q7) Explain properties (Physical and Chemical) for any 4 construction chemicals, in detail. **[16]**

Q8) What is FRP? Which different fibres are used? Why? Compare carbon fibres with other types. Explain any 2 applications of FRP in construction. **[1 + 3 + 6 + 8]**

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Total No. of Questions : 6] **SEAT No. :**

P2215 **[Total No. of Pages : 2**

[4165] - 437
M.E. (Civil) (Structures)
DESIGN OF COMPOSITE CONSTRUCTION
(2008 Course) (Elective - I(c)) (Sem. - I)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 2 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain concept of composite beam and concept of behaviour of composite beam. **[10]**

b) For fullinteraction case, determine the slip and slip strain values at mid span and support. Also draw the typical deflection, slip and slip for above condition **[15]**

Q2) a) Explain three structural elements of composite floors. State and explain the terms of the equation for neutral axis above the sheeting. **[10]**

b) Compare the stress block for concrete strength according to Eurocode and I.S. 456 - 2000 with help of figure and equations. **[15]**

Q3) A composite column of 350 mm × 350 mm × 3000 mm is cast with M30 concrete grade and ISHB 250 steel section. It consists of 4 bars of 14 mm diameter of Fe 415. If the design axial load is 1500 kN and design bending moment @xx and yy axis is 180 kNm and 0 kNm respectively, check adequacy of concrete encased composite section for uniaxial bending. For ISHB 250, f_y = 250 N/mm^2 and E_a = 200 kN/mm^2. M30, E_m = 31220 N/mm^2. Assume suitable partial safety factors. **[25]**

P.T.O.

SECTION - II

Q4) A composite truss has following parameters. **[25]**

a) Span = 11m.

b) Truss spacing = 3m

c) Slab thickness = 150 mm

d) Profile depth = 75 mm

e) Self weight of deck slab = 2.80 kN/m^2

f) Max. laterally un - restrained length in top chord = 1.5 m

g) Concrete grade = M20

i) Evaluate the - Pre composite stage loading.

ii) Design - the top chord.

iii) Design the bottom chord for composite stage.

iv) Determine the capacity of composite section in compression.

Q5) Explain design steps of multistoreyed residential composite building for following components - **[25]**

a) Composite Beam Design.

b) Design for compression member.

c) Vertical cross bracings.

Q6) State IRC specifications and code of practice for loads and composite constructions in bridges. Enlist detailed steps in composite deck slab design. **[25]**

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Total No. of Questions : 10]

SEAT No. :

P2222

[Total No. of Pages : 2

[4165] - 480

M.E. (Civil - Environmental Engg.)

ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT

(2008 Course) (Elective - I(C)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Your answers will be valued as a whole.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain following methodologies. **[18]**

a) Base line studies.

b) Scoping

c) Mitigation.

d) Screening.

Q2) a) Write about environmental indices & indicators for describing affected environment. **[10]**

b) Explain the life cycle assessment. **[6]**

Q3) Write in details about **[16]**

a) Interaction matrix methodologies.

b) Network methodologies.

Q4) a) What do you mean by air pollution? Discuss about identification of type & quantity of air - pollutants? **[9]**

b) Discuss about the air pollution dispersion potential? **[7]**

P.T.O.

Q5) Briefly discuss about existing noise levels & standards, assessment of impact & noise control practises? **[16]**

SECTION - II

Q6) a) Explain the mitigation measure to be taken up for reducing the impact on soils by industrial - activity. **[9]**

b) Give the general methodologies for the assessment of impacts on surface water environment. **[9]**

Q7) a) How to assess the impact significance on the soil due to project activity? **[8]**

b) State the water quality standards for surface & ground water? **[8]**

Q8) a) How do you consider socio - economic factors in an impact prediction study? **[8]**

b) Explain the following terms : **[8]**

i) Resettlement.

ii) Rehabilitation.

Q9) Write in details about any one case study related to Environmental Impact Assessment? **[16]**

Q10) a) State about rapid & comprehensive EIA. **[8]**

b) Write about post environmental monitoring. **[8]**

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Total No. of Questions : 8]

SEAT No. : ____

P2224

[Total No. of Pages : 3

[4165] - 533
M.E. (Mechanical) (Mechatronics)
DESIGN OF MACHINE ELEMENTS
(2008 Course) (Elective - I(a)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How do you classify the materials for engineering use? What are the factors to be considered for selection of materials for the design of machine elements? **[8]**

b) Explain the following heat treatment process : **[8]**

i) Normalizing

ii) Hardening.

Q2) a) A circular bar of 500 mm length is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 20 kN and a maximum value of 50 kN. Determine the diameter of bar by taking a factor of safety of 1.5, size effect of 0.85, surface finish factor of 0.9. The material properties of bar are given by : ultimate tensile strength of 650 MPa, yield strength of 500 MPa and endurance strength of 350 MPa. **[10]**

b) What is mean by endurance strength of the material? How do the size and surface condition of a component and type of load affect such strength? **[6]**

Q3) Two 35 mm shafts are connected by a flanged coupling. The flanges are fitted with 6 bolts on 125 mm bolt circle. The shafts transmit a torque of 800 Nm at 350 rpm. Assume the following safe stresses : **[18]**
Safe shear stress for the shaft material = 63 MPa
Safe stress for bolt material = 56 MPa

P.T.O.

Safe stress for cast iron coupling = 10 MPa
Safe stress for key material = 46 MPa
Calculate the following :

a) Diameter of bolts.

b) Thickness of flanges.

c) Key dimensions.

d) Hub length.

e) Power transmitted

Q4) a) A mild steel shaft transmits 20 kW at 200 rpm. It carries a central load of 900 N and is simply supported between the bearings 2.5 m apart. Determine the size of the shaft, if the allowable shear stress is 42 MPa and the maximum tensile or compression stress is not to exceed 56 MPa. **[8]**

b) A 45 mm diameter shaft is made of steel with a yield strength of 400 MPa. A parallel key of size 14 mm wide and 9 mm thick made of steel with a yield strength of 340 MPa is to be used. Find the required length of the key, if the shaft is loaded to transmit the maximum permissible torque. Use maximum shear stress theory and assume a factor of safety of 2. **[8]**

SECTION - II

Q5) a) What is the function of a spring? Explain what you understand by A.M. Wahl's factor and state its importance in the design of helical springs? **[8]**

b) A helical spring made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 kN/mm^2, find the axial load which the spring can carry and the deflection per active turn by considering the effect of curvature. **[8]**

Q6) a) A 150 mm diameter shaft supporting a load of 10 kN has a speed of 1500 rpm. The shaft runs in a bearing whose length is 1.5 times the shaft diameter. If the diametral clearance of the bearing is 0.15 mm and the absolute viscosity of the oil at the operating temperature is 0.011 kg/m.s, find the power wasted in friction. **[8]**

b) What is meant by hydrodynamic lubrication? Explain wedge film and squeeze film journal bearings? **[8]**

Q7) a) How do you express the life of a bearing? What is an average or median life? Explain the factors influencing the life of a bearing? **[10]**

b) Discuss the design procedure of spur gears. **[6]**

Q8) a) A bronze spur pinion rotating at 600 rpm drives a cast iron spur gear at a transmission ratio of 4 : 1. The allowable static stresses for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. The pinion has 16 standard 20° full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the standpoint of strength. **[10]**

b) Design a leaf spring for the following specifications : **[8]**

Total load = 140 kN;

Number of springs supporting the load = 4

Maximum number of leaves = 10

Span of the spring = 1000 mm

Permissible deflection = 80 mm

Allowable stress in spring material = 600 MPa

Take Young's modulus (E) = 200 kN/mm^2.

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Total No. of Questions : 8]

SEAT No. :

P2229

[Total No. of Pages : 2

[4165] - 640
M.E. (E & TC) (VLSI & Embedded Systems)
MACHINE INTELLIGENCE
(2008 Course) (Elective - I(c)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define linear separability? How is boundary region determined using linear separability concept? Give two examples of linearly inseparable problem. **[8]**

b) Given
$\delta(x) = \tanh(x)$
Show that $\delta(.)$ is monotonic increasing. What can you say about monotonicity of $\delta^{-1}(.)$? **[6]**

c) Calculate the output of neuron if net input is 0.64 & the activation function is **[4]**
   i) binary sigmoidal.
   ii) bipolar sigmoidal.

Q2) a) State the perceptron learning rule convergence theorem? Explain its significance? **[8]**

b) Giving the architecture, explain the training algorithm of an radial basis function network. **[8]**

Q3) a) Explain the concept of energy function of continuous & discrete Hopfield network. **[6]**

b) Explain the principal of back propagation? Derive the BPA for weight updation between the output layer & hidden layer? What is the significance of momentum term in Back propagation learning? **[8]**

c) Defferentiate between local minimax global minima. **[2]**

P.T.O.

Q4) a) Explain structure of SOFM? Its learning algorithm. **[8]**

b) Explain in detail with architecture the training algorithm of LVQ neural network. **[8]**

SECTION - II

Q5) a) What is the Fuzzy set and how does it difference from a crisp set? Explain minimum & maximum operation on fuzzy sets? **[8]**

b) Let X = [2,5] and Y = [1, 6] with fuzzy membership functions. **[8]**

$$\mu_x = \begin{cases} (x-2) & 2 \le x \le 3 \\ \dfrac{5-x}{2} & 3 \le x \le 5 \end{cases} \quad \&$$

$$\mu_y = \left\{ \begin{cases} (y-1)/3 & 1 \le y \le 4 \\ \dfrac{(6-y)}{2} & 4 \le y \le 6 \end{cases} \right\}$$

Q6) a) What is a membership function? How can a membership function be normalized? Explain different shapes of membership functions. **[8]**

b) What are the different gradients based optimization techniques used for determining search direction according to objective functions derivative information. Discuss any one in detail. **[8]**

Q7) a) Discuss in detail the principal component analysis networks. List the steps involved in the development of neural network for principal component analysis. **[8]**

b) Draw and explain the adaptive Neuro - fuzzy inference system architecture for sygeno fuzzy model where weight normalization is performed at the very last layer. **[8]**

Q8) Write short notes on (any Three) **[18]**

a) Performance of computer Vs Biological neural network.

b) Genetic algorithm.

c) K - means clustering algorithm.

d) Learning form reinforcement.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P2235

[Total No. of Pages : 2

[4165] - 677
M.E. (Electronics) (Digital Systems)
WIRELESS & MOBILE TECHNOLOGIES
(2008 Course) (Sem. - I) (Elective - I(c))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any Three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Name the main elements of the GSM system architecture and describe their functions. What are the advantages of specifying not only the radio interface but also internal interfaces of the GSM system? **[16]**

Q2) a) How does GSM convert 456 bits of speech, data or control signals into a normal burst of 156.25 bits? **[8]**

b) Why is the international availability of the same ISM band important? **[8]**

Q3) What is the difference between band - splitting and underlay -overlay techniques for increasing the capacity of cellular networks? What is the effectiveness of each in improving the capacity? How do they differ from one another? **[17]**

Q4) Why is mobility restricted using WLANs? What additional elements are needed for roaming between networks, how and where can WLANs support roaming? In your answer, think of the capabilities of layer 2 where WLANs reside. **[17]**

SECTION - II

Q5) a) Why is routing in multi - hop ad - hoc networks complicated? What are the special challenges? **[8]**

b) Show the interactive of mobile IP with standard TCP. Draw the packet flow from a fixed host to a mobile host via a foreign agent. **[8]**

P.T.O.

Q6) What is the difference between WAP service indication and service loading? What applications could use these services? What is a push good for anyway? **[16]**

Q7) a) What are the responsibilities of the MAC management sublayer in 802.11? **[8]**

b) Compare IEEE 802.11, HIPERLAN 2, and Bluetooth with regard to their ad - hoc capabilities. Where is the focus of these technologies? **[9]**

Q8) Discuss in detail about the request - to - send / clear - to - send (RTS/CTS) mechanism. **[17]**

♦♦♦♦

Total No. of Questions : 10]

SEAT No. : ____

P2238

[Total No. of Pages : 3

[4165] - 693

M.E (E & TC) (Communication Networks)

MICROWAVE & ANTENNA THEORY

(2008 Course) (Elective - I(a)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of Electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain the principle of operation of Traveling wave tube (TWT) **[8]**

b) Discuss Transferred Electron Effect in Gunn oscillators and explain working of Gunn diode. **[8]**

Q2) a) A Reflex Klystron operates under following conditions : **[8]**

V_0 = 600 V L = 1 mm

R_{sh} = 15 Kohm e/m = 1.759×10^{11} (MKS System)

f_r = 9 GHz

The tube is oscillating at f_r at the peak of the n = 2 mode or (1¾) mode. Assume that transit time through the gap and beam loading can be neglected.

i) Find the value of the repeller voltage V_r.

ii) Find the direct current necessary to give a microwave gap voltage of 200 V.

iii) Calculate electronic efficiency under this condition.

b) Explain the working of Reflex Klystron oscillator and different modes for the Reflex Klystron. **[8]**

Q3) a) Explain the principle of operation of IMPATT diode used at microwave frequencies. **[8]**

b) Discuss the following with reference to Magnetron : **[8]**

i) Cross electric and magnetic Field.

ii) RF structure.

P.T.O.

Q4) a) Derive S matrix of a four port Directional Coupler. **[8]**

b) Discuss working of Microwave Isolator. **[8]**

Q5) a) Design Digital Telemetry Microwave Link with following parameters : **[12]**

i) Application : Video Transmission at 7 Mbps.

ii) Link distance : 25 Km

iii) Frequency : 5 GHz.

iv) FSK receiver sensitivity : -80 dBm

v) Atmospheric loss : 0.05 dB/Km.

vi) Connector and cable loss : 6 dB(total)

vii) Gain of transmitting horn antenna : 18 dB.

viii) Gain of receiving microstrip patch Antenna : 3 dB

Calculate :

1) Path Loss for the link.

2) Transmitted power in watts and dBm

Calculate dimensions for microstrip patch & horn antennas used in the link.

b) What are the harmful effects of uncontrolled microwave frequency radiation on the human being. **[6]**

SECTION – II

Q6) a) A microstrip patch antenna with overall dimensions of L = 0.906 cm and W = 1.186 cm, substrate with height h = 0.1588 cm and dielectric constant , is operating at 10 GHz frequency, Find : **[8]**

i) The input impedance.

ii) The position of the inset feed - point where the input impedance is 50 ohms.

b) Define the terms with reference to antenna with necessary mathematical equations : **[8]**

i) Bandwidth.

ii) VSWR.

iii) Radiation power density.

iv) Radiation Intensity.

Q7) Explain the following antennas in detail : **[16]**

a) Horn Antenna.

b) Parabolic Reflector.

Q8) a) Discuss the different MMIC fabrication techniques. **[8]**

b) Explain the working of high electron mobility transistors (HEMT) used at Microwaves. **[8]**

Q9) a) Discuss the feeding methods for microstrip patch antenna. **[8]**

b) A parabolic reflector antenna has diameter of 1 meter. Calculate gain and half power beamwidth at 11 GHz with spillover efficiency as 85%. Suggest suitable application for this antenna. **[8]**

Q10) Write notes on : **[18]**

a) Linear Antenna array.

b) PIN Diode.

c) Multi cavity Klystron amplifier.

♦♦♦♦

Total No. of Questions : 8]

SEAT No. : ____

P2252

[Total No. of Pages : 2

[4165] - 918
M.E (Polymer Engineering)
POLYMER REACTION ENGINEERING
(2008 Course) (Elective - I(a)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Solve any three questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic table, electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Explain the significance of the following properties of a polymer in its processing : **[12]**

i) Weight Fraction.

ii) First moment of Pj's.

iii) Number Average Degree of Polymerization.

iv) Weight Average Degree of Polymerization.

v) Number Average Molecular Weight.

vi) Weight Average Molecular Weight.

b) Calculate the Polydispersity Index of the mixture composed of 150 mols of 1000 monomer lengths and 350 mols of 100 monomer lengths. **[4]**

Q2) Discuss and derive in detail the governing equation of Batch reactor for carrying out Free Radical Polymerization. Explain how Instantaneous Number Degree of Polymerization can be estimated. Also discuss how quality of a polymer product formed can be determined from your analysis. **[18]**

Q3) a) Derive total concentration of the Free Radicals (R_j) in terms of initiation rate (r_i) in free radical polymerization. **[8]**

b) Explain Auto Acceleration Effect in free radical polymerization. **[8]**

P.T.O.

Q4) Explain effect of RTD behavior of a reaction vessel on quality of the polymer product obtained. Give examples **[16]**

SECTION - II

Q5) a) Derive Copolymer Equation based on reactivity ratios of monomers. **[8]**

b) Write a note on determination of Reactivity Ratios of monomers. **[8]**

Q6) Describe the Three Stages of Emulsion Polymerization needed to understand its kinetics. Give the mathematical treatment wherever possible. **[18]**

Q7) a) Draw process flow sheet for the production of polystyrene and explain the process in detail. **[8]**

b) Write a note on interfacial polymerization. **[8]**

Q8) Discuss Chiu's model accounting for diffusion effects in step growth polymerization. **[16]**

♦♦♦♦

Total No. of Questions : 6] **SEAT No. :**

P2255 **[Total No. of Pages : 2**

[4165] - 937

M.E (Printing Engineering and Graphic Communication)

PRINTING & PACKAGING MATERIALS

(2008 Course) (Elective - I(b)) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain materials used for pre - press films, plates, chemicals and light sources. **[9]**

b) Explain the workflow of Gravure Cylinder preparation. **[16]**

Q2) a) Explain surface and optical properties of a substrate on Printability. **[9]**

b) What are chemical properties of paper? **[8]**

c) Write a short note on Ink and Paper interaction. **[8]**

Q3) a) Explain the identification tests for polyethylene. **[16]**

b) State various factors used for substrate selection of package. **[9]**

SECTION - II

Q4) a) Mention following tests for a substrate : (Any Four) **[16]**

i) Bursting Strength.
ii) Tensile Strength.
iii) Rub resistance.
iv) Drop Test.
v) Bond Strength.

b) Explain in detail end - use application tests for a package. **[9]**

P.T.O.

Q5) a) State and explain various ink drying mechanisms with suitable diagrams. **[9]**

b) Explain various types of vehicles used in printing process. **[8]**

c) Define and explain surface energy. **[8]**

Q6) a) Explain processes involved in testing of ink supplied for printing applications. **[16]**

b) State the causes and remedies of the following :(Any three) **[9]**

i) Misting.

ii) Print Mottle.

iii) Drying in

iv) Haze

v) Fisheye

♦♦♦♦

Total No. of Questions : 8]

SEAT No. :

P1811

[Total No. of Pages : 2

[4165] - 407

M.E. (Civil) (Construction & Management)

CONSTRUCTION SAFETY

(2008 Course) (Elective - I (d)) (Sem. - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Question 1 and 5 are compulsory. Out of remaining solve any two questions from each section.***
2) ***Numbers to the right indicates full marks.***
3) ***Neat figures are drawn wherever required.***
4) ***Answers to each section must be written in separate answer books.***
5) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Frame a safety policy for segmental bride construction on busy road. **[10]**

b) You are the safety officer appointed on a multistoreyed construction site. Design the daily / weekly / monthly reports to be generated and sent to the management. **[8]**

Q2) A bridge is under construction. Prepare the safety audit for the same. Assume suitable data. **[16]**

Q3) a) List down the direct and indirect cost associated to the accident. Give suitable example. **[8]**

b) Write a detailed note on Personal Protective equipments. **[8]**

Q4) a) Give the responsibilities to be shared by the junior site engineer. **[8]**

b) What are the precautions to be taken while operating tower crane? **[8]**

P.T.O

SECTION - II

Q5) Give the first aid to be given in case of following accidents: **[18]**

a) Falling from height.

b) Electric shock.

c) Skin irritation while concreting.

d) Eye irritation while welding.

Q6) a) A worker wearing a helmet was hit by a hammer which felt on his head. He was unconscious for 1 hour. Calculate the total time lost on site. Also calculate the indirect cost of accident. Assume suitable data. **[8]**

b) Write short notes on: **[8]**

i) Operational Health hazard.

ii) Group policy for labours.

Q7) a) List down the common hazards while doing the field operations for shaft construction. **[8]**

b) Design an incentive scheme to promote safety. **[8]**

Q8) a) Write down the points covered in training programs related to safety on construction of multistoried building for **[8]**

i) Unskilled labours.

ii) Site supervisors / engineers.

b) What are various clauses included in Workman's compensation act ? Explain in brief. **[8]**

Total No. of Questions : 6]

SEAT No. :

P1814

[Total No. of Pages : 2

[4165] - 435
M.E. (Civil) (Structures)
ADVANCED DESIGN OF CONCRETE STRUCTURES
(2008 Course) (Elective - I (a)) (Sem. - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any two questions from each Section.***
2) ***Answers to two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IS 456, IS 1343, IS 3370 & non programmable calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data if necessary.***

SECTION - I

Q1) a) Draw yield lines for the following. **[8]**

i) Triangular slab with fixed supports on two adjacent side with one side unsupported.

ii) Rectangular slab fixed at two adjacent sides, other two sides free and column at the corner at the junction of free sides.

b) Design a RCC slab for a circular hall of diameter 5.6 m using Yield Line Theory. Assume the peripheral support thickness 300 mm, The slab is simply supported Use M20 Fe500 take Live load = 4.5 kN/m^2 & floor finish load = 1.2 kN/m^2. Draw reinforcement details. **[10]**

c) Explain Hillerborgs strip method with sketches. **[7]**

Q2) a) Design a grid slab for a floor of hall 12 x 15 m c/c having square grid of 1.5 m. Use M25 Fe500 take Live load = 4.5 kN/m^2 and floor finish load = 1.2 kN/m^2 . Apply the required check & draw reinforcement details. **[15]**

b) Design a flat slab for a hall with column spacing 6.2 m x 6.2 m c/c. The size of the column is 500 mm x 500 mm each Use M20 Fe500 take Live load = 4.5 kN/m^2 & floor finish load = 1kN/m^2. Draw reinforcement details. **[10]**

P.T.O

Q3) Design a staging for circular type ESR for 3 lakh liters with staging height 12m using M25, Fe500 in earthquake zone III. Safe bearing capacity is 180 kN/m^2 Design of container is not required. Assume approx dimension of container, wall, top, bottom slab thickness, beams sizes & number of columns. Design must include Calculations of vertical loads and horizontal force calculations Design the bracings, columns and foundations. Draw the reinforcement details. **[25]**

SECTION - II

Q4) Design deep beam of a hall for flexure and shear for the following

Clear span = 5m, width of support = 450mm, working UDL on the beam 1200kN/m. Take the total depth of beam = 3.6 m Use M40 & Fe500. Show all Analysis and Design calculations & draw the reinforcement details. **[25]**

Q5) a) A two span prestressed concrete continuous beam ABC having cross section 230 x 750 mm simply supported at A & C and continuous over B with M45 and multistrand cables 2 Nos 12T13 with fy = 1900 N/mm^2 stressed to 75% of fy, each span is of 14m, superimposed load on both the spans 13.6 kN/m, Assume 15% loss of prestress. **[18]**

i) Determine primary, secondary moment at support at prestress and dead load.

ii) Calculate shift, and stress in extreme fibers at working load.

iii) Draw the resultant line of thrust at working load.

b) Write detailed note on shear wall. **[7]**

Q6) Design post tensioned prestressed concrete slab for a floor for the following Flat interior panel of 8m x 8m, live load on slab 4.5 kN/m^2, floor finish load on slab = 1 kN/m^2, concrete grade M50 HT steel is S3 cables of cross sectional area of each strand 150 mm^2 with fy = 1900 N/mm^2 Design cables to serve as beams. Assume 3 panels in each direction (floor size 24m x 24m) width of the beam on periphery of floor 600mm and column size 600mm x 600mm. Design must include check fiber stresses in concrete and deflection. Draw sketches showing cable profiles. **[25]**

Total No. of Questions : 6]

SEAT No. :

P1815

[Total No. of Pages : 3

[4165] - 436
M.E. (Civil) (Structures)
STRUCTURAL DESIGN OF CONCRETE BRIDGES
(2008 Course) (Elective - I (b)) (Sem. - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any Two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IRC - 5,6, 18,27,45,78 & 83 codes, IS 1343, IS 456-2000 is allowed.***
5) ***Mere reproduction of theory from IS or IRC codes as answer will not get full credit.***
6) ***Neat diagrams must be drawn wherever necessary.***
7) ***Assume any other data if necessary.***

SECTION - I

Q1) Write detail notes on with appropriate sketches.

a) Structural forms of bridge decks. **[9]**

b) IRC standards for live load on different road bridges. **[8]**

c) Planning of bridges. **[8]**

Q2) a) Design the culvert with the data: **[17]**

Clear span of the culvert = 5.6m

Clear carriage way width = 7.5m

Size of kerb = 150mm x 600mm

Average thickness of wearing coat 100mm

Use material M20, Fe500

Loading class AA

Draw the cross section showing details of reinforcement at mid-span and at junction of the slab are kerb.

b) Write detail notes on with appropriate sketches on skew bridges. **[8]**

P.T.O

Q3) Design slab, cross girder and main girder of RCC T-beam and slab girder deck for the crossing of a national highway. The carriage way is 7.5m and the footpaths of 1.2m on either side. The span of the beam is 12m. The cross section is as shown in figure Fig 1 consider interior panel of the deck slab. Place the loads so as to produce critical SF and BM in the deck slab and girder. Draw neat sketches showing details of reinforcement in plan and elevation. Take the spacing of cross girders as 3m C/C. Assume suitable cross section of the curbs. Use M25 Fe500. **[25]**

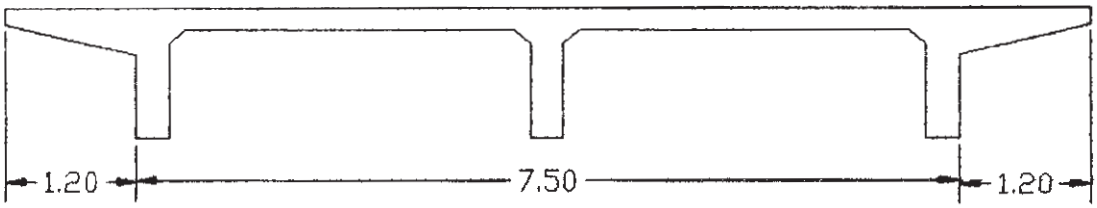

Fig1 (All dimensions are in meters)

SECTION - II

Q4) a) Necessity and functions of expansion joint. **[8]**

b) Differentiate between rigid frame bridges are different from simply supported bridges with appropriate explanatory sketches. **[8]**

c) Describe different factor affecting the design of rigid frame bridge. **[9]**

Q5) a) Write a short note wing wall. **[5]**

b) Design a reinforced elastomeric bearing at a pinned end of a plate girder of a bridge with following data. **[20]**

Maximum vertical load = 1050 kN

Dynamic vertical load = 100 kN

Transverse lateral load = 50 kN

Longitudinal load = 50 kN

Longitudinal total translation 12 mm

Rotation at support 0.003°

Shear modulus of elastomeric bearing = 1.2 N/mm^2

Allowable comp. stress for concrete = 8 N/mm^2

Allowable comp. stress for elastomer = 10 N/mm^2.

Q6) a) List merits and demerits pile foundation over well type used for bridges. **[5]**

b) Design wall type RCC pier for the following: **[20]**

Top width of pier = 1m with semicircular ends

Length of pier = 6m excluding the semicircular part

Height of above footing = 10m

HFL above the top of footing = 8m

Total DL Reaction = 1600 kN

Total LL Reaction = 1000 kN

Tractive force = 120kN

C/C distance of bearing on either side of centre line of pier = 1m

BM in traffic direction due to unequal DL & LL = 600 kN-m

Material of pier and footing = M30 & TMT steel

Safe bearing capacity = 180 kN/m^2

Velocity of water current = 3m/s consider the cross current also

Design the RCC footing and reinforcement in pier, check the stresses at the bottom of pier.

Total No. of Questions : 6]

SEAT No. :

P1816

[Total No. of Pages : 3

[4165]-439

M.E. (Civil - Structure)

ADVANCED DESIGN OF METAL STRUCTURE

(2008 Course) (Elective - II (a) (Sem. - I)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 2 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steel tables, IS codes is allowed.***

SECTION - I

Q1) a) Explain various forces to be considered in design of hoarding structures. **[4]**

b) Discuss various supporting systems required/used for hoarding and their suitabilities. **[6]**

c) A hoarding of 2 m × 5 m size is to be provided for advertizing purposes in Pune, close to Express-way. The centre of hoarding is 15 metres above the adjacent ground level. Assume suitable sizes for the framework of hoarding. Design the suitable supporting system for the hoarding.**[15]**

Q2) a) Explain open web girder. How are they fabricated? **[7]**

b) Design a castellated section to carry uniformly distributed load of 15 kN/m over a simply supported span of 10 metres. Assume factor of safety of 1.5. Assume any other necessary data if required but state it clearly.**[18]**

Q3) a) Write down the merits and demerits of Alluminium as structural engineering material in comparison with steel as structural engineering material. **[10]**

b) Design an Indian Standard Alluminium equal leg angle (ISALE) stunt to carry an axial load of 200 kN. The effective length of the stunt is 1.6 m. Use single angle section. Assume factor of safety of 2. **[15]**

P.T.O.

SECTION - II

Q4) A Schematic arrangement of microwave tower is as shown in fig.4.

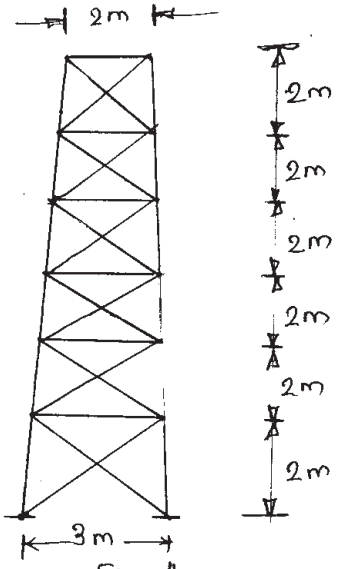

Fig 4

a) Draw free body diagram of pin jointed structure showing nodal loads. Assume loads for accessories installed on tower, along with usual loads. **[7]**

b) For arriving at free body diagram show detailed load calculations. **[10]**

c) Design foundation bolt for this tower structure. **[8]**

Q5) a) Enlist the classification and types of structural tubes. **[5]**

b) Design the welded joint of rectangular tubes for the joint as shown in fig. 5.b. **[10]**

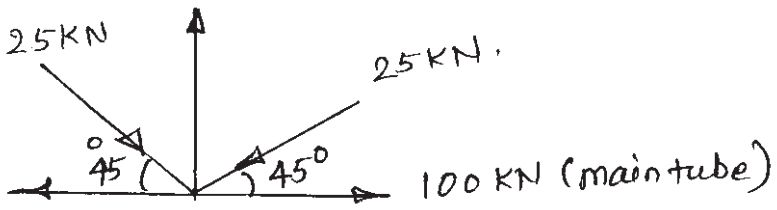

Fig 5.b.

c) Design the section for main tube and inclined tube using square tube/ rectangular tube section. **[10]**

Q6) a) Explain light gauge structural members with reference to manufacturing process, types of sections, advantages. **[8]**

b) Determine allowable load per meter. On a beam having cross section as shown in fig. 6.b. The beam has effective span 2.0 m. Also find deflection at allowable load. The beam is laterally supported.

Take y_{st} = 232 MPa, permissible $\sigma_{bt} = 125\,\text{MPa}$. **[17]**

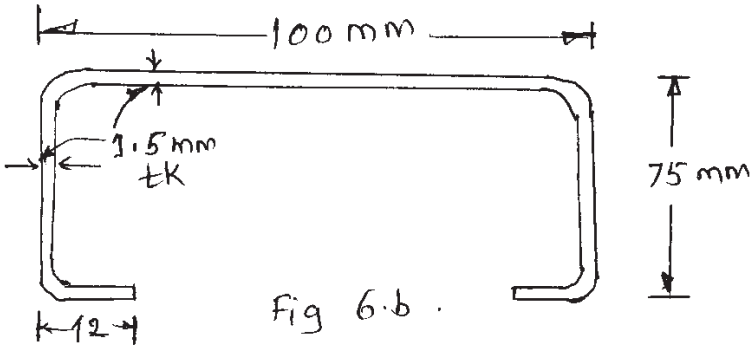

Fig 6.b.

✷✷✷

Total No. of Questions : 8]

SEAT No. :

P1818

[Total No. of Pages : 4

[4165]-445

M.E. (Civil) (Construction & Management)

OPERATIONS RESEARCH

(2002 & 2008 Course) (Sem. - II)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Solve by Big M or Two Phase Method. **[12]**

Minimize $Z = 3x_1 + 2x_2$

Subject to

$$7x_1 + 2x_2 \geq 30$$
$$x_1 + x_2 \geq 5$$
$$2x_1 + 8x_2 \geq 16$$
$$x_1, x_2 \geq 0$$

b) Solve the problem in Q1 (a) above graphically. **[4]**

Q2) The unit cost of supplying construction material from four sources to three sites is given below, along with the availability at each source and the demand at each site. **[16]**

Source	Site			Supply
	1	2	3	
A	2	6	8	40
B	4	6	4	80
C	2	4	10	60
D	8	2	18	20
Demand	60	100	40	

P.T.O.

a) Find the initial feasible solution by VAM.
b) Using the solution obtained by VAM, find the distribution policy which will minimize the cost of transportation.

Q3) a) In a project, four buildings are to be constructed. Five contractors have tendered for all four buildings, however only one building can be given to one contractor. Find the optimal assignment which will minimize the total cost. Which contractor does not get any building? **[10]**

Contractor	Buildings			
	A	B	C	D
1	15	10	12	9
2	13	14	11	10
3	11	10	14	15
4	10	13	9	12
5	12	11	10	13

b) Explain the algorithm of Lagrange Multiplier Technique. **[6]**

Q4) a) Use Fibonacci method to Maximize **[9]**
$Z = 24x - 0.2\,x^2$ in the range (20 to 120) to an accuracy of 0.1%. Carry out computations for the first 4 stages only.

b) Use Newton's method to maximize **[9]**

$$Z = 8x_2 + 2x_1x_2 - 3x_1^2 - 3x_2^2$$

Take starting point as (0, 0)

SECTION - II

Q5) a) A construction equipment is to be transported from destination 1 to destination 8. It can be transported through various routes. The distance of travel through the routes from place *i* to place *j* are given below :**[12]**

i–j	Distance in km
1–2	10
1–3	6
1–4	8
2–5	12
2–6	4
3–6	14
3–7	8
4–7	10
5–8	8
6–8	2
7–8	6

Use dynamic programming to find the route which will be covered through the shortest distance.

b) What are the civil engineering applications of dynamic programming? **[4]**

Q6) A sample of 100 arrivals at a reservation counter is found to be according to the following distribution. **[18]**

Inter arrival time in min.	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Frequency	4	2	9	6	15	20	25	11	2	6

A study of service time reveals the following distribution.

Service time in min.	0.5	1.0	1.5	2.0	2.5	3.0
Frequency	16	10	5	12	32	25

Estimate the average waiting time and percentage waiting time of the persons, Average idle time and percentage idle time of the server, by simulating 10 arrivals. Use the following random numbers.

Arrival	26	93	11	76	86	17	06	83	21	49
Service time	60	97	79	17	88	14	74	42	75	10

Q7) a) What are the direct costs and indirect costs in a construction project? **[6]**

b) Following data pertains to two projects A & B. If the two projects are to be taken up for development, rank the projects based on B/C ratio and NPV. **[10]**

Particulars	A	B
Investment in Rs. crore	25	27
Annual benefits	4	4.5
Project life years	15	12
Interest rate (%) per annum	10	10

Q8) a) The payoff matrix to A for a two person, gro-sum game is given below. Determine the optimal strategies for A & B and the value of the game. **[10]**

	B_1	B_2	B_3	B_4
A_1	140	–10	68	80
A_2	–4	40	44	40
A_3	120	–20	68	70
A_4	–6	35	44	39

b) Explain the various replacement models. **[6]**

Total No. of Questions : 8]

SEAT No. :

P1820

[Total No. of Pages : 2

[4165]-460
M.E. (Civil) (Hydraulics)
IRRIGATION AND DRAINAGE
(2008 Course) (Elective - III (a)) (Sem. II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various soil factors that influences storage of water in the soil plant system. **[8]**

b) Find field capacity of a soil if root zone depth = 2.5 m **[8]**
Existing water content = 7.5%
Dry density of soil = 1.5 gm/cc
Water applied to the soil = 600 m^3
Water losses due to evaporation = 15%
Area of plot = 1000 sq.m.

Q2) a) Determine consumptive use and net irrigation requirement for a crop from the data as under. **[8]**

Period	Oct.	Nov.	Dec.	Jan.	Feb.
Pan Evaporation Ep(cm)	5	10	9	8	4
Cv coefficient - K	0.5	0.55	1.0	0.9	0.7
Effective rainfall Re (cm)	2	1.5	1	0.5	0.2

b) Explain various factors affecting evaporation and methods used to control evaporation from reservoirs. **[10]**

P.T.O.

Q3) Write short notes on (any four) : **[16]**

a) Salinity problem and its management.

b) Saline soil and alkaline soil.

c) Reclaimation of saline soil.

d) Salinity concentration of soil solution.

e) Classification of irrigation water based on salt concentration.

Q4) a) What are the advantages and disadvantages of drip irrigation system. **[8]**

b) Explain - Design concepts of drip irrigation system with a layout. **[8]**

SECTION - II

Q5) a) Draw a neat line sketch of a lift irrigation scheme and state the function of various component parts of the scheme. **[10]**

b) What is the criteria for the design of lift irrigation scheme. **[6]**

Q6) a) Explain merits and demerits of sprinkler irrigation. **[8]**

b) Draw and explain various types of sprinklers. **[8]**

Q7) Write short notes on : **[18]**

a) Canal outlets for flow regulation.

b) Warabandi.

c) Rotational method of application of water to fields.

Q8) a) What is importance and objective of land drainage? Under what conditions deep tile drainage is preferred to open drainage system. **[8]**

b) Discuss various layouts of drainage system. **[8]**

Total No. of Questions : 6]

P1822

SEAT No. : [ ]

[Total No. of Pages : 2

[4165] - 471
M.E. (Civil - Structures)
BIOMATERIALS & BIOMECHANICS
(2008 Course) (Elective - IV(a)) (Sem. - II)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Draw neat sketches to illustrate your answer.***

SECTION - I

Q1) a) What are Biomaterials. Write their broad classification & explain each. **[8]**

b) How elastic properties of biomaterial are represented. Explain various viscoelastic models. **[9]**

c) What are replacement biomaterials. What are their essential properties, list or tabulate each property. **[8]**

Q2) a) Explain application of ceramic biomaterials; what are the properties of ceramic biomaterials. **[8]**

b) What are metallic biomaterials, what are its applications, what are their essental qualities & engineering properties. **[9]**

c) What is deterioration of ceramic in biological environment. **[8]**

Q3) a) Explain in brief use of polymer biomaterials. **[8]**

b) Write a note on polymer composite used as biomaterial. **[7]**

c) What are engineering properties of polymer based biomaterials. **[5]**

d) Write a note on an isotrophy of composite. **[5]**

P.T.O.

SECTION - II

Q4) a) What are the functions of articular cartilage? **[5]**

b) Write down the mechanical properties of cartilage. **[8]**

c) Explain with neat diagram the composition of bone and comment on the mechanical properties of bone. **[12]**

Q5) a) Draw a neat figure of hip joint and explain its mechanics. **[10]**

b) What are the problems arising in hip joint prosthesis fixation? Explain the possible solutions for the above problems. **[15]**

Q6) a) What is gait analysis? **[3]**

b) What data can be collected from gait studies? **[5]**

c) Write down the different systems required for collection of data. **[7]**

d) Explain the design cycle for introduction of new materials for artificial fixation devices. **[10]**

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Total No. of Questions : 6]

SEAT No. :

P1823

[Total No. of Pages : 2

[4165]-472

M.E. (Civil - Structure)

MECHANICS OF MODERN MATERIALS

(2008 Course) (Elective - IV (b)) (Sem. - II)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Assume suitable data, if required.***
4) ***Neat diagram be drawn to illustrate your answer.***
5) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Define structural composites and state their composition. **[7]**

b) State advantages of composite material over monolithic material. **[8]**

c) Explain limitations of composite material. **[10]**

Q2) a) Define isotropic, anisotropic and orthotropic materials. **[6]**

b) State the response of above materials under uniaxial normal loading and pure shear loading. **[10]**

c) What is prepregs? Explain hot melt system for manufacturing of prepregs. **[9]**

Q3) a) State various methods of manufacturing of composites materials and explain autoclave moulding in details. **[12]**

b) State various lamina failure theories. Explain in details energy based interaction theory (TSAJ-HiLL). **[13]**

SECTION - II

Q4) a) What are basic assumptions while studying elastic properties of composite laminate. **[6]**

b) Explain with neat sketch symmetric angle ply laminate & symmetric cross play laminate. **[6]**

P.T.O.

c) Determine the stiffness matrix for a [+ 45/–45/–45/+45] symmetric angle ply laminate using 0.25 mm thick unidirectional A S/3501 graphite/epoxy laminate laid in X-Y plane & thickness in Z direction. E_x = 138 GPa, E_y = 9 GPa, G×y = 6.9 GPa, υ_{xy} =0.3. **[13]**

Q5) a) Write a note on evaluation of laminate Hygrothermal Expansion Coefficient. **[8]**

b) Write equations to establish Hygrothermal stresses in laminate with in plane loading. i.e laminate laid in X-Y plane & loading also in X-Y plane. **[8]**

c) Write design steps & methodology for design of pressure vessel using composite laminate as pressure retaining material. **[9]**

Q6) a) Define toughness index. Compare load-deflection behaviour of composite laminate to non composite one when subjected to bending. **[8]**

b) Indicate in brief with figure effect of fibre volume on tensile properties of composite laminate. Explain ranges of stress-strain behaviour with high fibre volume. **[9]**

c) Enlist the type of test to carry out measurement of constituent material properties and basic engineering properties of composites. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1824

[Total No. of Pages : 2

[4165] - 478

M.E. (Civil) (Environmental Engineering)

AIR AND WATER QUALITY MODELLING

(2008 Course) (Sem. - I) (Elective - I (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section ie Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the importance of model building and write the steps in the model development. **[8]**

b) Explain the equilibrium principle. **[8]**

Q2) a) Discuss the historical developments of Water quality models. **[8]**

b) Discuss the modification to Streeter – Phelps equation. **[8]**

Q3) a) Explain Streeter – Phelps equation to determine the D.O. concentration at the downstream. **[8]**

b) What are different water quality models? Explain any one model with its assumptions and reliability. **[8]**

Q4) a) Discuss the various categories of Water quality index and explain in detail how you would calculate water quality index for Industrial and municipal wastewater. **[9]**

b) Discuss the various categories of Air quality index and explain in detail how you would calculate Air quality index for ambient air. **[9]**

P.T.O

SECTION - II

Q5) a) Derive Gaussian plume equation. **[8]**

b) Discuss the effect of velocity and topography on transport and diffusion of pollutants. **[8]**

Q6) a) How do you assess the performance of the air quality model? Explain any four performance evaluation statistics. **[8]**

b) Enlist different types of plumes and explain special features of each plume type with sketches. **[8]**

Q7) a) Discuss the salient features of multiple cell model. **[8]**

b) What are different types of Air quality indices? How are they evaluated? What is the significance of extreme values? **[8]**

Q8) Write short note on ANY THREE: **[3 x 6 = 18]**

a) Self cleansing Mechanism of Atmosphere.

b) Calibration and verification of model.

c) Importance of Air Quality Models.

d) Lake water quality models.

e) Combined water quality index.

Total No. of Questions : 8]

SEAT No. :

P1826

[Total No. of Pages : 3

[4165]-482

M.E. (Civil) (Environmental Engineering)

PRINCIPLES AND DESIGN OF BIOLOGICAL TREATMENT SYSTEM

(2008 Course) (Elective - II (b)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section ie Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Differentiate between : **[8]**

i) Attached growth process.
ii) Suspended growth process.

b) Explain the concept of Reactor? Discuss the Plug flow reactor and completely mixed Batch reactor. **[8]**

Q2) a) Discuss sampling of wastewater in detail. Also elucidate any one method of wastewater Flow Measurement. **[8]**

b) What is Oxygen Demand? Enlighten various Oxygen Demands in wastewater. **[8]**

Q3) a) Illustrate various functions of Primary sedimentation tank. Also discuss design criteria for PST. **[8]**

b) Discuss various techniques for control of odour and volatile organic compounds. **[8]**

P.T.O.

Q4) a) Design a primary sedimentation tank to treat domestic wastewater flow of a town having 5,00,000 population. Use following data : **[12]**

i) Average rate of water consumption = 250 lpcd.

ii) Wastewater generation rate = 80% of the water supplied.

iii) Suspended solids in wastewater = 250 mg/l.

iv) BOD_5 at 20ºC = 200 mg/l

v) Surface loading rate SLR:

1) At daily average flow = 40 m^3/m^2-d.

2) AT peak flow = 100 m^3/m^2-d

vi) Detention time = 2.0 Hrs.

b) Discuss disinfection with chlorine compounds. **[6]**

SECTION - II

Q5) a) Why does recycle of a portion of the settled effluent from an activated sludge reactor result in an increase in the average residence time of water in the reactor? **[8]**

b) How do operating conditions of an activated sludge basin generally influence the settleability of sludge in the secondary clarifier? **[8]**

Q6) a) Discuss why the sludge age used in calculations is not the actual residence time of sludge in the system (Aeration basin and clarifier). **[8]**

b) Discuss the operational problems and their solutions for trickling filters. **[8]**

Q7) a) For an SBR process, the sludge takes 45 min. to settle and the depth of liquid in the reactor is 40% of the depth of reactor after drawoff to prevent disturbing the settled sludge.

The drawoff period takes an additional 20 minutes after the settle phase. An ideal time of 10 minutes is to be allowed. What is the required volume of each of the tanks in 2-tank and 3-tank SBR system to handle a flow of 55000 m^3/day to provide a react time of 60 minutes. **[12]**

b) Discuss the operational and maintenance problems of sewage treatment plants and its trouble shooting. **[6]**

Q8) a) How much surface area is available on an RBC with a 9 mt shaft supporting 2.5 mt diameter disks spaced at 3.5 cm (centre to centre) with a thickness of 1.4 cm? What flow rate could be handled for an influent BOD_5 concentration of 150 mg/L to achieve a maximum loading of 1.2 kg soluble $BOD_5/100\ m^2/\partial$? **[8]**

Determine the size of the tank assuming 40% submergence of the media.

b) Explain the working principle of VASB process with neat diagram and discuss the modifications of VASB process. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1829

[Total No. of Pages : 2

[4165]-486

M.E. (Civil) (Environmental Engineering)

SOLID WASTE AND HAZARDOUS WASTE MANAGEMENT

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section ie Section - I and Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Which of these hazard is the greatest public-health risk? Discuss. **[9]**

i) Toxic waste sites.
ii) Oil spills in waterways.
iii) Pesticide residues on food.

b) A city has generated several truckloads of municipal solid waste that contains 100 ppm of toxic heavy metals. Discuss the relative risk to the environment of sending this waste to a landfill versus incinerator with ash being land filled. **[9]**

Q2) Describe the types of energy recovery that are possible from the thermal processing of hazardous waste. **[16]**

Q3) a) Discuss the manifest system for the disposal of hazardous wastes. **[8]**

b) Describe technical project consideration in the design of a hazardous waste landfill. **[8]**

Q4) a) Discuss the factors that could influence leachate generation and the potential detrimental impact on water resources at the landfill site. **[8]**

b) Final cover over a hazardous waste landfill is topically installed to minimize the environmental risk by addressing potential contaminant pathways. Indentify four of the contaminant pathways mitigated thorough the use of a cover system. **[8]**

P.T.O.

SECTION - II

Q5) As a consulting engineer, you have been commissioned to develop a comprehensive solid waste system for a community, interested in achieving a greater recovery and reuse of its solid wastes, Two of the possible alternatives are separation at the home or separation at the disposal site. Discuss the important factors that must be considered in evaluating these two alternatives. **[16]**

Q6) a) Write eight different processing techniques for solid wastes. List their uses, advantages and disadvantages in outline form. **[8]**

b) How are hazardous wastes handled at your college level? What about the wastes from chemical analysis laboratory classes? Are they discharged to the waste-water collection system, or are they collected separately? Analyze the various tests that are performed during the quarter or semester and whether toxic chemicals are used. **[8]**

Q7) Draw a diagram showing the sequence of the functional elements of solid waste management. Under each element, list some common processing equipment and techniques used to improve management functions. **[16]**

Q8) a) What is the greatest public health concern associated with sanitary landfills? What techniques are used to mitigate potential health problems? What inventory methods are used? **[9]**

b) Discuss the advantages and disadvantages associated with the separation of solid waste in high rise apartment buildings. **[9]**

Total No. of Questions : 8]

SEAT No. :

P1830

[Total No. of Pages : 2

[4165] - 488

M.E. (Civil) (Environmental Engg.)

AGRICULTURAL POLLUTION CONTROL AND ENVIRONMENTAL BIOTECHNOLOGY

(2008 Course) (Elective - III (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) How meteorological data would be helpful for selection of type of crop? Explain. **[8]**

b) Which type of farming system is useful to save water? Explain. **[8]**

Q2) a) Enlist any four agrochemicals. What are the uses of these agrochemicals? **[8]**

b) What is organic fertilizer? State major and macro nutrients. **[8]**

Q3) a) Which type of waste of sugar industry can be utilized for agricultural purpose? What are the benefits of the same? **[8]**

b) What are the effects of water logging? Explain with any one example phenomenon of water logging. **[8]**

Q4) Write short notes on the following: **[18]**

a) Water requirement for different crops.

b) Bioremediation of soil.

c) Water conservation.

P.T.O.

SECTION - II

Q5) a) Comment in detail on scope and importance of Environmental Biotechnology. **[8]**

b) Explain replication of DNA. **[8]**

Q6) a) Draw a flowchart for treating dairy industry waste water. Explain. **[8]**

b) Microbiology in activated sludge process. Explain. **[8]**

Q7) a) Describe with sketch the treatment of the sewage by trickling filter. **[8]**

b) What is Vermitechnology? Explain. **[8]**

Q8) Write short notes on the following: **[18]**

a) Protein synthesis.

b) Rotating discs.

c) Up flow anaerobic sludge blanket reactor.

Total No. of Questions : 8]

SEAT No. :

P1831

[Total No. of Pages : 3

[4165]-490

M.E. (Civil) (Environmental Engineering)

GROUND WATER CONTAMINATION AND POLLUTION TRANSPORT

(2008 Course) (Elective - IV(a)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary clearly mentioning the same.***
4) ***Use of non-programmable scientific calculator is allowed.***

SECTION - I

Q1) a) Explain in detail, the importance of G.W. What are the sources of pollution for GW? Enlist 4 assumptions made in deriving general differential equations for GW flow. **[8]**

b) Derive a general steady state continuity equation for GW flow in a heterogeneous anisotropic aquifer. **[8]**

Q2) a) Explain in detail various factors that affect fluctuations in GW levels. **[10]**

b) Explain the procedure for drawing flow nets using. **[8]**

i) Graphical method.
ii) Numerical solution.

Q3) a) Explain with suitable sketch: well interference. **[6]**

b) Tracer injected into a well took 4 hours to travel up to another well 40 m apart. The difference in water surface elevation was found to be 1.0 m; the aquifer samples indicated a porosity of 30%. Determine the following: **[6]**

i) Permeability,
ii) Seepage velocity and
iii) Reynold's no. of flow.

Assume average grain size as 1 mm and kinetic viscosity at 27 deg C. for water as 0.008 Stokes.

c) Explain in brief sea water intrusion. **[4]**

P.T.O.

Q4) a) Assume that three piezometers are installed very close to each other but penetrate up to different depths as given below : **[6]**

Piezometer	a	b	c
Elevation at surface (m)	400	400	400
Depth of piezometer (m)	150	100	50
Depth of Water (m)	27	47	36

Let A, B and C refer to the points of measurement of piezometers a, b and c respectively, Calculate :

i) GW head at a, b and c in meters.
ii) Pressure head at a, b and c in m.
iii) Fluid pressure at B in N/m^2.

b) Distinguish between ground surface contour and water table contours. Explain how water table contours are prepared and state their uses. **[6]**

c) Explain the following terms : **[4]**

i) Aquifer.
ii) Aquiclude.
iii) Aquifuge.
iv) Aquitard.

SECTION - II

Q5) a) Discuss briefly Hydrochemical facies in GW contamination and explain its utility. **[6]**

b) Explain how the rock forms affects the GW availability wrt following rock types : **[6]**

i) Carbonate terrain.
ii) Crystalline rocks and
iii) Complex sedimentary systems.

c) How does adsorption help organic chemical transport into soil? **[4]**

Q6) a) Explain in detail relation between dispersion and GW hydrology. **[6]**

b) Write a note on GW tracer. **[6]**

c) Explain the dispersion analysis of contaminant transport in fractured rock. **[4]**

Q7) a) What are different types of GW plumes? Explain Gaussian plume model for GW dispersion. **[6]**

b) Explain underground travel phenomenon of GW contamination. **[6]**

c) What is the necessity of modeling for GW systems? What are the different types of GW models? **[6]**

Q8) a) What is the utility of GW investigation? Explain seismic refraction and reflection method of GW investigation. **[8]**

b) Enlist any 4 methods of GW recharge. Explain any one in detail. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1833

[Total No. of Pages : 2

[4165] - 495

M.E. (Mechanical) (Heat Power Engineering)

PERFORMANCE ASSESSMENT OF MECHANICAL EQUIPMENTS

(2008 Course) (Elective - I (a)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary and mention it clearly.***

SECTION - I

Q1) Explain the direct and indirect method of boiler testing for efficiency calculation. **[16]**

Q2) a) What do you understood by boiler performance? Explain the factors affecting the boiler performance. **[8]**

b) Explain 'Topping cycle' and 'Bottoming cycle' cogeneration plant with neat sketch. **[8]**

Q3) a) A gas turbine based cogeneration system has the following details. **[8]**
Capacity of gas turbine generator : 4000 kW
Plant operating hours per annum : 8000 hrs.
Plant load factor : 90%
Heat rate as per standard given by gas turbine supplier : 12768.78 kJ/KWH
Waste heat boiler parameters – unfired steam output: 10 TPH
Steam temperature : 200ºC
Steam pressure : 8.33 bar
Steam enthalpy : 2832.1 kJ/Kg.
Fuel used : Natural gas
Calorific value – LCV : 40000 kJ/m^3
Price of gas : Rs. 3000/ 1000 m^3
Capital investment for total co-generation plant : Rs. 1300 Lakhs
Find the natural gas quantity required per annum and the overall cost of power per annum.

b) Explain step by step the procedure for performance evaluation for a typical furnace. **[8]**

P.T.O

Q4) Write a short note on: **[18]**

a) Waste heat qualities and applications.

b) Factors affecting furnace performance.

c) Energy conservation opportunities in boiler system.

SECTION - II

Q5) a) Explain in detail how the field testing is carried out for general purpose fans. **[10]**

b) A chemical plant operates a cooling water pump for process cooling and refrigeration applications. During the performance testing the following operating parameters were measured. **[6]**

Operating Parameters of the pump:

Pump flow, Q = 0.40 m^3/ s

Power absorbed, W (Motor input) = 325 kW

Suction head (Tower basin level) h1 = + 1 m

Delivery head h2 = 50 m

Type of drive = Direct coupled

Motor efficiency at the operating loading = 88%

Density of water = 996 Kg/m^3

Determine the overall system efficiency and pump efficiency.

Q6) a) Explain the flow control strategies used in various fans. **[6]**

b) Explain the compressed air system components with neat schematic. **[6]**

c) Discuss the effect of change in Compressor volumetric efficiency on its performance. **[4]**

Q7) a) Explain the step by step procedure of energy performance assessment of DG sets. **[8]**

b) Explain the energy conservation opportunities in compressed air system. **[8]**

Q8) Write a short note on the followings: **[18]**

a) Fan laws.

b) Energy conservation opportunities in Heat pumps.

c) Heat wheels.

Total No. of Questions : 8]

SEAT No. :

P1834

[Total No. of Pages : 2

[4165] - 497

M.E. (Mechanical - Heat Power Engg.)

ENERGY CONSERVATION AND MANAGEMENT

(2008 Course) (Elective - I (c)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers of two sections should be written in separate answer books.***
3) ***Neat diagram must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator log tables and electronic calculator is allowed.***

SECTION - I

Q1) a) Explain the various types of sources of energy in world energy market. **[8]**

b) What are the various steps involved in implementation of the energy management in an organization. **[8]**

Q2) a) Explain the importance of energy management program in industry. **[8]**

b) Explain the roles of Energy Manager and Energy Auditor in energy management program. **[8]**

Q3) a) With the help of example explain payback period and life cycle costing. **[8]**

b) Write in short the steps involved in energy audit of any industry. **[8]**

Q4) Write a short note on (Any three): **[18]**

a) Discount Rate and internal rate of return.

b) Energy audit of air compressor.

c) Energy analysis of furnace system.

d) Instruments used in energy audit.

P.T.O

SECTION - II

Q5) Explain any three of the following: **[18]**

a) Energy efficient Refrigeration system.

b) Importance of performance monitoring in energy economics.

c) Electricity act 2001.

d) Energy economics of power plant.

Q6) a) Write notes on (any two): **[8]**

i) Lighting levels in various applications.

ii) Power factor correction.

iii) Energy efficient motors.

b) Two lamps are to be compared: **[8]**

i) Cost of first lamp is Rs. 1 and it takes 100 watts.

ii) Cost of second lamp is Rs. 4 and it takes 60 watts.

Both the lamps are of same candlepower and each has the useful life of 100 hr. Which lamp will prove economical if the energy is charged at Rs. 70 per kW of maximum demand per year plus Rs. 0.05 per kWh?

Q7) a) Explain the waste heat recovery systems used in boiler and explain how efficiency of the plant increases. **[8]**

b) Explain the energy conservation opportunities in refrigeration systems. **[8]**

Q8) a) What is cogeneration? Explain in detail cogeneration systems in sugar industry. **[8]**

b) Explain in details the cogeneration system of gas power plant. **[8]**

Total No. of Questions : 8]

SEAT No.:

P1835

[Total No. of Pages : 3

[4165]-499
M.E. (Mechanical) (Heat Power Engineering)
INTERNAL COMBUSTION ENGINES
(2008 Course) (Elective - II (a)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic calculator and steam table is allowed.***
6) ***Assume suitable data,if necessary.***

SECTION - I

Q1) a) In a trial of a single cylinder oil engine working on dual cycle, the following observation were made : Compression ratio = 15, Oil consumption = 10.2 kg/h, Calorific value of fuel = 43890 kJ/kg, Air consumption = 3.8 kg/min, Speed = 1900 rpm, Torque on the brake drum = 186 N-m, Quality of cooling water used = 15.5 kg/min, Temperature rise = 36ºC, exhaust gas temperature = 410ºC, room temperature = 20ºC, Cp for exhaust gases = 1.17 kJ/kg K. **[10]**

Calculate :

i) Brake power.
ii) Brake specific fuel consumption.
iii) Brake thermal efficiency.
iv) Draw heat balance sheet on minute basis.

b) Explain in detail Diesel Knock. What are the methods of controlling Diesel Knock? **[6]**

Q2) a) What are the functional requirements of an injection system? How are injection system classified. **[6]**

b) During trial of 40 minutes on a single cylinder gas engine of 200 mm cylinder bore and 400 mm stroke, working on the four stroke cycle and governed by hit and miss method of governing, the following observations were taken,

P.T.O.

Total number of revolutions = 9400, Total number of explosions = 4200, Area of indicator diagram = 550 mm^2, Length of indicator diagram = 72 mm, spring number = 0.8 bar/mm, Brake load = 540 N, Brake wheel diameter = 1.6 m, Brake rope diameter = 2cm, Gas used = 8.5 m^3, Calorific value of gas = 15900kJ/m^3. Calculate :

i) Indicated Power.
ii) Brake Power.
iii) Indicated and Brake thermal efficiencies. **[10]**

Q3) a) Enlist the materials used for the following components with their properties: **[10]**

i) Connecting rod.
ii) Crank shaft.
iii) Cylinder head.
iv) Crankcase.
v) Fuel injector.

b) What is the general material selection criteria for I.C.Engines. **[6]**

Q4) Write short notes on (any three) : **[18]**

a) MPFI System.
b) Turbocharging.
c) Combustion chambers in C I engines.
d) Electronic Diesel injection system.

SECTION - II

Q5) a) Explain the concept of EGR in CI engine and effect on emissions. **[8]**

b) A 6 cylinder, 4 stroke petrol engine with a bore of 125 mm and a stroke of 190 mm was supplied during a test with petrol of composition C = 82% and H_2 = 18% by mass. The dry exhaust composition by volume was CO_2 = 11.19%, O_2 = 3.61% and N_2 = 85.2%. Determine the mass of air supplied per kg of petrol, the percentage of excess air and the volume of the mixture per kg petrol at 17ºC and 0.98 bar, which are the conditions for the mixture entering the cylinder during the test.

Assume : Density of petrol vapour as 3.35 times that of air at the same temperature and pressure. 1 kg of air at 0ºC and 1.0132 bar occupies 0.7734 m^3. Air contains 23% oxygen by mass. **[10]**

Q6) a) Discuss the catalytic converter to reduce emissions and effect of temperature on the performance. **[8]**

b) Discuss various controls and sensors used in modern engines. **[8]**

Q7) a) Discuss the operation of a dual fuel engine with a neat sketch. What are its advantages over conventional diesel engine? **[8]**

b) Explain how crankcase blow method reduces emissions in IC Engine. **[8]**

Q8) Write short notes on <u>any three</u> : **[16]**

a) Application of simulation technique for engine tuning.

b) Health effect of air pollution from I.C.Engines.

c) Hybrid vehicles.

d) Performance maps.

Total No. of Questions : 8]

SEAT No. :

P1837

[Total No. of Pages : 2

[4165] - 506

M.E. (Mechanical) (Heat Power Engineering)

I.C. ENGINES - FUELS & COMBUSTION

(2008 Course) (Elective - III (a)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary and mention it clearly.***

SECTION - I

Q1) a) Discuss the quality rating of Petrol and Diesel. **[6]**

b) Comment on the crude oil availability scenario in the world. What kind of impact is there on India? **[6]**

c) What are the various additives used to improve fuel qualities? **[6]**

Q2) a) Classify alternative fuels and discuss the importance of alternative fuels in the Indian context. **[8]**

b) Explain in brief the benefits of blending biodiesel with diesel. **[4]**

c) Explain in brief why hydrogen is termed as a freedom fuel. **[4]**

Q3) a) Explain the process of pollutant formation during various stages of diesel combustion. **[8]**

b) Explain various types of combustion chambers for SI engines. **[8]**

Q4) Write short notes: **[16]**

a) CNG as a vehicular fuel.

b) Transesterification for Biodiesel production.

c) LPG fuel Kit.

d) Ethanol blending with gasoline.

P.T.O

SECTION - II

Q5) a) Discuss the detonation phenomenon in SI engines and factors affecting it. **[8]**

b) What is the importance of EGR in CI engine? **[4]**

c) Explain the concept of chemical delay in CI engine. **[4]**

Q6) a) Discuss various methods of supercharging. **[8]**

b) Discuss the concept of turbocharging with a neat sketch. What are the advantages and limitations? **[8]**

Q7) a) Explain the air-fuel ratio requirements for different operating conditions. **[8]**

b) Discuss some modern alternative combustion techniques. **[8]**

Q8) Compare SI and CI engines with respect to: **[18]**

a) Combustion phenomenon.

b) Supercharging.

c) Fuel economy.

d) Power output per unit displacement volume.

e) Power output per unit weight.

f) Fuel economy.

Total No. of Questions : 8]

SEAT No. :

P1838

[Total No. of Pages : 2

[4165] - 508
M.E. (Mechanical) (Heat Power)
NON CONVENTIONAL POWER PLANTS
(2008 Course) (Elective - III (c)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What are the prospects of renewable energy sources in India? Explain. **[8]**

b) What are advantages and limitations of renewable energy sources. **[8]**

Q2) a) What are the reasons for variation in solar radiation reaching the earth than received at the outside of the atmosphere? **[8]**

b) What are the different types of concentrating type collectors? Describe a collector used in power plant for generation of electrical energy. **[8]**

Q3) a) Describe the different methods of sun tracking. Why the orientation is needed in concentrating type collectors? **[8]**

b) Explain with neat sketch any two applications of solar PV system. **[8]**

Q4) Write short notes on (Any Three): **[3 x 6 = 18]**

a) Reduction of CO_2 potential of renewable energy.

b) Wind energy installation and potential in India.

c) Solar passive space cooling.

d) Photo voltaic technology.

P.T.O.

SECTION - II

Q5) a) Derive the expression for maximum power developed in case of horizontal axis wind turbine. **[8]**

b) What are the advantages and disadvantages of floating drum type biogas plant? **[8]**

Q6) a) What is a community biogas plant? What are main problems encountered in its operation? **[8]**

b) Give a brief note on prospects of Geothermal energy in content to India. **[8]**

Q7) a) Write a short note on small head hydro power development. **[8]**

b) Explain prospects of Tidal energy in India. **[8]**

Q8) Write short notes on (Any Three): **[18]**

a) Closed cycle - OTEC system.

b) Micro hydel plant.

c) Applications of Fuel Cells.

d) Clean Development Mechanism.

Total No. of Questions : 8]

SEAT No. :

P1839

[Total No. of Pages : 2

[4165]-509

M.E. (Mechanical) (Heat Power Engg.)

HEAT EXCHANGER SYSTEM DESIGN AND PERFORMANCE

(2008 Course) (Elective - IV (a)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the classification of Heat Exchangers according to surface compactness. Explain with the help of Heat Transfer surface area density spectrum of Exchanger surfaces. **[10]**

b) Explain with a neat sketch the working of fluidized bed heat Exchanger.**[6]**

Q2) Define fouling. Give some representative values of fouling factors. Explain in context of fouling the followings. **[18]**

a) Fouling and its effects on exchanger heat transfer and pressure drop.

b) Fouling mechanisms.

c) Sequential events in fouling.

d) Prevention and mitigation of fouling.

Q3) Given the following data for a counter flow heat exchanger : **[16]**

$\dot{m}_h = 3\ kg/s \quad \dot{m}_c = 0.75\ kg/s$

$^{C}P_h = 1.05\ kJ/kg-K \quad ^{C}P_c = 4.2\ kJ/kg-K$

$T_{hi} = 500^{o}C \quad T_{ce} = 85^{o}C$

$U = 450\ W/m^2-K,\ A = 1m^2$

Calculate T_{he} and T_{ci}

Derive the Expression you use.

P.T.O.

Q4) Write notes on (any Two) : **[16]**

a) Use of codes and standards in heat exchanger practice.

b) Power plant heat exchangers.

c) Heat Exchanger design methodology flow chart.

SECTION - II

Q5) a) Explain the Rating problem and Sizing problem of Thermal Design. How LMTD and NTU-$\in$ methods are used to solve these problems. Illustrate with suitable example. **[12]**

b) Draw a neat labelled sketch of a shell and Tube heat exchanger and explain why these exchangers are called as Industrial work horses. **[6]**

Q6) Write notes on : **[16]**

a) Buffles - types used in practice.

b) Heat pipe heat exchangers.

c) Matrix types heat exchangers.

d) Gasketed plate heat exchangers.

Q7) a) Draw the temperature distribution in parallel flow counterflow and cross flow heat exchangers. What is mixed and unmixed cross flow exchangers? **[4]**

b) Derive expression for LMTD of a counterflow heat exchangers. **[6]**

c) Discuss the Mechanical Design aspects of Heat Exchangers. **[6]**

Q8) Explain any (Two) : **[16]**

a) Recent Developments in Heat Exchangers.

b) Furnaces and Radiative heat exchangers.

c) Testing evaluation and maintenance of heat exchangers.

Total No. of Questions : 8]

P1840

SEAT No. : ____

[Total No. of Pages : 3

[4165] - 510

M.E. (Mechanical) (Heat Power Engineering)

COMPUTATIONAL FLUID DYNAMICS

(2008 Course) (Elective - IV(b)) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary and mention it clearly.***

SECTION - I

Q1) a) Consider an infinitesimally small fluid element fixed in space **[12]**

i) State the fundamental physical principle of continuity equation.

ii) Derive the continuity equation.

iii) Present the equation in form particularly suited for CFD.

b) Indentify and Classify the following equations according to whether they are parabolic, elliptic, or hyperbolic. **[4]**

i) $\frac{\partial T}{\partial t} = \alpha \frac{\partial^2 T}{\partial x^2}$ ii) $\frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} = 0$ iii) $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$

Q2) Consider the viscous flow of air over the flat plate. At a given station in flow direction, the variation of flow velocity, u, in the direction perpendicular to the plane is given by the expression.

$$u = 482.2(1 - e^{(-y/L)})$$

Where L is characteristic length in mm = 25.4mm, y is in mm, u is in m/s. The viscosity coefficients $\mu = 1.93 \times 10^{-4}$ Pa.s.

i) Obtain u at discrete grid points (0, 2.5, 5, and 7.5mm) equally spaced in y direction, with Δy = 2.5mm. **[2]**

P.T.O.

ii) Assume obtained u values at discrete grid points as a numerical finite difference solution of the flow field. Calculate shear stress at the wall τ_w using first-order, second order and third-order one-sided difference. **[8]**

iii) Derive the expression for second order one sided difference you use. **[4]**

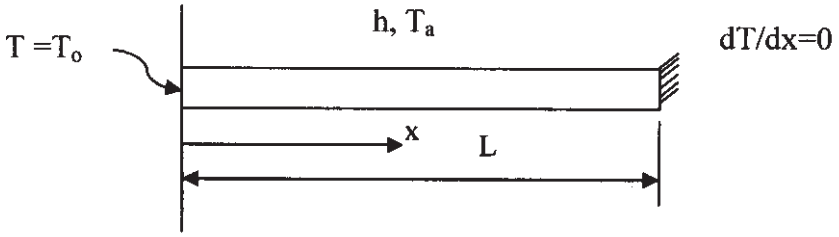
iv) Compare calculated finite difference results with exact value of τ_w. **[2]**

v) Comment on your results. **[2]**

Q3) a) Explain implicit and explicit approach for obtaining the solution of PDEs with its merits and demerits. **[8]**

b) Compare FDM and FVM used for solving CFD problems. Explain briefly why FVM is preferred in CFD. **[8]**

Q4) Consider 1D steady state heat conduction in an isolated rectangular horizontal fin of length L as shown in Figure. **[16]**



The base temperature is T_o and the tip of the fin is insulated. T_a is ambient temperature and h is average heat transfer coefficient. The energy equation for the fin assuming constant thermal conductivity, k is

$$\frac{\partial^2 T}{\partial x^2} - \frac{hP}{kA}(T - T_a) = 0$$

Where P and A are perimeter and cross section area of fin respectively.

BCs are : At x = 0, T = T_o and x = L, dT/dx = 0.

Discretise the equation using control volume formulation and present the solution technique for the same.

SECTION - II

Q5) a) Explain MacCormack's technique with predictor and corrector step. Comment on its applicability against Lax-Wendroff Technique. **[12]**

b) Explain the concept of Artificial Viscosity and comment on its effect on solution accuracy and stability. **[6]**

Q6) With a suitable grid explain procedure to solve 2D heat conduction equation $\frac{\partial T}{\partial t} = \alpha\left(\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2}\right)$ Using ADI scheme. **[16]**

Q7) a) Flow between two plates can be expressed as $\mu\frac{\partial^2 u}{\partial y^2} = \frac{\partial p}{\partial x}$ which is constant. Such that $\frac{\partial^2 u}{\partial y^2} = 1$; Find Velocity distribution in the slit having width of 10 cm & upper plate moving at a velocity of 1 cm/s with respect to stationary lower plate. Using 5 nodes for finite differencing and applying Gauss seidel method calculate velocity at each node point. **[10]**

b) Explain in brief: Round-off error, Iterative convergence error, and Discretisation error. **[6]**

Q8) Give detailed procedure, while obtaining numerical solution for Supersonic flow over a flat Plate up to setting the boundary conditions. **[16]**

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Total No. of Questions : 10]

SEAT No. :

P1843

[Total No. of Pages : 3

[4165] - 515

M.E. (Mechanical) (Design Engg.)

INSTRUMENTATION AND AUTOMATIC CONTROL

(2008 Course) (Elective - I (a)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the various elements of measurement system with suitable example. **[8]**

b) The table shows the frequency distribution of the resistance of resistor manufactured by a company. **[8]**

Resistance (Ω)	Frequency
93-95	4
96-98	15
99-101	33
102-104	21
105-107	7

Determine the following:

i) Arithmetic mean.

ii) Median value.

iii) Modal value.

Q2) a) Write a short note on correlation analysis. **[8]**

P.T.O.

b) A company has a sales pattern (in units) during 1994 to 2002 , as shown in table. **[8]**

Year	Sales (in lakhs of units)
1994	10
1995	12
1996	15
1997	27
1998	33
1999	38
2000	44
2001	49
2002	60

Fit a linear regression for the given data.

Q3) a) Two machines are working in noisy environments. The background noise when the machines are in operative is 65dB. If the two machines having individual sound pressure level of 84dB and 88dB are switched on simultaneously, determine the combined sound pressure level of the machines along with the background noise. **[8]**

b) Explain the working principle of piezoelectric accelerometer with a neat sketch. **[8]**

Q4) a) Explain the heat flux measurement method. **[6]**

b) Explain the method of measuring very low pressure with a suitable sketch. **[5]**

c) Explain the working principle of Load Cell with a neat sketch. **[5]**

Q5) Write short note on: **[18]**

a) Humidity measurement.

b) Installation of strain gauge.

c) Ultrasonic flow meter.

SECTION - II

Q6) a) A mild steel shaft is used to connect a motor drive to a constant load torque. To measure this torque, a resistance strain gage with a resistance of $120\,\Omega$ and gage factor 2 is mounted at 45° to the shaft axis. Shear modulus of steel is 80Gpa, shaft diameter is 50 mm and change in strain gage resistance due to load is $0.1\,\Omega$. Find the load torque. **[6]**

b) Explain the following with suitable figure. **[12]**

i) Servo controlled dynamometer.

ii) Absorption dynamometer.

iii) Instantaneous power measurement.

Q7) a) Explain the principle & working of optical pyrometers for measuring temperature. **[8]**

b) What are the factors influencing selection of strain gauges. **[8]**

Q8) a) Sketch & comment on the out puts of P, PI, PD and PID controllers for a unit step input. **[8]**

b) The temperature range of temperature controller is 250ºC to 550ºC. The set point is kept at 415ºC. Find the percent of span error when the temperature is **[8]**

i) 410ºC.

ii) 415ºC.

iii) 425ºC.

Q9) a) Explain difference between electronic controllers & other type of controller. **[8]**

b) What is meant by stability of control system? Explain the criteria for determing stability. **[8]**

Q10) a) Explain the working of single beam spectrophotometer. **[8]**

b) Enumerate the application of chromatography & spectroscopy. **[8]**

Total No. of Questions : 10]

SEAT No. :

P1844

[Total No. of Pages : 2

[4165] - 516

M.E. (Mechanical) (Design Engineering)

ADVANCED MATERIAL SCIENCE

(2008 Course) (Elective - I (b)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) An atomic plane in a crystal lattice makes intercept of 3a, 4b and 6c with the crystallographic axes where a, b and c are the dimensions of the unit cell. Find the Miller indices of the atomic plane. **[8]**

b) Draw the planes (020), (120) and (220) in a FCC structure. **[8]**

OR

Q2) Explain line imperfections in crystals with neat sketch. **[16]**

Q3) Draw iron-carbon phase diagram and explain solid state transformation. **[16]**

OR

Q4) a) Explain heat treatment process used for tool steel. **[8]**

b) List applications of: **[8]**

i) Duplex Stainless Steel.

ii) Maraging Steel.

Q5) Write short notes on: **[18]**

a) Dendritic Solidification.

b) Bravais Lattices.

c) Coordination Number.

P.T.O

SECTION - II

Q6) a) Explain applications of Nano materials and super - conducting materials. **[8]**

b) Explain benefits of cobalt-chromium alloys used in hip joint prosthetic applications. **[8]**

OR

Q7) A continuous and aligned glass fibre-reinforced composite consists of 35 Vol% of glass fibres having a modulus of elasticity 73 GPa and 65 Vol% of a polyester resin that, when hardened, displays a modulus of 4 GPa. Calculate the modulus of elasticity of this composite in the longitudinal directions and in perpendicular to the direction of the fibre alignment. **[16]**

Q8) Classify and explain various composite types. **[16]**

OR

Q9) a) Explain advantages and applications of shape memory alloy. **[8]**

b) Explain the PVD process and state its limitations. **[8]**

10) Write short notes: **[18]**

a) Ion implantation.

b) Orthodental materials.

c) Sports materials.

Total No. of Questions : 10]

SEAT No. :

P1845

[Total No. of Pages : 3

[4165]-523

M.E. (Mechanical) (Design Engineering)

ANALYSIS & SYNTHESIS OF MECHANISMS

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the difference between Degrees of freedom of kinematic pair and that of mechanism? How these two are interconnected? **[4]**

b) How the spacing of accuracy points is related with the structural error of a mechanism? **[8]**

c) What are spatial mechanisms? **[4]**

Q2) a) What are the types of synthesis of mechanisms? **[4]**

b) Determine the chebychev spacing for function $Y = 2x^3 - x$ for the range $0 \le x \le 4$. Where four precision points are required. For these precision points determine $\theta_2, \theta_3, \theta_4$ and ϕ_2, ϕ_3, ϕ_4. If $\Delta\theta = 45^o$ and $\Delta\phi = 90^o$ with usual notations. **[12]**

Q3) Derive the Freudenstein's equation? How this is used for the mechanism design? **[16]**

Q4) a) What do you understand by complex mechanism? **[4]**

b) Derive the expression for instantaneous linear velocity of the reciprocating link from a scotch yoke mechanism, when the crank is rotating with uniform velocity. Hence find the linear velocity of similar reciprocating link when 200 mm long crank rotating at 5 rad/sec. is at 45° with horizontal. **[12]**

P.T.O.

Q5) Write short note on any three : **[18]**

a) Ball's point.

b) Cubic of stationary curvature.

c) Denavit-Hartenberg parameters.

d) Elastic linkage model.

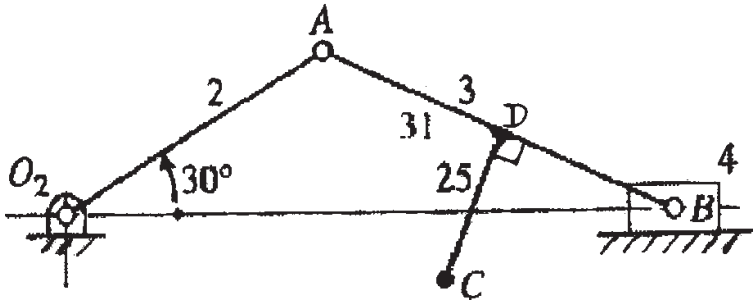
e) Acceleration analysis of ternary link using auxiliary point method.

SECTION - II

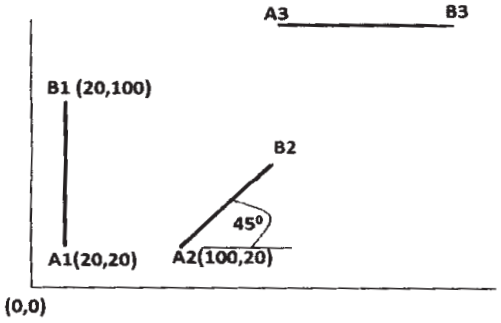
Q6) a) Explain the Bobillier construction with the help of sketches. **[10]**

b) What is the inflection circle? How it is used in kinematics? **[6]**

Q7) Find the inflection circle for the motion of the coupler of the slider crank linkage of Fig. and determine instantaneous radius of curvature of the path of the coupler point c. Assume R_{AO2} = 50 mm, R_{BA} = 53 mm, DC = 25 mm **[16]**



Q8) a) Figure shows the three positions of link AB of length 80 mm; it is to be moved through successive positions A_1B_1, A_2B_2, A_3B_3 with the coordinates as shown. Position A_3B_3 is horizontal and point A_3 is 80 mm vertically above B_2. Graphically synthesize the four bar mechanism with link AB as coupler. Find the coordinates of the ground pivots in the same reference plane. Also find the length of input and output links. Draw the mechanism in its second position. **[8]**



b) What is the double point on coupler curve? What is the difference between cusp and crunode? Where are cusps and crunodes seen in the standard curves? **[8]**

Q9) What are relative poles of four bar mechanisms? Explain the method of construction of relative pole for specified input and output angles. **[16]**

Q10) Write short note on any three : **[18]**

a) Moving and fixed centrodes.

b) Matrix method.

c) Branch and order defects.

d) Difference between path generation & motion generation.

e) Point position reduction.

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Total No. of Questions : 10]

P1848

SEAT No. : [ ]

[Total No. of Pages : 4

[4165] - 527
M.E. (Mechanical) (Design Engineering)
VEHICLE DYNAMICS
(2008 Course) (Elective - IV(a)) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Square bracketed figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule and non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain implication of wide separation of the natural frequencies of the sprung and un-sprung mass on the vibration isolation characteristics of the suspension system. **[4]**

b) The sprung parts of a passenger car weigh 12 kN and the un-sprung parts weigh 900 N. The combined stiffness of the suspension springs is 45 kN/m and that of the tires is 5555 kN/m. Determine the two natural frequencies of the bounce motions of the sprung and un-sprung mass. Calculate the amplitudes of the sprung and un-sprung parts if the car travels at a speed of 40 km/h over a road of a sine wave form with a wavelength of 5 m and amplitude of 5 cm. **[12]**

OR

Q2) An independent front suspension of a passenger car carries a mass (sprung mass) of 455 kg. The suspension spring rate is 21 kN/m. The mass of the tire/wheel assembly (un-sprung mass) is 45 kg and the equivalent tire stiffness is 176 kN/m. The damping ratio of the suspension produced by the shock absorber is 0.1. If the car is traveling on a sinusoidal road profile with a wave-length of 5 m and amplitude of 5 cm, estimate the lowest vehicle speed at which the tire may lose contact with the road. Also estimate the effect of increasing damping ratio to 0.3 and 0.707. (Refer Fig. 1 at the end of paper to estimate frequency of excitation). **[16]**

P.T.O.

Q3) In a quarter car model of vehicle sprung mass is 500 kg, suspension stiffness is 400 kN/m, damping coefficient is 3 kN-s/m. Road profile is assumed to be sinusoidal with pitch of 2.5 m and amplitude of 10 mm. If the vehicle travels at a constant speed of 52 m/s, what will be the acceleration amplitude of sprung mass in vertical direction? **[16]**

OR

Q4) A tractor with a bounce natural frequency of 3.5 Hz and a damping ratio of 0.1 travels at a speed of 5 km/h over a plowed field described by $S_g(\Omega) = 6.5 \times 10^{-4}\Omega^{-1.6} m^2/cycles/m$. Determine the root-mean-square value of vertical acceleration of the tractor at a frequency of 1 Hz. Evaluate whether the vibration of the vehicle is acceptable from a fatigue or decreased proficiency viewpoint for an 8 h duration based on the International Standard ISO 2631 (refer Fig. 2 on last page). **[16]**

Q5) Write short notes : **[18]**

a) Frequency weightings.
b) Constant radius test.
c) Effect of tractive forces on cornering.

SECTION - II

Q6) A passenger car weighs 1.2 kN and has a wheelbase of 2.3 m. The center of gravity is 0.9 m behind the front axle and 0.5 m above ground level. The braking effort distribution on the front axle is 65%. The coefficient of rolling resistance is 0.02. Determine which set of the tires will lock first on two road surfaces: one with a coefficient of road adhesion $\mu = 0.8$, and the other with $\mu = 0.2$. **[16]**

OR

Q7) A vehicle weighs 17 kN and has a wheelbase of 2.6 m. The center of gravity is 1.3 m behind the front axle and 50 cm above ground level. The frontal area of the vehicle is 2.4 m^2 and the aerodynamic drag coefficient is 0.25. The coefficient of rolling resistance is given by $f_r = 0.0136 + 0.4 \times 10^{-7} V^2$, where V is the speed of the vehicle in kilometers per hour. The rolling radius of the tires is 33 cm. The coefficient of road adhesion is 0.8. Estimate the possible maximum speed of the vehicle on level ground as determined by the maximum tractive effort that the tire-road contact can support if the vehicle is **[16]**

a) rear-wheel drive, and
b) front-wheel-drive. Plot the resultant resistance versus vehicle speed, and show the maximum thrust of the vehicle with the two types of drive.

Q8) A tracked vehicle weighs 155 kN and has a contact length of 3 m and a tread of 2 m. The vehicle has a uniform contact pressure and is equipped with a clutch/brake steering system. On a sandy terrain, the value of the coefficient of motion resistance is 0.15, and that of the coefficient of lateral resistance is 0.5. The angle of internal shearing resistance of the terrain φ is 30°. **[16]**

a) determine the thrusts of the outside and inside tracks required to execute a steady state turn.
b) If, during the turn, the sprocket of the outside track, with a radius of 0.3 m, is rotating at 10 rad/s, and the inside track is disconnected from the driveline by declutching and the brake is applied, determine the turning radius and yaw velocity of the vehicle during the turn. The slip of the running gear during the turn may be neglected in the calculations.

OR

Q9) A passenger car weighs 20 kN and has a wheelbase of 2.8 m. The center of gravity is 1.3 m behind the front axle and 50 cm above ground level. In practice, the vehicle encounters a variety of surfaces, with the coefficient of road adhesion ranging from 0.2 to 0.8 and the coefficient of rolling resistance of 0.015. With a view to avoiding the loss of directional stability on surfaces with a low coefficient of adhesion under emergency braking conditions, what would you recommend regarding the braking effort distribution between the front and rear axles? **[16]**

Q10) Write short notes : **[18]**

a) Frequency response of road vehicle in yaw.
b) Frequency response function.
c) Skid steering.

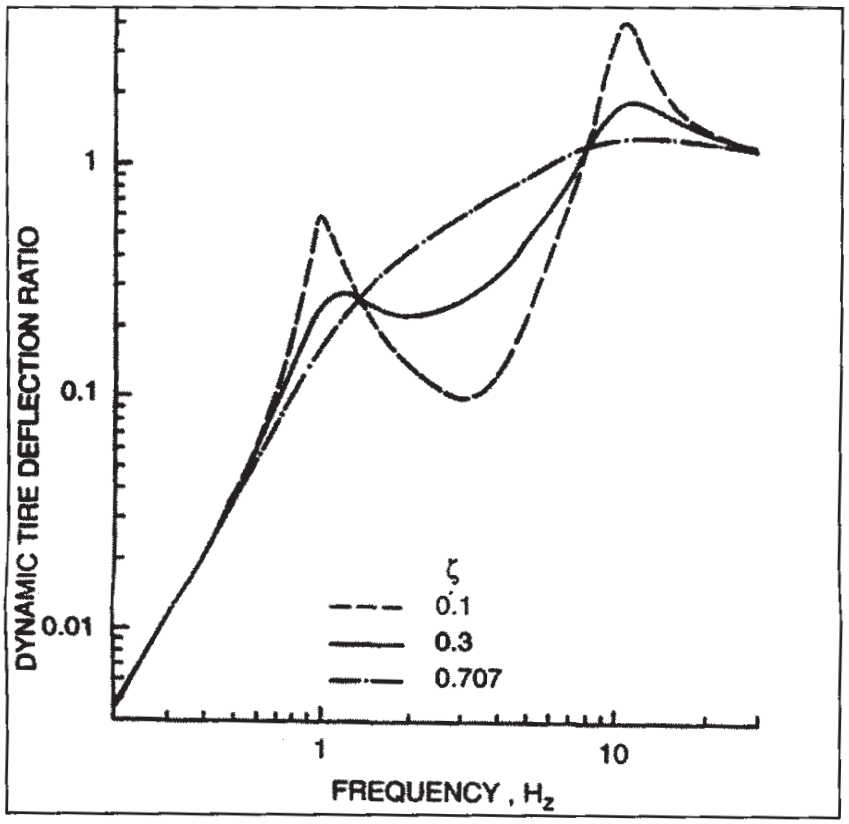


Figure 1 Dynamic tire deflection ratio as a function of frequency

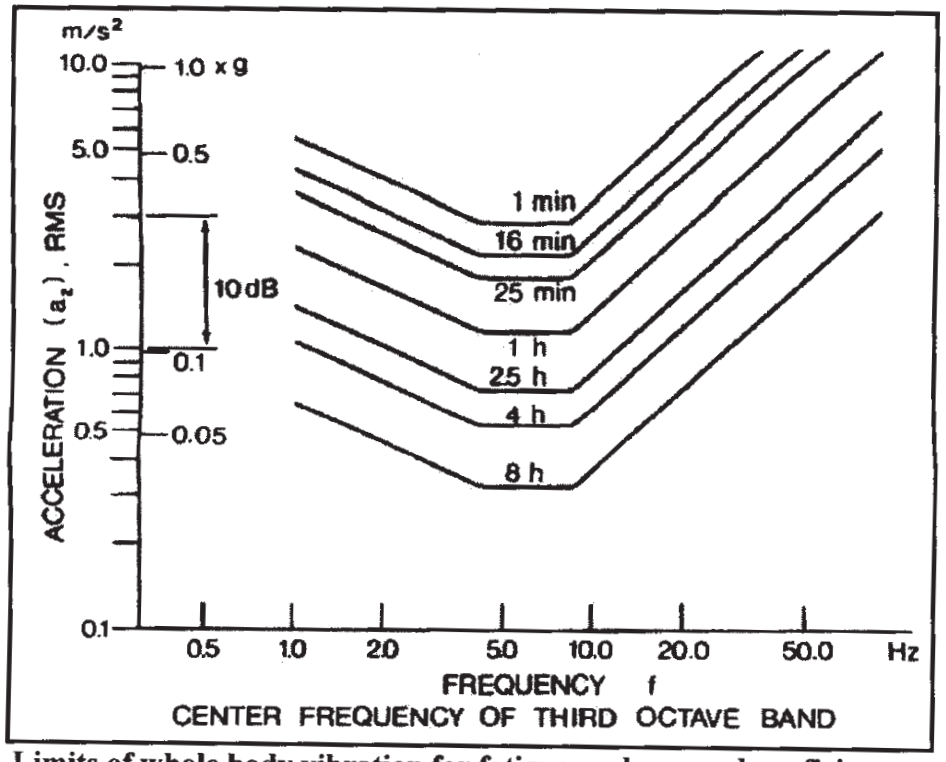


Figure 2. Limits of whole body vibration for fatigue or decreased proficiency as per ISO

❖ ❖ ❖ ❖

Total No. of Questions : 10]

SEAT No. :

P1851

[Total No. of Pages : 3

[4165] - 534

M.E. (Mechanical) (Mechatronics)

DIGITAL SIGNAL PROCESSING

(2008 Course) (Sem. - I) (Elective - I(b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A discrete time signal $x(n)$ is defined as

$$x(n) = 1 + \frac{n}{2} \qquad -3 \le n \le -1$$

$$= 1 \qquad 0 \le n \le 3$$

$$= 0 \qquad \text{otherwise.}$$

Determine its values and sketch the signal $x(n)$. Also sketch $x(n+4)$, $x(n-4)$ and $x(-n)$ signals with appropriate values. **[10]**

b) What is convolution? What are the properties of convolution? Explain the same in details. **[8]**

Q2) A discrete time system can be

1) Static or dynamic
2) Linear or non-linear
3) Time variant or time invariants.
4) Causal or non causal.

With respect to above properties examine the following systems.

a) $x(n) = \cos |y(n)|$

b) $y(n) = x(n) \sin w_0 n$.

c) $y(n) = x(-n+3)$

d) $y(n) = |x(n)|$ **[16]**

P.T.O.

Q3) a) Find the impulse response for the following **[8]**

$x(n) = \{\underset{\uparrow}{1}, 2, 0, 4\}$

$h(n) = \{-2, \underset{\uparrow}{3}, 9, 5\}$

b) What is ROC. What is the significance of ROC? Explain the same in detail for finite duration sequences (causal, noncausal, anticausal type)**[8]**

Q4) a) Determine the 'Z' transform of the following discrete sequence. **[8]**

i) $x(n) = r^n \cos(wn)\, u(n)$

ii) $x(n) = \left(\frac{1}{2}\right)^n . u(n)$

b) State and prove following properties of 'Z' transform. **[8]**

i) Linearity.

ii) Time reversal.

Q5) Write short notes on any four: **[16]**

a) DTMF

b) Barrel shifter

c) Energy and power signals

d) Relation between FT and ZT

e) MAC

SECTION - II

Q6) a) Distinguish between Microprocessor and DSP. **[8]**

b) With a neat block diagram. Explain the architectural details of DSP chip. **[10]**

Q7) a) Define circular convolution. How it is obtained. Distinguish between linear and circular convolution of two sequences. **[8]**

b) Compute the DFT of the signal

$x(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}$ considering N = 4. **[8]**

Q8) a) What is FFT? What is decimation - in - time algorithm? Draw the basic butterfly diagram for DIT algorithm. **[8]**

b) With the help of frequency response explain HPF and BPF in detail.**[8]**

Q9) a) Establish the system transfer function for the system defined by

$$y(n)-\frac{1}{4}y(n-1)=x(n)-\frac{3}{4}x(n-1)$$

Also realize the same using DF-I and DF-II methods. **[10]**

b) Give the equations for and characteristics of the following windows. **[6]**

i) Hamming.

ii) Rectangular.

Q10) Write short notes on (any four) **[16]**

a) Power spectral density.

b) Application of DSP in mechatronics.

c) Filter structures.

d) Selection criteria for any DSP processor as per application.

e) Linear filtering based on DFT.

Total No. of Questions : 8]

SEAT No.:

P1852

[Total No. of Pages : 4

[4165]-537
M.E. (Mechanical) (Mechatronics)
THEORY OF MACHINES AND MECHANISMS
(2008 Course) (Elective - II (b)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you understand by kinematic pair? With the help of neat sketches explain different type of kinematic pair. **[6]**

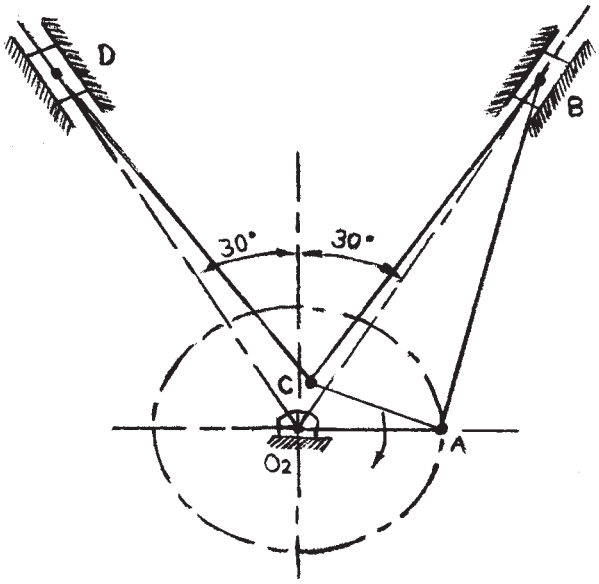
b) Define Inversion of a Mechanism? Explain with the help of neat sketches inversions of single slider crank chain? Give their applications? **[6]**

c) Write short notes on straight line mechanism. **[4]**

Q2) a) What is instantaneous centre of rotation? Explain Body centrode and Moving centrode with suitable example. **[4]**

b) Fig shows the mechanism used in two cylinder 60° V-engine. Crank O_2A rotates in clockwise direction at a speed of 2000 rpm. Determine for the position shown, the velocities of the sliders B and D and angular velocity of link CD. Link lengths are O_2A = 20 mm, AC = 20 mm, AB = BC = 60 mm and CD = 50 mm. **[12]**

P.T.O.

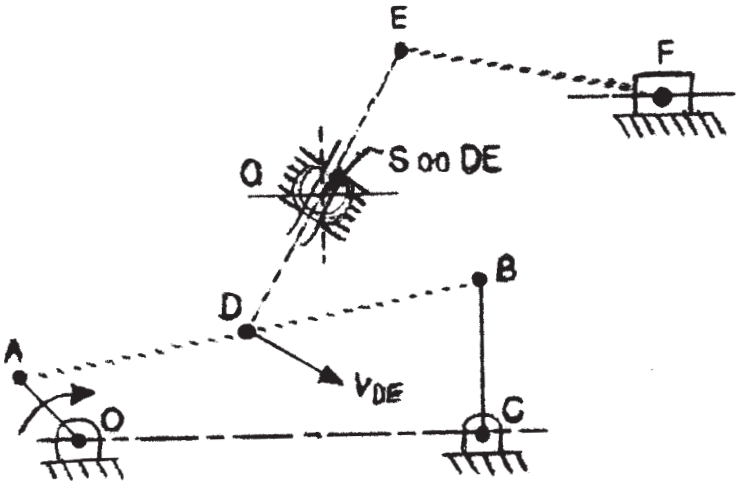


Q3) a) An I.C. Engine runs at 2100 rpm. The length of the connecting rod is 250 mm and crank radius is 50 mm. Determine at 35% of outstroke using analytical method,

i) Angular position of the crank.
ii) Linear velocity and acceleration of piston.
iii) Angular velocity and angular acceleration of the connecting rod.
iv) Crank angle for maximum velocity.
v) Maximum piston velocity.
vi) Crank angle for zero acceleration of piston. **[6]**

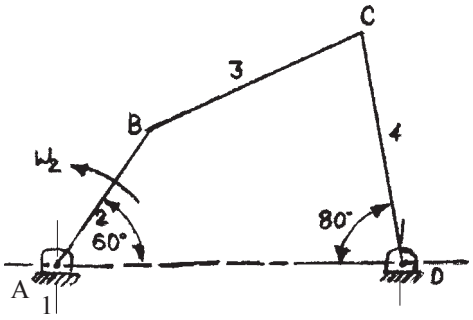
b) In a swiveling joint mechanism, as shown in fig., the driving crank OA is rotating clockwise at 125 rpm. The lengths of various links are, OA = 50 mm, AB = 350 mm, AD = DB, DE = EF = 250 mm and CB = 125 mm. The horizontal distance between the points O and C is 300 mm and between O and Q is 180 mm. Vertical distance between F and C is 250 mm and between C and Q is 150 mm. For the given configuration determine,

i) Acceleration of slider block F,
ii) Angular acceleration of the link DE. and
iii) Acceleration of sliding of the link DE in the trunnion. **[12]**



Q4) a) In an I.C. engine mechanism, the radius is 100 mm and the length of the connecting rod is 450 mm. The crank is rotating in anticlockwise direction with the angular velocity of 10 rad/sec. Using vector algebra method, determine the velocity of piston and the angular velocity of connecting rod when the crank is at 45° from the inner dead centre. **[8]**

b) The four bar mechanism ABCD as shown in fig., which is driven by link AB at 12 r/s, counterclockwise. Find the angular velocity of link BC and DC using complex algebra method. AB = 50 mm, CD = 56 mm, AD = 100 mm. **[8]**



SECTION - II

Q5) a) Explain three position synthesis for crank and rocker mechanism by using inversion method. **[6]**

b) Using freudenstein equation, design a four bar mechanism to generate the function $y = x^{1.5}$ for an interval in x from 1 to 4. The input link is to start from 30° and is to have a range of 90°, the output link is to start from 90° and is to have a range of 90°. Use three point chebychev spacing. Take the length of fixed link AD as 50 mm. **[10]**

Q6) a) Explain the terms Longitudinal vibrations, Transverse vibrations and Torsional vibrations. **[6]**

b) A vertical shaft of 5 mm diameter is 200 mm long and is suspended in long bearings at its ends. A disc of mass 50 kg is attached to the centre of the shaft. Neglecting any increase in stiffness due to attachment of the disc to the shaft, find the critical speed of rotation and maximum bending stress when the shaft is rotating at 70% of the critical speed. The centre of disc is 0.26 mm from geometric axis of the shaft. E = 200 GN/m^2. **[10]**

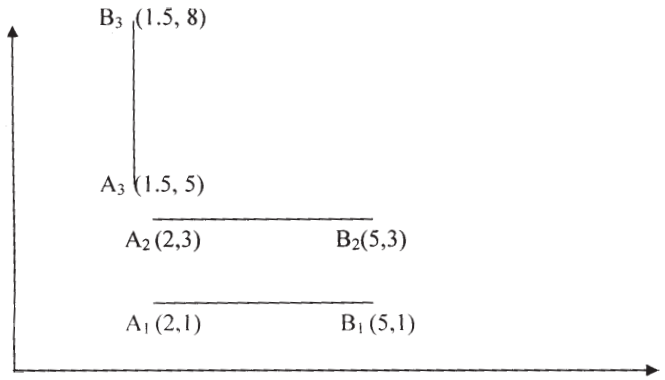
Q7) a) Write short note on Eccentric cam. **[4]**

b) A cam operates a roller type reciprocating follower moving it with cycloidal motion during the lift and returning it with uniform acceleration and deceleration, acceleration being half of the retardation. The specifications of the cam and follower are :- **[12]**

Base circle radius of the cam = 25 mm,
Roller radius = 10 mm,
Lift of follower = 30 mm,
Offset of reciprocating follower axis = 12 mm towards right,
Angle of lift = 60°,
Angle of outer dwell = 45°,
Angle of return = 90°,
Speed of cam = 200 rpm.

Draw the cam profile and determine maximum velocity and acceleration of the follower during lift and return.

Q8) a) Design a four bar mechanism to move the link AB through the positions A_1B_1, A_2B_2 and A_3B_3 as shown in fig. **[6]**



b) Deduce an expression for the natural frequency of free transverse vibration for a simply supported shaft carrying a uniformly distributed mass of m kg per unit length. **[6]**

c) Derive equations for displacement velocity and acceleration for a tangent cam operating a radial translating roller follower when the contact with the nose. **[6]**

Total No. of Questions : 10]

SEAT No. :

P1854

[Total No. of Pages : 2

[4165]-541
M.E. (Mechanical) (Mechatronics)
DRIVES AND ACTUATORS
(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections must be written on separate answer papers.***
2) ***From Section - I, Q.No.5 is compulsory. Solve any two questions out of Q.No.1, Q.No.2, Q.No.3, Q.No.4.***
3) ***From Section - II, Q.No.10 is compulsory. Solve any two questions out of Q.No.6, Q.No.7, Q.No.8, Q.No.9.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain transfer, output and switching characteristics of n channel E-MOSFET. **[8]**

b) Explain the methods adopted for protection of SCR against over voltage and overcurrent. **[8]**

Q2) a) Explain generalized treatment of speed torque conventions and multiquadrant operation of an Electrical Drive. **[8]**

b) Sketch and explain the constant power and constant drive characteristics for separately excited DC motor. **[8]**

Q3) a) Explain four quadrant operation of chopper controlled DC drive. **[8]**

b) Describe brushless DC Motor. Give the advantages of brushless DC motor over conventional DC motor. **[8]**

Q4) a) Explain the static Schebrius drive for speed control of induction motor. **[8]**

b) Explain with neat diagram the closed loop speed control of CSI fed induction motor drives. **[8]**

P.T.O.

Q5) Write short note on (any three) : **[18]**

a) Unipolar drive circuit for stepper motor.

b) AC and DC drive.

c) Cycloconverter.

d) IGBT.

SECTION - II

Q6) a) Explain the Diaphragm actuators w.r.t. construction, working and applications. **[8]**

b) Explain classification of pneumatic cylinders w.r.t. construction with industrial application of each type. **[8]**

Q7) a) Explain the effect of incorrect alignment of hydraulic cylinder during installation. **[8]**

b) Explain the factors on which decides whether hydraulic system is to be used or pneumatic system is to be used. **[8]**

Q8) a) Explain the application of sequence valve and pressure relief valve in industrial hydraulic circuits. **[8]**

b) Explain hydraulic power steering as an hydraulic servo system. **[8]**

Q9) a) Explain counter balance circuit w.r.t. hydraulic circuit, working and industrial application. **[8]**

b) Compare Air motor and electric motor. **[8]**

Q10) a) Enlist any four significant factors to be considered while choosing hydraulic fluid medium. **[10]**

b) Write a short note on Encoders w.r.t. actuators. **[8]**

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Total No. of Questions : 10]

SEAT No. :

P1855

[Total No. of Pages : 3

[4165] - 544

M.E. (Mechanical) (Mechatronics)

AUTOMOTIVE ELECTRONICS

(2008 Course) (Sem. - II) (Elective - III (c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer 3 questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessay.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Comment on Design of vehicle electrical system w.r.t. dynamic system characteristic curve and charge balance calculation of batteries. **[9]**

b) Discuss Electrical locking system in brief. **[9]**

Q2) a) Explain with significance any four indications on dashboard. **[8]**

b) Comment on knock sensor and its signal evaluation. **[8]**

Q3) a) Discuss in brief "Two battery vehicle electrical system". **[8]**

b) Enlist the functions of electrical motor in electrical seat adjustment system. **[8]**

Q4) a) Explain Lambda sensor. **[8]**

b) Explain Roll over protection systems w.r.t. function and operating principle. **[8]**

P.T.O

Q5) a) Discuss lane assistance system used in modern luxury cars. **[8]**

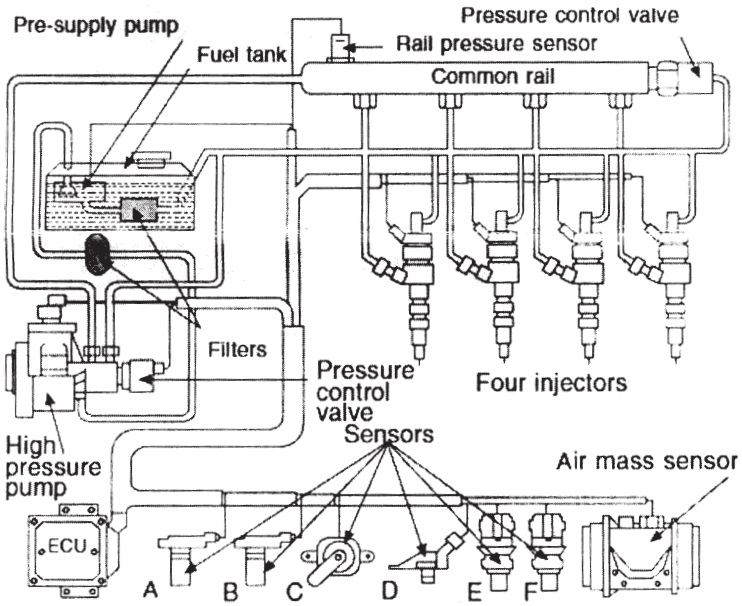
b) Discuss in brief Electric Power Steering in luxury cars. **[8]**

SECTION - II

Q6) a) Discuss in brief Electronically controlled carburetor system (ECOTRRONIC). **[9]**

b) Write in brief Electronic Stability program w.r.t. function and vehicle handling. **[9]**

Q7) Figure Q7 shows Principle Components of Common Rail Diesel Injection System. Discuss in brief essential features of Crankshaft, Rail Pressure Sensor, Air Mass sensor and Coolant Temperature sensors involved in it (Do not reproduce the figure) **[16]**



Principal components of the Bosch common rail injection system. The sensors **A** to **F** are as follows: **A** Crankshaft position ; **B** Camshaft position; **C** Accelerator pedal; **D** Boost pressure; **E** Air temperature; **F** Coolant temperature

Figure Q7

Q8) a) With respect to drives, motors and control discuss Power Windows. **[8]**

b) Discuss in brief parking sensors. **[8]**

Q9) a) Discuss in brief Electrical Steering Column adjustment. **[8]**

b) Discuss Head Lamps in modern automobiles. **[8]**

10) a) Discuss the function, requirements and operating principle of anti lock breaking system. **[8]**

b) Comment on recent trends in wiper systems. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1856

[Total No. of Pages : 2

[4165] - 545
M.E. (Mechanical) (Mechatronics)
EMBEDDED SYSTEMS
(2008 Course) (Elective - IV(a)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Attempt any three questions from each section.***
2) ***Answers to the each section should be written in separate answer books.***
3) ***Figures on the right side indicate full marks.***

SECTION - I

Q1) a) State and explain characteristics of embedded system and compare it with Conventional system. **[8]**

b) List and discuss design metrics of embedded system. **[8]**

Q2) a) Discuss how hardware for embedded system is designed. **[8]**

b) What are the hardware and software tools used in designing embedded system. **[8]**

Q3) a) Explain with block diagram architecture of typical processor used in embedded system. **[8]**

b) Explain CAN & I2C protocol. Compare features of them. **[8]**

Q4) Write short notes on: **[18]**

a) USB.

b) MODBUS.

c) 802.11.

P.T.O

SECTION - II

Q5) a) List and explain Scheduling algorithms used in embedded OS. **[8]**

b) What is priority inversion problem? How this problem is solved? **[8]**

Q6) a) What is need of semaphore in RTOS how it helps to solve the problem. **[8]**

b) What is message queue how it is used in RTOS? **[8]**

Q7) a) Define task, task state, and task priority. How this is used in task creation. **[8]**

b) State typical specifications of mucos RTOS and compare with VxWorks. **[8]**

Q8) Write short notes on: **[18]**

a) Automatic Cruise Control system.

b) Digital camera.

c) RFID Attendance system.

Total No. of Questions : 9]

SEAT No. :

P1858

[Total No. of Pages : 3

[4165]-552

M.E. (Mechanical) (Automotive Engineering)

FINITE ELEMENT METHOD

(2008 Course) (Elective - I (b) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

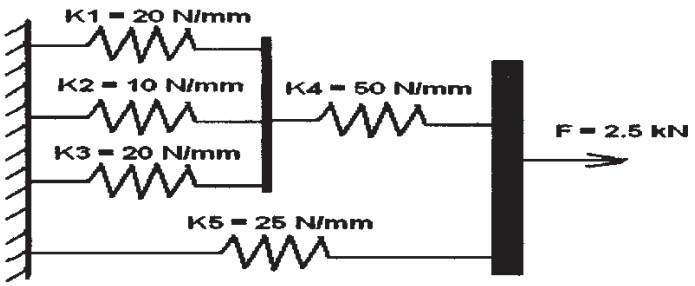
Instructions to the candidates:

1) *Answer any Three questions from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Figures to the right indicate full marks.*
4) *Use of electronic calculator is allowed.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Briefly explain the three typical areas of engineering where the finite element method is used. **[6]**

b) A system of spring is shown in the fig. Determine the overall stiffness matrix and deflection of each spring. **[10]**

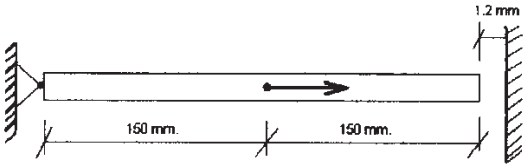


Q2) a) The 1-D element has a length of 200 mm. The temperature at nodes 1 and 2 are 100ºC and 40ºC respectively. Evaluate the shape function associated with nodes 1 and 2, if the temperature is to be estimated at point P within the element, situated at 150 mm from node. Also calculate temperature at point P. **[10]**

b) Briefly explain the non-structural areas of engineering where the finite element method is used. **[6]**

P.T.O.

Q3) a) In the figure below, a load P = 60 kN is applied as shown. Determine the displacement field, stress and support reaction in the body. Take $A = 250\ mm^2$ and $E = 20\ kN/mm^2$. **[10]**



b) Sketch and explain the Frame element. **[6]**

Q4) a) What is the significance of shape function? Obtain the shape functions, in terms of natural coordinates, for the three-noded 1-D element. **[6]**

b) What do you mean by FEM errors? Explain various sources of errors. **[6]**

c) Explain shape function of CST element. Also explain the physical representation by area coordinates. **[6]**

SECTION - II

Q5) a) Explain semiautomatic and fully automatic method of mesh generation with suitable example. **[6]**

b) Explain how symmetry and Anti-symmetry is used in FEA with suitable applications. **[4]**

c) Derive a relation to determine the Jacobian function for CST element. **[6]**

Q6) a) How will you decide element type and element length for a given problem? **[4]**

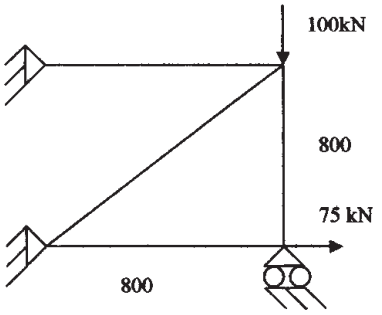
b) What input data would you request to design engineer for carrying out FEA? **[4]**

c) Consider the four bar truss shown in the figure. It is given that E = 210 GPa and $A = 381\ mm^2$ for all elements. **[8]**

i) Using elimination approach, solve for the global displacement vector.

ii) Evaluate stress in each element.

Determine the reaction force at support.



Q7) a) How effect of temperature is taken care in Finite Element Analysis in a spar or link element? **[8]**

b) Name three commonly used methods for deriving the element stiffness matrix and element equations. Briefly describe each method. **[8]**

Q8) a) In a triangular element, the nodes 1,2 and 3 have Cartesian coordinates (30, 40), (140, 70) and (80, 140) respectively. The displacements, in mm, at 1, 2 and 3 are (0.1, 0.5), (0.6, 0.5) and (0.4, 0.3) respectively. The point P within the element has Cartesian coordinates (77, 96) for point P, determine : **[10]**

i) The natural coordinates,
ii) The shape functions.
iii) The displacement.

b) Discuss the Problem Modeling and Boundary conditions for the following cases : **[6]**

i) A cylinder of infinite length subjected to external pressure.
ii) Belleville spring.

Q9) Write a short note on any three : **[18]**

a) Interfacing of CAD and 3D analysis.

b) Difference between Linear and Non-linear Analysis.

c) Accuracy of FEA results.

d) Plane stress and plane strain condition.

Total No. of Questions : 8]

SEAT No. :

P1859

[Total No. of Pages : 2

[4165]-553

M.E. (Mechanical) (Automotive Engineering)

ADVANCED HYDRAULICS AND PNEUMATIC SYSTEMS

(2008 Course) (Elective - I (C)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) List the five fields of applications where fluid power can be used more effectively than any other power source. Explain in detail. **[8]**

b) What are the materials used in making seal? Discuss the composition, application & design or shape of seals. **[8]**

Q2) a) Compare characteristics, advantages and applications of gear pumps, vane pumps, axial piston pumps and radial piston pumps. **[8]**

b) What are the different accessories used in hydraulic systems? What are their functions? **[8]**

Q3) a) Explain with a hydraulic circuit diagram, the controlling of a power holding device used in automobiles. **[8]**

b) Draw a regenerative circuit used in a hydraulic system. Discuss. **[8]**

i) When the speed of the extension stroke will be equal to the retraction stroke of the cylinder.

ii) When the speed of the extension stroke will be greater than the retraction stroke of the cylinder.

Q4) Answer any **three** of the following : **[18]**

a) Properties of hydraulic fluid.
b) Pressure intensifiers in fluid power system.
c) Hydraulic plumbing.
d) Efficiencies in Hydraulic power pack.
e) Functions of Accumulators in hydraulic systems.

P.T.O.

SECTION - II

Q5) a) Explain with a neat sketch working of counter balance valve and draw a typical circuit showing its application. **[8]**

b) What is open centre and close centre valve position in direction control valves? Sketch different valve positions for the same. What are their typical applications? **[8]**

Q6) a) Draw and explain a pneumatic circuit using double acting cylinder to fulfill the following conditions. **[8]**

i) Velocity control – in both directions.

ii) Velocity control – the cylinder rod to extend two times faster than its retraction.

b) Draw a typical circuit showing control of a double acting cylinder operated by an air pilot actuated direction control valve and explain the working of the circuit. How can the circuit be automated? **[8]**

Q7) a) A dual pump is used for press operation. Draw a hydraulic circuit showing all the components required for the operation. Calculate the ratings of the components. Assume the working pressure. **[8]**

b) Explain the principles of fluidic logic control. How Boolean algebra can be used in fluidic logic control? **[8]**

Q8) Answer any **three** of the following : **[18]**

a) Moving Part Logic (MPL) control system in pneumatics

b) FRL unit.

c) Sequencing of actuators.

d) Air motor.

e) Vacuum clamps in Fluid power systems.

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Total No. of Questions : 10]

SEAT No. :

P1862

[Total No. of Pages : 3

[4165]-559

M.E. (Mechanical) (Automotive Engineering)

FUNDAMENTALS OF VEHICLE DYNAMICS

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Square bracketed figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, and non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are frequency weightings? Explain its benefits and limitations. **[8]**

b) Mass of the sprung parts of a passenger car 1050 kg and the un-sprung mass is 100 kg. The combined stiffness of the suspension springs is 47.5 kN/m and that of the tires is 480 kN/m. Determine the natural frequencies of bounce motion of the sprung and unsprung mass. **[8]**

OR

Q2) The mass of the vehicle is 1150 kg and its radius of gyration is 1.1 m. The stiffness of the front suspension is 145 kN/m and that of rear suspension is 190 kN/m. Center of gravity of the vehicle is 1.6 m from front and 1.4 m from rear wheel and 0.7 m above ground. Find the natural frequencies and mode shapes, considering the vehicle as two degree freedom system in bounce and pitch mode. **[16]**

Q3) a) Explain the procedure to find steady state response to steering input.**[8]**

b) A passenger car has a mass of 1300 kg. The weight distribution on the front axle is 54% and that on rear axle is 46% under static condition. If cornering stiffness each of the front tires is 33 kN/rad and that of rear tires is 32 kN/rad determine the steady state handling behavior of the vehicle. If the vehicle is to be designed for characteristics speed of 150 km/hr find the value of wheel base. **[8]**

P.T.O.

OR

Q4) a) Explain Yaw velocity gain characteristics of under-steer vehicle with neat sketch. **[8]**

b) Derive an expression for the steer angle δ_f required to negotiate a given turn with usual notations. **[8]**

Q5) Explain how constant speed, constant radius test and constant steer angle tests are conducted and their significance. Which parameters of vehicle design can be refined based on the test results. **[18]**

SECTION - II

Q6) a) Draw neat sketch of idealized automobile suspension (single dof) system approaching half sine speed bump. Write governing differential equation, base input displacement, velocity and acceleration function when vehicle is on the speed bump. **[8]**

b) List and explain basic damper parameters to characterize force-speed response. **[8]**

OR

Q7) A tracked vehicle is equipped with a controlled differential steering system having a gear ratio of 3: 1. The vehicle weighs 150 kN, and has a tread of 2 m and a contact length of 3 m. The contact pressure of the track is assumed to be uniform. On a particular terrain, the value of the coefficient of motion resistance is 0.2, and that of the coefficient of lateral resistance is 0.55. Determine the minimum turning radius of the vehicle. Also calculate the power required to maintain a steady-state turn at the minimum turning radius when the speed of the center of gravity of the vehicle is 16 km/h. **[16]**

Q8) A vehicle has a weight of 11 kN and a wheelbase of 2.25 m. The ratio of the distance between the center of gravity of the vehicle and the front axle to the wheelbase is 0.4. The cornering stiffness of each of the front tires is 39 kN/rad and that of the rear tires is 38 kN/rad. The average steering gear ratio is 18. Determine the yaw velocity gain and the lateral acceleration gain of the vehicle with respect to the steering wheel angle for speed upto 120 km/hr. **[16]**

OR

Q9) A quarter car vehicle model is loaded with a mass of 350 kg, stiffness of suspension spring is 55 kN/m, damping factor 0.5. The road profile is approximated as sine wave of amplitude 40 mm and wavelength 4 m estimate

a) critical speed of the vehicle

b) amplitude of steady state motion of vehicle mass when vehicle is driven at critical speed.

c) amplitude of steady state motion of mass when the vehicle is driven at 60 km/hr. **[16]**

Q10) Write short notes on : **[18]**

a) Differential action hydraulic damper.

b) Frequency Response of road vehicle in yaw.

c) Air suspension system.

Total No. of Questions : 8]

SEAT No. :

P1864

[Total No. of Pages : 2

[4165] - 564

M.E. (Mechanical) (Automotive Engineering)

AUTOMOTIVE CHASSIS DESIGN

(Sem. - II) (2008 Course) (Elective - IV (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with neat sketch function and working of McPherson Strut system. **[8]**

b) A helical compression spring is to be designed to absorb the shocks. The initial compression of the spring is 35 mm and it is further compressed by 55 mm while absorbing the shocks. The spring is to absorb 260 J of energy during the process. The spring index can be taken as 7. The spring is made of patented and cold drawn steel wire with an ultimate tensile strength of 1600 N/mm^2 and modulus of rigidity of 81370 N/mm^2. The permissible shear stress for the spring wire should taken as 30% of ultimate tensile strength. Calculate

i) Spring stiffness,

ii) Wire diameter,

iii) Mean coil diameter and

iv) Number of active coil. **[8]**

Q2) a) What do you understand by double wish bone suspension system? Give its advantages during different kinematic conditions of the vehicle. **[6]**

b) State and prove the condition of correct steering for a four wheeled vehicle. Explain with neat sketch, Ackermann steering gear mechanism. **[5]**

c) Explain with the help of neat sketch worm and worm wheel steering. **[5]**

P.T.O.

Q3) a) With the help of neat sketches explain different types of steering column. **[8]**

b) Explain with the help of neat sketch vacuum brakes. **[8]**

Q4) Write short notes on the following (Any Three): **[18]**

a) Variable rate spring.

b) Torsion bar.

c) Active suspension.

d) Electrical power steering system.

e) Hydraulic braking system.

SECTION - II

Q5) a) A motor car weighs 13341.5N and has a wheelbase of 2.65m. The CG is 1.27m behind the front axel and 0.76m above the ground level. Maximum braking on all four wheels on level ground will bring the vehicle uniformly to rest from a speed of 64km/h in a distance of 25.9m. Calculate the value of an adhesion between the tyre and the road. **[6]**

b) What are the design requirements for the wheel and tyre assembly? **[5]**

c) What are the desirable properties of brake lining material? **[5]**

Q6) a) What are the types of rim suitable for large commercial vehicles and why? **[8]**

b) What is a run flat car tyre? What are its design features? What is tyre tread and what is its purpose? **[8]**

Q7) a) With the help of neat sketch explain transmissions of six wheelers. **[8]**

b) Explain Scammell design in six wheelers. **[8]**

Q8) Write short note on (Any Three): **[18]**

a) Bendix Hydrovac.

b) Michelin manufacturing process.

c) Materials used in tyre construction.

d) Scammell Routeman.

Total No. of Questions : 12]

SEAT No.:

P1867

[Total No. of Pages : 3

[4165]-568
M.E. (Electrical) (Control Systems)
NONLINEAR CONTROL SYSTEMS
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss classification of nonlinearities present in the system. Give examples of each type of nonlinearity. **[8]**

b) Explain the following terms in connection with nonlinear control systems.

i) Hysterisis.
ii) Subharmonic generation.
iii) Hard and soft excitation. **[9]**

OR

Q2) a) Compare the nonlinear control system with linear control system. **[8]**

b) Consider the system described by $\ddot{x} + 0.3\dot{x} - x = 0$. Evaluate the phase trajectory for initial conditions as $x = 0, x = 1$. **[9]**

Q3) a) Describe isocline method for constructing phase plane trajectory. **[8]**

b) Discuss different types of singular points for autonomous system with their significance. **[9]**

OR

P.T.O.

Q4) A unity feedback control system has forward transfer function $G(s)=\frac{1}{s(s+2)}$ in cascade with relay whose output equal to ± 2. For unit step input using isocline method, construct phase plane trajectory. Also comment on stability. **[17]**

Q5) a) Derive the describing function for ON-OFF relay with hysterisis. **[8]**

b) Explain clearly limitations and advantages of describing function and phase plane method. **[8]**

OR

Q6) A unity feedback control system having $G(s)=\frac{50}{s(s+2)(s+10)}$ is driven by relay having dead 2 one d = 1. The relay has output amplitude equal to unity. Determine amplitude, frequency and stability of the possible limit cycle. Also sketch nature of input and output of relay. **[16]**

SECTION - II

Q7) a) Explain the terms in the sense of Lyapunov. **[8]**

i) Stability.
ii) Asymptotic stability.
iii) Global asymptotic stability.
iv) Instability.

b) An autonomous system is given with $A=\begin{bmatrix} 0 & 1 \\ -1 & -2 \end{bmatrix}$. Explain the stability using Lyapunov theorem. **[8]**

OR

Q8) a) Apply Lyapunov direct method to determine stability of the system given below : **[8]**

$\dot{x}_1 = -x_1 - 2x_2$

$\dot{x}_2 = -2x_2$

b) Explain stability determination applying Lypunov direct method. **[8]**

Q9) a) Express scalar function given below in quadratic form and test it for positive definiteness. **[8]**

$V(x) = 2x_1^2 + 3x_2^2 + 2x_3^2 + x_1 x_2 - x_1 x_3 + 4x_2 x_3$

b) Explain Krasovskii's method for determination of Lyapunov function. **[9]**

OR

Q10) a) For autonomous state equation, derive $A^TP + PA = -Q$ as Lypunov function. Where P & Q are real, symmetric and positive definite matrices. **[9]**

b) Explain briefly : **[8]**

i) Positive definite and semidefinite function.

ii) Negative definite and semidefinite function.

Q11) Write short notes on : **[17]**

a) Input output linearization.

b) Sliding mode control.

OR

Q12) Explain clearly for input - output linearization and input state linearization for the system given as below : **[17]**

$$\dot{x}_1 = x_2 + 2x_1^2 + u$$

$$\dot{x}_2 = -u.$$

Total No. of Questions : 6]

SEAT No. :

P1868

[Total No. of Pages : 2

[4165]-569
M.E. (Electrical) (Control System)
AUTOMATION AND ROBOTICS
(2008 Course) (Elective - I (a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define the following terms : **[10]**

i) Work Envelope.
ii) Work Volume.
iii) Repeatability.
iv) DOF.
v) Co-ordinated motion.

b) Give basic concept of Automation. Discuss the differences between fixed and flexible automation. **[10]**

c) Discuss at least three reason for using a robot instead of a human being to perform a specific task. **[5]**

Q2) a) Explain in detail the concept of Yaw, pitch and roll. **[10]**

b) Give the robot classification according to **[15]**

i) Co-ordinate system.
ii) Form of motion.

Q3) a) Explain programming of industrial Robot and hence discuss concept of three levels of robot programming. **[10]**

b) Discuss various aspect of Robot for the application of spray painting. **[15]**

P.T.O.

SECTION - II

Q4) a) Explain in detail Lagrangian analysis for a single prismatic joint working against gravity and single revalute joint. **[15]**

b) Explain concept of 'HAND MATRIX' and hence give effect of pre and post multiplication of 'hand matrix' by basic matrix operation. **[10]**

Q5) a) Give the rules for establishing link coordinate frames and hence explain D-H matrix. **[10]**

b) Explain 'PUMA' Robot for forward kinematic solutions. **[10]**

c) Explain Geomatric approach for inverse kinematic. **[5]**

Q6) Discuss any three from the following : **[25]**

a) PD and PID control.

b) Joint position control.

c) Resolved motion position control.

d) Resolved motion rate control.

Total No. of Questions : 12]

SEAT No. :

P1870

[Total No. of Pages : 2

[4165]-576

M.E. (Electrical) (Control System)

ADVANCED DIGITAL CONTROL TECHNIQUE

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are different methods of digital modelling? Explain numerical integration method in detail. **[10]**

b) Explain the concept of digital re-design in detail. **[6]**

OR

Q2) Explain w.r.t digital system : **[16]**

a) Closed form solution of G(T).

b) Partial matching of states.

Q3) a) Write in detail different steps for design of digital system in z-plane using root locus technique. **[10]**

b) What is phase-lag controller in digital system? Explain with neat sketches. **[8]**

OR

Q4) a) Design a full order observer for following satellite control system :

$$x(k+1)=\begin{bmatrix}0 & 1\\ 0 & 0\end{bmatrix}x(k)+\begin{bmatrix}0\\ 1\end{bmatrix}u(k)$$

$$y(k)=\begin{bmatrix}1 & 0\end{bmatrix}x(k),$$

such that the closed loop poles are placed at $z = +j0.5 – j0.5$. **[10]**

P.T.O.

b) Write a short note on pole-zero cancellation technique related to discrete data system. **[8]**

Q5) a) With the help of block diagram, explain in detail, state regulator design for digital control system. **[8]**

b) A discrete time state regulator system has the plant

$$x(k+1)=\begin{bmatrix} 2 & -1 \\ -1 & 1 \end{bmatrix}x(k)+\begin{bmatrix} 4 \\ 3 \end{bmatrix}u(k)$$

$$y(k)=\begin{bmatrix} 1 & 1 \end{bmatrix}x(k)$$

Design a state feedback control algorithm $u(k) = -kx(k)$ which places the closed loop characteristic poles at $\pm j\frac{1}{2}$.(Use ackerman formula). **[8]**

OR

Q6) a) Explain digital control system with deadbeat observer. **[8]**

b) Design compensator by separation principle. **[8]**

SECTION - II

Q7) a) What is multirate sampling? State its applications. **[8]**

b) Write a short note on sampling rate conversion. **[8]**

OR

Q8) a) Explain FIR form structure in detail with neat sketches. **[8]**

b) Explain finite wordlength effect in digital filters. **[8]**

Q9) Draw and explain in detail, architecture of TMS320C5X processor. **[16]**

OR

Q10) a) Differentiate between fixed and floating point DSP. **[6]**

b) What is instruction pipelining in DSP? **[6]**

c) Enlist various addressing modes in TMS 320C5X DSP. **[4]**

Q11) a) Draw and explain memory architecture of TMS 320C54X processor. **[10]**

b) Explain instruction set of TMS 320C54X DSP. **[8]**

OR

Q12) a) Explain in detail function of discrete wavelet transform in digital system. **[10]**

b) State and explain key features of TMS 320C5X processor. **[8]**

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Total No. of Questions : 6]

SEAT No.:

P1874

[Total No. of Pages : 2

[4165]-583
M.E. (Electrical) (Power Systems)
COMPUTER APPLICATIONS IN POWER SYSTEMS
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***All questions are compulsory.***

SECTION - I

Q1) a) Explain the optimization problem based on : **[12]**

i) Nature of equations involved.
ii) Permissible values of design variables.

b) Explain multivariable optimization with inequality constraints. **[9]**

c) State the Kuhn Tucker conditions. **[4]**

Q2) a) State the different Random search methods of unconstrained minimization. Explain any one with flow chart. **[12]**

b) Explain Unimodal function. Describe algorithm for unrestricted search elimination method with a limited step size. **[13]**

Q3) a) Explain the Newton Raphson method of load flow analysis (Rectangular form). **[12]**

b) Explain the fast decoupled load flow method along with its flow chart. **[13]**

P.T.O.

SECTION - II

Q4) a) Explain Newton Raphson method of optimal power flow. **[12]**

b) Explain : **[13]**

i) DC load flow.

ii) Power loss in a line and

iii) Generation shift distribution factors with reference to Loss coefficients using sensitivity factors.

Q5) a) Explain optimal power flow based on Gradient method. **[12]**

b) Explain AC-DC load flow with formulation of problem, D.C. System model, converter variables, derivation of equations and inverter operation. **[13]**

Q6) a) Explain three phase load flow analysis. **[13]**

b) Describe formulation of sequence impedance matrix in terms of self and mutual impedances using transformation matrix. **[12]**

Total No. of Questions : 6]

SEAT No.:

P1875

[Total No. of Pages : 2

[4165]-584
M.E. (Electrical) (Power Systems)
POWER SECTOR ECONOMICS MANAGEMENT AND RESTRUCTURING
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any Two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) In an industrial plant, the off-site boiler was revamped to improve the efficiency by spending Rs.200 lacs. The discount rate for the company is 15%. The projected cost of saving of fuel was Rs.40 lacs/year. Find out the NPV at the end of 10 years of the operation of the boiler. **[9]**

b) Explain role of Central Electricity Authority and Planning Commission in deregulated power industry. **[8]**

c) Discuss stages of tariff determination under restructured power sector. **[8]**

Q2) a) Explain institutional structure of Indian power sector under going reforms. **[8]**

b) With reference to tariff, explain following aspects : **[9]**

i) Subsidy and cross subsidy.
ii) Regulator assets and liabilities.
iii) Incentives and penalties.

c) Discuss rate of return regulation method of economic regulation. **[8]**

Q3) a) What is regulation and deregulation of power industry? Explain conditions that favoured deregulation? **[9]**

b) What are the functions of CERC? Explain performance based regulation **[8]**

c) Discuss guidelines for determination of tariff for renewable energy and captive power. **[8]**

P.T.O.

SECTION - II

Q4) a) What are Forward and Future contracts? **[8]**

b) Explain regulatory reforms in UK. **[8]**

c) What are ancillary services? State requirements of various ancillary services required for restructured power industry. How these services are acquired? **[9]**

Q5) a) Explain following terms related to power and energy markets. **[9]**

i) Market Clearing Price.

ii) Market Power and its impact on pricing structure.

iii) Zonal and locational pricing.

b) Explain power sector models based on trading arrangements. **[8]**

c) What is Arbitrage? Explain same and cross commodity arbitrages with suitable example. **[8]**

Q6) a) Discuss various methods used for transmission pricing. **[8]**

b) Explain Option contracts, Contract for differences and Bilateral contracts. **[9]**

c) Discuss various performance indices used by regulator for accessing performance of various utilities. **[8]**

Total No. of Questions : 6]

SEAT No. :

P1876

[Total No. of Pages : 2

[4165]-586

M.E. (Electrical) (Power System)

DIGITAL SIGNAL PROCESSING & ITS APPLICATIONS

(2008 Course) (Elective - I (a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain following classification of discrete systems with examples. **[12]**

i) Static and dynamic system.
ii) Time variant & time invariant systems.
iii) Causal and non-causal systems.

b) Find convolution of following two sequences **[5]**

$x(n) = \{\underset{\uparrow}{1}, 0, -1, 2\}$

$h(n) = \{-2, \underset{\uparrow}{-1}, 3, 0, 1\}$

c) Explain following methods for finding inverse z-transform. **[8]**

i) Partial fraction.
ii) Method of long division.

Q2) a) Find DFT X(K) of a sequence $x(n) = \{1, 1, 0, 0\}$cross check your answer by finding IDFT of X(K) obtained. **[10]**

b) Explain radix2 DIT-FFT algorithm deriving necessary relations. **[12]**

c) Explain the concept of power density. **[3]**

P.T.O.

Q3) a) Explain different methods of designing FIR filters using windows in brief. **[13]**

b) Explain how DSP algorithm can be used for detecting faults in bearings. **[12]**

SECTION - II

Q4) a) Explain Direct Form I and Direct Form II realization of IIR filters. **[10]**

b) Explain digital Butterworth low pass filter design. **[10]**

c) Explain frequency warping **[5]**

Q5) Write notes on : **[25]**

a) Special addressing modes in DSP.

b) Memory mapped register addressing.

c) Circular addressing.

d) Hardware architecture.

e) Pipelining.

Q6) a) Draw and explain in details architecture of TMS 320C50. **[25]**

b) Write a note on 'DSP based power factor correction system'.

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Total No. of Questions : 6]

SEAT No. :

P1877

[Total No. of Pages : 2

[4165]-588

M.E. (Electrical - Power Systems)

ARTIFICIAL INTELLIGENCE AND ITS APPLICATIONS IN POWER SYSTEMS

(2008 Course) (Elective - II (a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain any three applications of Fuzzy logic for solving problems in power system. **[8]**

b) Explain different fuzzy relations and operations on fuzzy sets. **[9]**

c) With examples explain following numbers associated with fuzzy set. **[8]**

i) Height of a fuzzy logic

ii) Normalization of a fuzzy set.

Q2) a) Explain following methods of generation of membership function **[10]**

i) Choice based on intuitive understanding.

ii) Generation of membership function based on subjective perception and inductive reasoning.

b) Explain following methods of associating crisp set with a given fuzzy set. **[10]**

i) Core of a fuzzy set.

ii) Support of a fuzzy set.

iii) Level set associated with a fuzzy set.

iv) $\alpha - \text{cuts}$ of a fuzzy set.

P.T.O.

c) With examples explain following numbers associated with fuzzy set. **[5]**

i) Height of a fuzzy logic.

ii) Normalization of a fuzzy set.

Q3) Explain 'Predicate Logic' PL(2) with reference to following points giving appropriate examples. **[25]**

a) Syntax of PL (2)

b) Semantics of PL (2)

c) Semantic Properties.

d) Derivation.

e) Resolution in PL (2)

SECTION - II

Q4) a) Explain the fundamental operational logic of Artificial Neural Network (ANN) and explain the functional ability of ANN when compared to Expert System. Fuzzy Logic. **[8]**

b) Explain basic McCullock Pitts' non linear model of a neuron with schematic diagram. Give analogy between biological neuron and artificial neuron. **[9]**

c) Write short note on following : **[8]**

i) Different transfer functions and concept of Bias.

ii) Input-output Mapping ability of ANN.

Q5) a) Define learning of artificial neural network. Compare between basic types of learning methods. **[10]**

b) Explain algorithm of 'Perceptron learning Rule'. Explain 'learning rate' and 'momentum coefficient' and also role of these coefficients during training of neural network. **[10]**

c) Explain the competitive learning of neural network. **[5]**

Q6) a) With neat diagram explain the architecture of Multi-Layer Perceptron (MLP). Also explain basic rules of signal flow graph. **[10]**

b) Explain with mathematical formulae, the error back propagation algorithm. **[15]**

Total No. of Questions : 6]

SEAT No. :

P1878

[Total No. of Pages : 2

[4165]-589
M.E. (Electrical) (Power System)
RENEWABLE ENERGY SOURCES
(2008 Course) (Elective - II (b)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) State different sources of power generation in India with approximate electricity production in India. **[5]**

b) State branches of science and Technology concerning 'energy'. **[5]**

c) Explain Renewable and Non-Renewable energy Resources. Point out its difference. Give different methods of harnessed. **[15]**

Q2) a) State different types of collector in solar thermal system and mention their uses. **[10]**

b) The incident beam of sunlight has power density of 0.7 kw/m^2 in the direction of the beam. The angle of incidence θ is 60°. Calculate power collected by the surface having total flat area of 100 m^2. **[5]**

c) Sketch combined cycle power plant with solar thermal input for preheating of air and indicate name of each component. **[10]**

Q3) Write short notes on any three :

a) Clean development mechanism. **[9]**

b) Types of Turbine. **[8]**

c) Wind Energy. **[8]**

d) Characteristics of PV systems. **[8]**

e) Kyoto protocol. **[8]**

P.T.O.

SECTION - II

Q4) a) State various resources of Biomass. **[5]**

b) Explain Technological advancement and conversion of Biomass in other form of energy. **[10]**

c) Differentiate Tidal and wave energy with due application. **[10]**

Q5) a) State different types of Battery. **[5]**

b) State and explain benefits of flywheel energy relation over battery. **[10]**

c) Explain interface requirements and stable operation of Grid integration with the system. **[10]**

Q6) Write short notes on any three :

a) Feasibility of small, mini and micro hydel plants scheme layout economics. **[9]**

b) Battery Management. **[8]**

c) Dynamic reactive power support. **[8]**

d) Geothermal and OTEC systems. **[8]**

e) Hybrid system economics. **[8]**

Total No. of Questions : 6]

SEAT No. :

P1879

[Total No. of Pages : 2

[4165] - 591
M.E. (Electrical) (Power System)
POWER SYSTEM PLANNING AND RELIABILITY
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write short note on following: **[25]**

a) Need for power system planning.

b) Different criteria for load forecast.

c) Importance of Load Research techniques.

d) Additive and multiplicative model for forecasting method.

e) Load growth characteristics for power system planning.

Q2) A city indoor substation has two 11/0.433 kV transformer, 750 kVA & 320 kVA and are operating in parallel to cater load of 800 kW at pf of 0.8. The percent impedance of each is 5.5 % and load losses are 7 and 3.5 kW respectively. Find load shairing. Also explain different stability issues for above problem in transmission planning. **[25]**

Q3) a) Explain concept of probability. **[5]**

b) Explain continuous markov process in evaluation of reliability. **[10]**

c) Write the evaluation method to find reliability cost. **[10]**

P.T.O

SECTION - II

Q4) Explain generation system model with the help of four state model for planning studies and hence derive the conditional For **[25]**

$$P=\frac{f(FOT)}{sT+f(FOT)}.$$

Q5) Consider the following two systems: **[25]**

System A :

6 x 50 MW units - For = 4%.

Peak load 240 MW.

System B :

6 x 100 MW units - For = 6%.

Peak load 480 MW.

The two systems are interconnected by a 50 MW tie line. Calculate the loss of load expectation in each system on a one day basis for above data.

Q6) Explain any three: **[25]**

a) Radial Network & it's reconfiguration.

b) Effects of latteral distribution protection.

c) Distribution reliability Indices.

d) Weather effects on distribution planning and reliability.

e) LOLE.

Total No. of Questions : 6]

SEAT No. :

P1880

[Total No. of Pages : 2

[4165] - 593

M.E. (Electrical) (Power System)

DIGITAL POWER SYSTEM PROTECTION

(2008 Course) (Elective - III(a)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State merits of digital protection over conventional protection. **[5]**

b) Explain least error squared technique. **[10]**

c) Draw flow chart of numerical overcurrent protection. **[10]**

Q2) a) Explain why distance relays are preferred than overcurrent relays for protection of transmission line. **[5]**

b) Explain modern relaying scheme for digital protection of transmission line using amplitude comparison. **[10]**

c) Explain travelling wave phenomenon used in protection of EHV/UHV transmission line. **[10]**

Q3) a) Explain the causes of failure of synchronous generator. **[5]**

b) Explain second harmonic current injection method. **[10]**

c) Explain injection of subsynchronous component method in protection of synchronous generator. **[10]**

P.T.O.

SECTION - II

Q4) a) In a differential scheme of power transformer explain principle of operation and reasons for taking high bias factor. Derive relay characteristics in complex β-plane. **[15]**

b) Explain Buchholtz relay. **[10]**

Q5) a) Explain directional multizone distance relay. **[10]**

b) Explain characteristics and co-ordination criteria for two terminal lines along with time delay operating setting in case of directional instantaneous IDMT over current relay. **[15]**

Q6) a) State assumptions made for conducting short-circuit studies of a large scale power system. **[5]**

b) Develop fundamental algorithm for short circuit studies. **[10]**

c) With reference to (b) above, explain and derive equations for transformation to symmetrical components. **[10]**

Total No. of Questions : 8]

SEAT No.:

P1882

[Total No. of Pages : 3

[4165]-598
M.E. (Electrical) (PowerElectronics & Drives)
MODELING AND ANALYSIS OF ELECTRICAL MACHINES
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Explain how a rotating commutator winding can be represented by a pseudo-stationary oil on the moving element. Enumerate the prosperities' possessed by this coil. **[5]**

b) What is Kron's primitive machine? How machine windings are represented by the primitive machine. Draw necessary sketches with examples. **[6]**

c) Write the voltage equations for Kron's Primitive machine in matrix form. What observations are made from the impedance matrix of the machine? **[7]**

Q2) a) How can a differential equation of an ac machine be converted to a phasor equation? Illustrate your answer. **[8]**

b) Discuss : **[8]**

i) Basic two-pole machine diagram.

ii) Primitive machine diagram for the following machines :

1) DC compound machines.
2) Polyphase induction machine.
3) Synchronous machine.

Q3) a) What do you understand by the term 'Linear transformation as used in Electrical Machines'? Explain the basic reason of using transformations in Electrical Machines. Illustrate your answer with suitable examples. **[8]**

b) In order to ensure power invariance in transforming one set of variables to another, show that the transpose of the transformation matrix should be equal to its inverse. **[8]**

P.T.O.

Q4) a) Deduce Park's transformation relating the 3-phase currents of synchronous machine to its corresponding d-q axes currents. Express three phase currents in terms of d-q axes currents and its inverse. **[8]**

b) A 2-pole synchronous machine has 3-phase armature currents as under :
$i_a = I_m \cos wt$, $i_b = I_m \cos (wt - 120)$, $i_c = I_m \cos (wt - 240)$
At time t = 0, the rotor phase – α axis is aligned with the field winding axis. Find the direct and quadrature-axes current components. **[8]**

SECTION - II

Q5) a) Draw the generalized mathematical model of a polyphase induction machine. Write down voltage equations for this model and hence obtain an expression the steady state torque. **[8]**

b) Discuss on 'Dynamic performance of 3-phase Induction motor' subjected to

i) Sudden changes in load torque.

ii) a 3-phase fault at the machine terminals. Give the time response behavior for changes in speed, torque, voltages and currents for both the kind of disturbances. **[8]**

Q6) a) What are the basic parameters of a synchronous machine? Derive expressions for armature to field mutual inductances and armature self inductance for a salient pole synchronous machine. **[10]**

b) A 3-phase, 50 Hz cylindrical-rotor synchronous machine has the following parameters :

Self-inductance for phase α = 3.15 mH
Armature inductance = 0.35 mH

For this machine calculate the mutual inductance between armature phases and its synchronous reactance. **[8]**

Q7) a) Draw the equivalent circuit of polyphase induction motor and state what is represented by the various parameters involved in this circuit. From the equivalent circuit derive an expression for the air gap power in terms of rotor resistance, slip etc. **[8]**

b) Deduce small-displacement equations of an induction machine with flux linkages per second as state variables. Express the equations in fundamental form. **[8]**

Q8) a) A synchronous machine is being driven with on half rated speed with stator terminals open circuited. A step voltage is applied to the field winding and the speed is held fixed. Express the magnitude of voltage in terms of state variables. **[8]**

b) Formulate the transfer function between the field voltage and the magnitude of terminal voltages of a synchronous machine connected to infinite bus through a transmission line having the resistance r_1 and inductive reactance x_1 per phase. **[8]**

Total No. of Questions : 6]

SEAT No.:

P1883

[Total No. of Pages : 1

[4165]-599
M.E. (Electrical) (Power Electronics and Drives)
ENERGY MANAGEMENT AND POWER QUALITY IN ELECTRICAL DRIVES
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer two questions from section-I and two questions from section-II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain optimal control of induction motor through search control. **[15]**

b) What is energy efficient motors? **[10]**

Q2) a) Which are different power quality issues present? **[15]**

b) What are energy efficient light sources. **[10]**

Q3) a) Explain the cogeneration system. **[15]**

b) Explain energy conservation measures in cooling towers. **[10]**

SECTION - II

Q4) a) Explain the effect of power quality problem on equipments with remedy. **[15]**

b) Explain different power quality reliability indices. **[10]**

Q5) a) Explain the harmonics reduction techniques in transformer. **[10]**

b) Explain different devices used to control harmonics in the system. **[15]**

Q6) a) Explain shunt type active power filter. **[15]**

b) Explain reference signal generation technique for APF. **[10]**

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Total No. of Questions : 6]

SEAT No.:

P1884

[Total No. of Pages : 2

[4165]-600
M.E. (Electrical) (Power Electronics and Drives)
POWER ELECTRONIC DEVICES AND CIRCUITS
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from section-I and any two questions from section-II.***
2) ***Answers to the two sections should be written in separate answer sheets.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain switching and V-I characteristics of SCR, and GTO. Compare two. **[10]**

b) What are different protections required for SCR, GTO, MOSFET, IGBT? **[15]**

Q2) a) What is safe operating area. Explain in relation with MOSFET, IGBT. **[10]**

b) What is need of isolation between power circuit and control circuit. Explain different isolation circuits. **[15]**

Q3) a) What is need of isolation between power circuit and control circuit. Explain different isolation circuits. **[15]**

b) What is need of snubber to power semiconductor devices. Explain turn on snubber. **[10]**

SECTION - II

Q4) a) Three phase converter supplying balance R load. Draw output voltage, current, Thyristor current, voltage across thyristor, supply current. Derive voltage equation. **[15]**

b) Derive steady state equation for single phase converter for R and RL load. **[10]**

P.T.O.

Q5) a) Explain dual converter and its mode of operation. **[10]**

b) Write a detail note on three phase VSI inverter stating mode of operations, control strategies. **[15]**

Q6) a) What is cyclo converter. Draw circuit diagram of three phase cycloconverter and explain its working with output waveform. **[15]**

b) What are advantages and disadvantages of bidirectional control. Explain single phase bi directional controller with R load. **[10]**

Total No. of Questions : 8]

SEAT No.:

P1886

[Total No. of Pages : 2

[4165]-606
M.E. (Electrical) (Power Electronics & Drives)
CONTROLLED ELECTRICAL DRIVES
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the expression for average current in a 1-phase full converter fed dc separately excited motor. Also deduce equation for maximum current. Assume dis continuous armature current. Sketch the output of converter. **[8]**

b) The speed of a 5h, 230V, 1200rpm separately excited dc motor is controlled by a single-phase full-converter. The rated armature current is 19A and the armature resistance is $R_a = 0.3\,\Omega$. The ac supply voltage is 260V. The motor voltage constant is $K_a\phi = 0.182$V/rpm. Assume that armature current is continuous and ripple-free.

For a firing angle $\alpha = 30^\circ$ and rated motor current, calculate :

i) Motor torque.
ii) Speed of motor.
iii) Supply power factor. **[8]**

Q2) a) Discuss the steady state performance of semi-converter fed dc series motor derive expression for average armature current. **[8]**

b) Write short note on dual converter-fed drives. Describe relative merits and demerits of four quadrant dc drives employing non-circulating and circulating current dual converters. **[8]**

Q3) a) Discuss four quadrant chopper-fed dc separately excited motor. Draw necessary sketches. **[8]**

P.T.O.

b) A 230V, 1000rpm 30A, separately excited motor has armature resistance and indutance of 0.7Ω and 50mH respectively. Motor is controlled in regenerative braking by chopper operating at 800Hz from a 230V dc source. For continuous conduction, calculate :

i) duty ratio of chopper for rated torque and speed of 800 rpm.
ii) motor speed for duty ratio 0.6 at rated torque.
iii) max allowable speed for max duty ratio of 0.9 and max current is twice rated current. **[8]**

Q4) a) With a necessary block diagram, explain a closed-loop control of the slip-energy-recovery-controlled induction motor drive. Also discuss the principle of this control strategy with necessary equations. **[9]**

b) Draw a control scheme for closed-loop CSIM. Drive system, explain control strategy and functions of each block. **[9]**

SECTION - II

Q5) a) With connection diagram, output wave form and necessary equations, discuss VSI fed induction motor. **[8]**

b) Show that a variable frequency induction motor drive, develops at all frequencies the same torque for a given slip-speed when operating at constant flux. **[8]**

Q6) a) Discuss the principle of field oriented control of induction motor. Sketch necessary diagrams and write transformation equations. **[8]**

b) Derive vector control model of induction motor starting from dynamic model. From the model justify decoupled control. **[8]**

Q7) a) Explain basic implementation principle of vector control of induction motor. Draw necessary phasor diagram showing transformation of rotating frame variables into stationary d-9 frame. **[8]**

b) Write short note on implementation of direct vector control. Enumarate on how rotor flux vector is identified using terminal voltages. **[8]**

Q8) a) Write down the model of permanent magnet synchronous motor (PMSM) and explain implementation of vector control of polyphase PMSM. **[9]**

b) Discuss construction of flux density distribution and machine configuration of PMSM. **[9]**

Total No. of Questions : 6]

SEAT No. :

P1887

[Total No. of Pages : 1

[4165] - 607

M.E. (Electrical) (Power Electronics & Drives)

POWER ELECTRONIC APPLICATIONS

(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer two questions from Section - I and two questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) With the help of neat diagram explain the Hybrid Electrical Vehicle system. **[15]**

b) How power electronics is used in battery charging? **[10]**

Q2) a) Discuss the different areas of applications of Power Electronics in Electrical Engineering. **[15]**

b) Explain the operation of 3 phase full bridge Converter along with its waveform. Also discuss the different applications of the converter. **10]**

Q3) a) What are the recent trends in electric traction system? Explain how power electronics is applicable in electrical traction? **[15]**

b) How power electronics is useful in Air Conditioning system? **[10]**

SECTION - II

Q4) a) What is the function of UPS? Draw the block diagram of it. Also discuss the use of power electronics devices in it. **[15]**

b) What is SMPS? What are different controlling strategies in it. **[10]**

Q5) a) Discuss the role of power electronics in electrical power system. **[15]**

b) With the help of neat diagram explain the use of Inverter in Wind power plant. **[10]**

Q6) a) Explain different industrial applications of Power Electronics. **[13]**

b) What is ZVS? Explain the operation of resonant DC link inverter with ZVS. **[12]**

Total No. of Questions : 6]

SEAT No. :

P1889

[Total No. of Pages : 1

[4165] - 611

M.E. (Electrical) (Power Electronics and Drives)

MICROCONTROLLER APPLICATIONS

(2008 Course) (Elective - III(C)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer 2 questions from Section I and 2 questions from Section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write note on
i) Reset circuit of 8051
ii) Power down mode in 8051
iii) AD converter **[15]**

b) Enlist the microcontroller family and explain architecture of 8051. **[10]**

Q2) a) Explain the interrupt structure of 8051 and toggle the LED connected at P1.0 through interrupt pin. **[15]**

b) Explain the generation of triangular wave using 8051. Program expected. **[10]**

Q3) a) Write down cross assembler directives used in 8051. **[15]**

b) Write note on Queues and Macros. **[10]**

SECTION - II

Q4) a) Discuss interfacing of seven segment display and LCD to 8051. **[15]**

b) Explain BLDC drive operation using 8051. **[10]**

Q5) a) Enlist any five sensors/actuators and their interface with 8051. **[15]**

b) Explain different modes of timer in 8051. **[10]**

Q6) a) Explain the 8051 based auto synchronizing unit. **[15]**

b) Write short note on protection of induction motor using 8051. **[10]**

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Total No. of Questions : 8]

SEAT No.:

P1891

[Total No. of Pages : 2

[4165]-616
M.E. (E & TC/Electronics)
Microwave/VLSI-Embedded Systems/Communication Network/ Signal Processing/Digital Systems
PRINCIPLES AND PRACTICES FOR IT MANAGEMENT
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the process of management. **[10]**

b) What is strategic management? Explain the steps involved in it. **[8]**

Q2) a) Write a note on risk management. **[8]**

b) Why work breakdown structure (WBS) is important in management? Explain any method for obtaining WBS. **[8]**

Q3) a) Write a note on project budget. **[8]**

b) Explain the process for implementing project revision. **[8]**

Q4) a) Discuss the methods for tracking the project progress. **[8]**

b) Write a note on business ethics and social responsibilities. **[8]**

SECTION - II

Q5) a) Explain the theories of group formation. **[9]**

b) Explain the strategies for conflict management within a team. **[9]**

Q6) a) Discuss stress management techniques. **[8]**

b) Write a note on Energy Management and Energy Audit. **[8]**

P.T.O.

Q7) a) Explain the process of knowledge management. **[8]**

b) Discuss in detail supply chain management. **[8]**

Q8) a) Explain six sigma. **[8]**

b) Write a note on application of IT in health care. **[8]**

Total No. of Questions : 8]

P1892

SEAT No.:

[Total No. of Pages : 4

[4165]-617
M.E. (E & TC) (Microwave)
RF WAVE AND MICROWAVE CIRCUIT DESIGN
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) With reference to RF circuit design explain the meaning of following terminologies **[18]**

a) Inter-Symbol Interference.

b) Nonlinearity and Time Variance.

c) Conversion Gain and Distortion.

Q2) A certain n-channel MOSFET has the following parameters **[16]**

Channel length :	$L = 4\mu m$
Channel Depth :	$Z = 12\mu m$
Gate Oxide thickness	$d = 0.05\mu m$
Gate Voltage	$V_g = 5V$
Doping factor	$m = 1$
Threshold Voltage	$V_{th} = 0.1V$
Electron Mobility	$\mu_n = 1350 \times 10^{-4}$ m^2/V-s
Electron Velocity	$v_s = 1.7 \times 10^7$ cm/s
Relative dielectric Constant of SiO2	$\varepsilon_r = 3.9$

Determine :

a) Gate oxide capacitance.

b) Saturation drain current.

c) Transconductance in saturation region.

d) Maximum operating frequency in saturation region.

P.T.O.

Q3) a) What is the effect of positive and negative bias applied to the following junctions **[8]**

i) Metal-Oxide-Semiconductor (MOS) Junction.
ii) Metal-Semiconductor (MS) Junction.
iii) p-n junction.

b) An abrupt p-n junction made up of Si has the acceptor and donor concentration $N_A = 10^{15}$ cm^{-3} and $N_D = 5 \times 10^{12}$ cm^{-3} respectively. Assuming T = 300 ºK find **[8]**

i) Barrier voltage.
ii) Space charge width.

Q4) a) Explain the operating principle of following devices. **[8]**

i) IMPATT.
ii) BARITT.
iii) TRAPATT.

b) An IMPATT diode has the following parameters : **[8]**

Carrier drift velocity :	$v_d = 2 \times 10^7$ cm/s
Drift region Length :	$L = 6\mu m$
Maximum operating voltage :	$V_{omax} = 100$ V
Maximum operating current :	$I_{omax} = 200$ mA
Efficiency :	$\eta = 15\%$
Breakdown Voltage :	$V_{BD} = 90$ V

Determine :

i) Maximum output power.
ii) Resonant Frequency.

SECTION - II

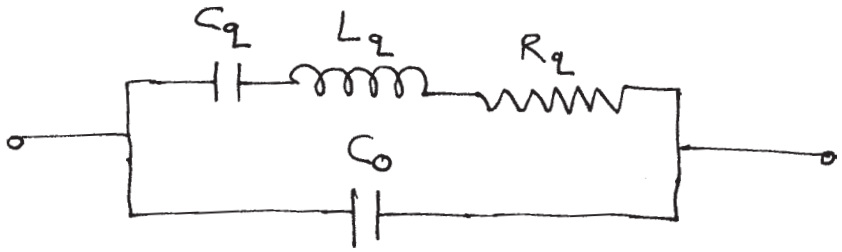
Q5) a) Briefly explain the working principle and application of following two terminal microwave devices. **[8]**

i) PIN diode.
ii) Tunnel diode.
iii) Varactor diode.
iv) Schottky barrier diode.

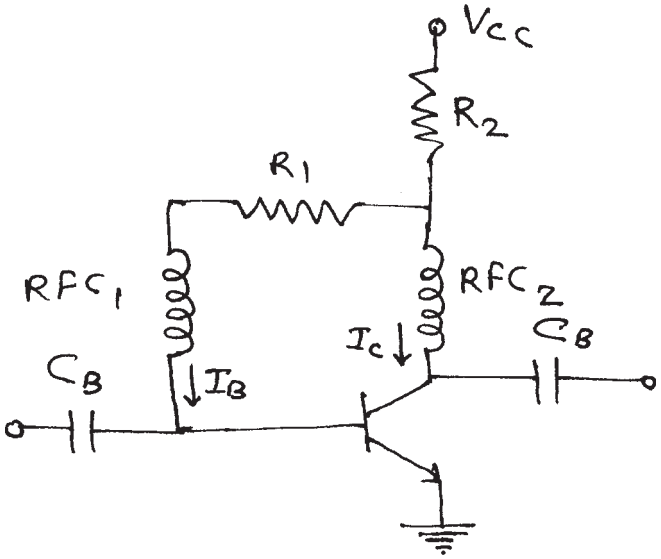
b) A crystal oscillator shown in figure is characterized by the following parameters, L_q = 0.1 H, R_q = 25 Ω, C_q = 0.3 pF and C_0 = 1 pF. Determine : **[8]**

i) Series resonance frequency.

ii) Parallel resonance frequency.



Q6) For the single ended BJT mixer shown in figure, find the values of resistors R_1 and R_2 such that the biasing conditions V_{CE} = 2.5 V, V_{BE} = 0.8 V, I_C = 2.5 mA and I_B = 40 μA are satisfied at a supply voltage V_{CC} = 3.2 V. RF and IF frequencies are f_{RF} = 2.5 GHz and f_{IF} = 250 MHz. The BJT is measured at IF to have an output impedance $Z_{out} = (650 - j\,2400)\ \Omega$ for short-circuit input and an input impedance $Z_{in} = (80 - j\,136)\ \Omega$ for short-circuit output at RF frequency. **[16]**



Q7) An amplifier is characterized by the following *S*-parameters $S_{11} = 0.78 \angle -65°$, $S_{21} = 2.2 \angle 78°$, $S_{12} = 0.11 \angle -21°$, $S_{22} = 0.9 \angle -29°$. The input side of the amplifier is connected to a voltage source with $V_S = 4V \angle 0°$, and impedance $Z_S = 65\,\Omega$. The output is utilized to drive an antenna that has an impedance of $Z_L = 85\,\Omega$. Assuming that the *S*-parameters of the amplifier are measured with reference to a $Z_0 = 75\,\Omega$ characteristic impedance, find : **[16]**

a) Transducer gain.

b) Unilateral transducer gain.

c) Available gain.

d) Operating power gain.

e) Power delivered to the load.

f) Available power.

g) Incident power to the amplifier.

Q8) Write short notes on (any three) : **[18]**

a) High Electron Mobility Transistors.

b) Charged Coupled Devices.

c) Metal-Effect Semiconductor Field Effect Transistors.

d) GaAs Field Effect Transistors.

Total No. of Questions : 8]

SEAT No. :

P1893

[Total No. of Pages : 2

[4165]-619

M.E. (E & TC) (Microwave)

DIGITAL IMAGE PROCESSING AND ANALYSIS

(2008 Course) (Elective - I (b)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is histogram equalization? Explain with suitable example. **[8]**

b) Explain monochrome vision model. **[8]**

Q2) a) Give the equation of 2D FFT. What are the properties of 2D DFT? Explain in detail. **[8]**

b) Enlist different types of basic gray level Transformations. Explain the power Law transformation in detail. **[8]**

Q3) a) Give the masks for Average filter and Laplacian mask for Sharpening Filter. Compute the value of the pixel F(3, 3) if it is smoothened by 3 × 3 average filter. **[8]**

$$F(m,n) = \begin{vmatrix} 0 & 1 & 2 & 3 & 2 \\ 5 & 6 & 7 & 8 & 4 \\ 4 & 3 & 2 & 1 & 2 \\ 8 & 7 & 6 & 5 & 3 \\ 1 & 5 & 3 & 7 & 8 \end{vmatrix}$$

b) Explain Additive and Subtractive color models. **[8]**

Q4) Give short notes on : **[18]**

a) Colour Image Processing.

b) Inverse Filters.

c) Lossy Compression Techniques.

P.T.O.

SECTION - II

Q5) a) Discuss Hough transform with algorithm and its application. **[10]**

b) Find the set of codewords and average word length using Huffman coding scheme for a set of gray levels with probabilities given below. **[8]**

Input	G1	G2	G3	G4	G5	G6	G7	G8
Probability	0.03	0.1	0.02	0.15	0.05	0.15	0.20	0.3

Q6) a) Give a model of image degradation/restoration process. Explain image restoration in the presence of noise. **[8]**

b) Give the expression for Weiner Filter assuming that the ratio of power spectra of the noise and undegraded signal is a constant. **[8]**

Q7) a) Give the kernel equation for DCT. Explain how it is used for compression. **[8]**

b) What is the limiting effect of repeatedly dilating an image assume that a trivial structuring element is not used. **[8]**

Q8) a) What is Graph iso-morphism? Give its algorithm. **[8]**

b) With the help of block diagram explain fuzzy reasoning. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1894

[Total No. of Pages : 2

[4165]-622
M.E. (E & T/C) (Microwave)
SPEECH PROCESSING AND APPLICATION
(2008 Course) (Elective - II (b)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define the following : **[6]**

i) Formants.
ii) Consonants.
iii) Vowels.

b) Define articulation. Explain the different manner of articulation in detail. **[10]**

Q2) a) What is speech digitization? **[2]**

b) Explain any three speech digitization technique in detail. **[10]**

c) Compare the different speech digitization technique with respect to digitization rate. **[4]**

Q3) a) Explain how Neural Network approach can be used for speech recognition. **[8]**

b) Explain how LVQ (Learning Vector Quantization) can be used for consonant recognition. **[8]**

Q4) Explain the hardware and software architecture used in voice processing system. **[18]**

P.T.O.

SECTION - II

Q5) a) Explain the stages of speech to Text conversion process with the help of block diagram. **[10]**

b) Draw the block diagram of speech recognition process and explain the details. **[6]**

Q6) a) Explain the basic concept of spectrum distance measures for speech recognition. **[6]**

b) Explain LPC Spectral Matching measures. **[10]**

Q7) a) Explain Hidden Markov Model (HMM) for speech recognition. **[8]**

b) Explain the training algorithm for HMM. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Ensemble Interval Histogram Model of Speech.

b) Quality assessment of coded speech.

c) Map parameter Estimation and all pole modeling of degraded speech.

d) Dynamic programming based speech recognition.

✷✷✷

Total No. of Questions : 8]

P1895

SEAT No.:

[Total No. of Pages : 3

[4165]-624
M.E. (E & TC) (Microwave)
MICROWAVE INTEGRATED CIRCUITS
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

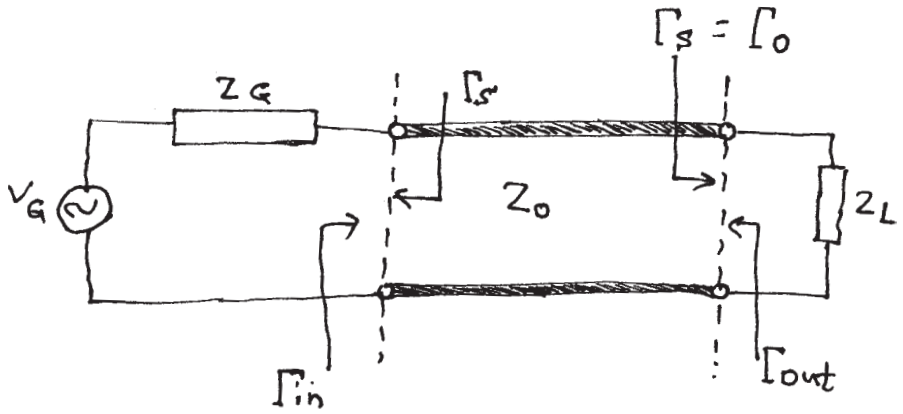
1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data,wherever necessary.***

SECTION - I

Q1) For the lossless transmission line shown in figure assume $Z_0 = 75\,\Omega$, $Z_G = 50\,\Omega$ and $Z_L = 40\,\Omega$, the length of line is $\lambda/2$ with a source voltage V_G = 5 V. Determine,

a) Input power.

b) Power delivered to the load. Give your answers both in W and dBm.



[16]

Q2) a) For a parallel copper plate transmission line operated at 1 GHz, W = 6 mm, d = 1 mm, $\varepsilon_r = 2.25$ and $\sigma_{diel} = 0.125$ mS/m. Find the line parameters R, L, C and G per unit length. **[6]**

P.T.O.

b) A four port network has the scattering matrix shown below. **[10]**

$$[S]=\begin{bmatrix} 0.2\angle 90^{o} & 0.8\angle -45^{o} & 0.1\angle -45^{o} & 0 \\ 0.8\angle -45^{o} & 0 & 0 & 0.4\angle 45^{o} \\ 0.3\angle -45^{o} & 0 & 0 & 0.5\angle -45^{o} \\ 0 & 0.4/45^{o} & 0.5\angle -45^{o} & 0 \end{bmatrix}$$

i) Is this network lossless.
ii) Is this network reciprocal.
iii) What is the return loss at port 1 when all other ports are terminated with matched load.

Q3) a) Compare the attenuation versus frequency behavior of following : **[10]**
Third order low-pass filters.
i) Standard 3-dB Butterworth.
ii) Linear phase Butterworth.
iii) 3-dB Chebyshev design.

b) With reference to RF amplifier explain the following terminologies. **[6]**
i) Transducer gain.
ii) Unilateral Transducer gain
iii) Available gain.
iv) Operating power gain.

Q4) Write short notes on (any three) : **[18]**
a) Circulators and Isolators.
b) MIC Synthesis.
c) MIC phase shifter.
d) Microstrip discontinuities.

SECTION - II

Q5) a) Describe the fabrication flow of hybrid MICs. **[6]**

b) Draw the layout diagram and the equivalent circuits of the following microstrip components,
i) An equivalent split Wilkinson power divider.
ii) An unequivalent split Wilkinson power divider.
iii) A quadrature (90°) hybrid branch line coupler.
iv) A hybrid or Rat-race in microstrip form. **[10]**

Q6) A Colpitts oscillator is to be designed for 250 MHz. At the bias point V_{CE} = 2.7 V and I_C = 2 mA. The following circuit parameters are given at room temperature of 25°C : C_{BC} = 0.2 fF, r_{BE} = 3 KΩ, r_{CE} = 12 KΩ, C_{BE} = 80 fF. If the inductance is fixed at 47 nH, find values for capacitances in the feedback loop. Examine whether it is appropriate to use the *h*-parameter obtained under DC conditions. **[16]**

Q7) a) Compare hybrid and monolithic microwave integrated circuits. **[8]**

b) Explain the techniques involved in the noise and power measurement of microwave integrated circuits. **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Application of MICs in radio communication systems.

b) Future trends in MICs.

c) MIC test systems.

d) Antenna elements.

Total No. of Questions : 8]

SEAT No. :

P1896

[Total No. of Pages : 2

[4165] - 625
M.E. (E & T/C) (Microwave)
SIGNAL PROCESSING FOR WIRELESS COMMUNICATION
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With the help of expressions, statistical parameters, sketches etc compare any four probability distribution models suggest suitable applications of each with reference to statistical signal processing. **[12]**

b) Explain the difference between probability density function and probability distribution function. Mention any two properties of each. **[6]**

Q2) Explain the following in detail: **[16]**

a) Hypothesis testing.

b) Likelihood and Sufficiency.

c) Maximum Likelihood estimator.

d) Gauss Markov Model.

Q3) a) Explain the receiver structure of colored noise. **[8]**

b) Explain and derive the expression for correlation receiver for binary decision problem. **[8]**

Q4) a) Explain the basic concept of adaptive filtering with the help of block diagram. **[6]**

b) Explain the basic concept of Wiener filter. Derive the Wiener Hopf equation. **[6]**

c) Explain any two applications of adaptive filters. **[4]**

P.T.O

SECTION - II

Q5) a) Design a matched filter to detect the signal **[10]**

$$y(t) = e^{-t/2} - e^{-t} \quad t \geq 0$$
$$y(t) = 0 \qquad\qquad t < 0$$

The noise spectral density is $\phi_v(s) = \frac{1}{1-s^2}$

and signal to noise ratio is to be maximized at sometime T > 0.

b) Explain the difference between white noise and colored noise. **[6]**

Q6) a) Explain the LMS and RLS algorithm in detail and compare their performance. **[8]**

b) Explain the difference between parametric and non parametric estimation. **[8]**

Q7) a) Explain the Periodogram method of power spectrum estimation. **[8]**

b) Explain how DFT can be used for power spectrum estimation. **[4]**

c) Explain any one parametric power spectrum estimator. **[4]**

Q8) Write short notes on (any three): **[18]**

a) Intersymbol interference in digital Communication.

b) Kalman equaliser for ISI channel.

c) Spread Spectrum Communication.

d) Radar target models.

Total No. of Questions : 8]

SEAT No. :

P1898

[Total No. of Pages : 2

[4165] - 627

M.E. (E & TC) (Microwave)

FIBER OPTIC COMMUNICATION

(2008 Course) (Elective - III(a)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is attenuation? Explain the cause of attenuation in the case of optical fibers. **[10]**

b) Explain any two fabrication techniques of fiber. **[8]**

Q2) a) Explain fiber optic communication with the help of a neat block diagram. Also compare it with other communication techniques stating its advantages and disadvantages. **[8]**

b) Write a note on the degradation of the signal due to dispersion. **[8]**

Q3) a) Explain the working principle of an electro-optics switch with the help of an example. **[8]**

b) Define quantum efficiency and responsivity of photodetector. Derive expression for responsivity of photodetector in terms of quantum efficiency and wavelength of incident wave. **[8]**

Q4) a) Draw and explain the schematic of an optical receiver. **[8]**

b) A glass clad fiber is made with core glass of refractive index 1.5 and cladding is doped to give a fractional index difference of 0.0005. Find cladding index, critical internal reflection angle, the external critical acceptance angle, NA. **[8]**

P.T.O.

SECTION - II

Q5) a) Describe why the design of optical fiber network is challenging? Explain the methodologies to meet these challenges. **[8]**

b) Explain the working principle of any one optical source. **[10]**

Q6) a) Explain OTDR. **[8]**

b) A continuous 50 km long optical fiber link has a loss of 0.5 dB/km calculate what is the maximum optical power level that must be launched into the fiber to maintain the optical power level of 2 micrometer at the receiver end? What is the required input power if the fiber has a loss of 0.6 dB/km? **[8]**

Q7) a) Discuss the different power penalties in the optical link. **[8]**

b) Discuss the concept of self-phase modulation. **[8]**

Q8) a) Explain in detail Raman Amplifier. **[8]**

b) Write a note on group velocity dispersion. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1900

[Total No. of Pages : 2

[4165]-638

M.E. (E & TC) (VLSI & Embedded System)

ASIC DESIGN AND MODELLING

(2008 Course) (Elective - I (a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the step by step process of ASIC Design. **[10]**

b) Draw the FSM for lift controller and write the VHDL code for same. Assume suitable data. **[8]**

Q2) a) Describe the various issues in verification. **[8]**

b) Classify and explain in detail different simulation modes in simulator. **[8]**

Q3) a) Classify and explain in detail gate array based ASIC. **[8]**

b) Draw the stick diagram for 3 input OR gate. Calculate area needed on chip. **[8]**

Q4) a) Explain the scan path technique in detail. **[8]**

b) Explain tap controller in detail. **[8]**

SECTION - II

Q5) a) Explain BIST and boundary scan in detail? Where it is useful? **[10]**

b) Discuss the static and dynamic power dissipation in detail. **[6]**

Q6) a) What do you mean by clock skew. Explain the methods to minimize the clock skew. **[8]**

b) Explain the K-L algorithm in detail. **[8]**

P.T.O.

Q7) a) What are various issues in analog mixed signal design. **[8]**

b) Explain the various routing techniques. Explain any one of them in detail. **[8]**

Q8) Write short note on : **[18]**

a) Measurement if interconnect delays.

b) Features of EDA tools.

c) Automatic Test Pattern Generator (ATPG).

Total No. of Questions : 8]

SEAT No.:

P1902

[Total No. of Pages : 2

[4165]-644
M.E. (E & TC) (VLSI & Embedded Systems)
REAL TIME OPERATING SYSTEMS
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data whenever necessary.***

SECTION - I

Q1) a) Describe Foreground-background software architecture. Why it is not suitable for real time applications? Explain. **[10]**

b) Describe RTOS architecture based on the role of TCB, stack and CPU. **[6]**

Q2) a) Why 'Context switch' is essential operation in multitasking system? Describe the context switch operation and its related aspects in detail. **[10]**

b) Describe round robin scheduling algorithm. Why it is not suitable for real time applications? Explain. **[6]**

Q3) a) Essential features of RTOS are ROMable, scalable and portable. Explain why? **[8]**

b) Describe the Task state diagram. **[8]**

Q4) Write short notes on (any three) : **[18]**

a) Shared data problem in RTOS.

b) Critical code in RTOS.

c) Delay generation mechanism in RTOS.

d) Priority inversion and inheritance.

P.T.O.

SECTION - II

Q5) a) Describe three techniques used to make function reentrant. **[8]**

b) Write C code for message mailbox implementation using μCOS-II. **[8]**

Q6) a) Describe four methods used to obtain exclusive access to shared resources. **[8]**

b) Describe rate monotonic scheduling algorithm. **[8]**

Q7) a) What are the Inter task communication services for message queue, supported by μCOS-II? **[10]**

b) Describe the features of RT-LINUX. **[6]**

Q8) Write short notes on (any three) : **[18]**

a) Integrated Development Environment (IDE) tool.

b) File handling in LINUX.

c) Porting of μCOS-II.

d) Task synchronization.

Total No. of Questions : 8]

SEAT No. :

P1903

[Total No. of Pages : 2

[4165] - 645
M.E. (E & TC) (VLSI EMBEDDED SYSTEMS)
EMBEDDED SIGNAL PROCESSING
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe in detail "Divide & Conquer Method" of computation of DFT. Describe in detail column was mapping & row wise mapping. **[8]**

b) Explain DTMF application with importance of Goertzel Algorithm in it. **[8]**

Q2) a) What is a STFT? Explain with example how STFT can be used for time frequency analysis? **[8]**

b) What is Discrete Cosine Transform. Discuss in detail the different properties of DCT. **[8]**

Q3) a) Justify that the pipelining increases the performance and reduces the power consumption of DSP system with suitable example. **[8]**

b) Explain different retiming techniques. **[8]**

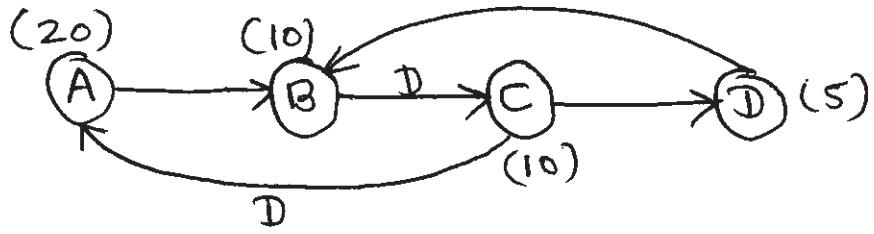
Q4) a) Define unfolding. State & explain properties of unfolding. **[8]**

b) Explain how adaptive filter can be implemented using LMS algorithm. **[10]**

P.T.O

SECTION - II

Q5) a) Consider the DFG shown below. **[8]**



i) What is the maximum sample rate of this DFG.

ii) Manually retime this DFG to minimize the clock period.

b) Explain with an example how convolution algorithm can be implemented on TMS320C54 XX. **[8]**

Q6) a) Draw & explain the architecture of black fin processor. **[8]**

b) Explain with an example how FFT algorithm can be implemented on TMS320C67XX. **[8]**

Q7) a) Explain different addressing modes of TMS320C54XX. **[8]**

b) Why SFG are not used to represent the multirate DSP systems? Explain the suitable methods. **[8]**

Q8) a) Discuss in detail finite word length effect in DSP system. **[8]**

b) Write short note on (any two): **[10]**

i) Adaptive noise canceling with LMS adaptation algorithm.

ii) Wavelet transform.

iii) Representation methods of DSP systems.

Total No. of Questions : 10]

SEAT No. :

P1905

[Total No. of Pages : 2

[4165] - 652

M.E. (E & TC) (VLSI & Embedded Systems)

SOFTWARE DEFINED RADIO

(2008 Course) (Sme. - II)(Elective -IV(C))

Time :3 Hours] *[Max. Marks :100*

Instruction to the candidates:-

Attempt any three questions from both the sections.

SECTION - I

Q1) a) Enlist the factors that has pushed wider acceptance of software defined radio? What are the design principles of software defined radio? Explain in brief. **[10]**

b) On the basis of architecture, compare traditional hardware radio and ideal software defined radio. **[6]**

Q2) a) With respect to wideband band RF front end, draw and explain the basic software defined radio architecture. How does down conversion takes place in it? **[10]**

b) Enlist the various factors to be considered while designing the dynamic range of SDR receiver? **[6]**

Q3) a) Explain the importance of Link Budget in a typical radio system. Compute free space loss for a radio system for the following specifications:

- Frequency: 3G frequency (1.9 Ghz),
- Distance between Tx and Rx antenna: 100 metres. **[10]**

b) Through light on hardware implementations (FPGA/CPLD/ASIC) of SDR. **[6]**

Q4) a) Explain different overview in relation to SDR namely: Architecture overview, Functional overview and Networking overview. **[10]**

b) What is the impact of noise and interference on Dynamic range requirements of ADC/DAC Convertors. **[6]**

P.T.O.

Q5) Write short note on (Any three): **[18]**

a) Common Object Request Broker Architecture.

b) Joint Tactical Radio System.

c) DAC Noise budget related to Radio's Digital to analog convertor.

d) Need of multirate signal processing (Digital Up convertor - DUC and Digital down convertor - DDC) in the design of software radio.

e) The aim and requirements of the SCA.

SECTION - II

Q6) a) How to apply software radio principles to antenna systems? **[8]**

b) What are different smart antenna architectures, explain any one of them in detail. **[8]**

Q7) a) Explain the parameters to be considered for selecting a DSP processor for SDR application? **[8]**

b) What are the factors to be considered while selecting the antenna for SDR? **[8]**

Q8) a) Explain how Phased Antenna Array concept was employed in traditional antenna arrays? **[6]**

b) What are the different signal processing adaptive techniques (LMS, RLS, LS) involved in the processing of software defined radios? Explain any one of them. **[10]**

Q9) a) Explain the layout of SpectrumWare System. Also explain the GuPPI functions. **[8]**

b) Draw and explain the system hardware architecture for low cost SDR implementation using DSP Processor. **[8]**

Q10) Write short notes on: (any three) **[18]**

a) Application of FPGA's to Software Radios.

b) SDR - 3000 Digital Transceiver Subsystem.

c) CHARIOT's Layered Radio Architecture.

d) SPEAKeasy.

Total No. of Questions : 8]

SEAT No.:

P1906

[Total No. of Pages : 3

[4165]-654
M.E. (E & TC) (Signal Processing)
LINEAR ALGEBRA AND RANDOM PROCESSES
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Apply test rank to examine if the following equations are consistent. **[6]**

$2x - y + 3z = 8$

$-x + 2y + z = 4$

$3x + y - 4z = 0$

and if consistent, find the complete solution.

b) Show that A is involutor, if and only if $(I + A)(I - A) = 0$. **[4]**

c) Determine the characteristic roots and the corresponding characteristic vectors of the matrix. **[8]**

$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$

Q2) a) Solve completely the system of equations. **[6]**

$4x + 2y + z + 3u = 0$

$6x + 3y + 4z + 7u = 0$

$2x + y + u = 0$

b) Prove that every invertible matrix possesses a unique inverse. **[4]**

c) Find the characteristic roots of matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ and verify Caley-Hamilton theorem for the matrix. Find inverse of matrix A. **[6]**

P.T.O.

Q3) a) Prove or disprove each of the following statements. **[4]**

i) The product of 2 upper triangular matrices is upper triangular.

ii) The product of 2-Toeplitz matrices is Toeplitz.

b) Determine non-singular matrices P & Q such that PAQ is in normal form. where

$$A=\begin{bmatrix} 3 & 2 & -1 & 5 \\ 5 & 1 & 4 & -2 \\ 1 & -4 & 11 & -19 \end{bmatrix}. \quad \textbf{[6]}$$

c) Prove that :

$$\Delta=\begin{vmatrix} 1+a & 1 & 1 & 1 \\ 1 & 1+b & 1 & 1 \\ 1 & 1 & 1+c & 1 \\ 1 & 1 & 1 & 1+d \end{vmatrix} = abcd \times \left[1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}+\frac{1}{d}\right]. \quad \textbf{[6]}$$

Q4) a) For what values of λ will the following equations fail to have unique solutions. **[6]**

$3x - y + \lambda z = 1$

$2x + y + z = 2$

$x + 2y - \lambda z = -1$

will the equations have any solutions for these values of λ?

b) Write down in matrix form the system of equations. **[6]**

$2x - y + 3z = 9$

$x + y + z = 6$

$x - y + z = 2$

Find A^{-1} and hence solve the given equations if $A=\begin{bmatrix} 2 & -1 & 3 \\ 1 & 1 & 1 \\ 1 & -1 & 1 \end{bmatrix}$.

c) Write matrix A of quadratic form $6x^2 + 65y^2 + 11z^2 + 4zx$. Find eigen values of A and hence determine the value class of the given quadratic form. **[4]**

SECTION - II

Q5) a) The sample space 's' of an experiment is given by S = {a, b, c, d}. P (a) = 0.2 P (b) = 0.3 P (c) = 0.4 P (d) = 0.1. Let 'A' denote the event {a, b} and B the event {b, c, d}. Find P (A), P (B), P ($\overline{A}$), P (A $\cup$ B) P (A $\cap$ B). **[5]**

b) A random variable 'X' has the following probability distribution. **[5]**

X	0	1	2	3	4
P (X = x)	2k	4k	5k	3k	K

Find :

i) P (X $\leq$ 2).
ii) P (X > 1).
iii) P (1 < x < 4).

c) Define probability. What is the difference between mutually exclusive and independent events. Give an example of each. Explain with an example what do you mean by conditional probability. **[8]**

Q6) a) Let 'X' be a uniform random variable over (a, b). Derive the equation for mean, mean square value and variance, given $f(x) = \frac{1}{b-a}$. **[8]**

b) A random variable has following exponential probability density function. $f(x) = k\, e^{-|x|}$. Determine the value of 'k' and corresponding c.d.f. Also plot the pdf. **[8]**

Q7) a) A 2D random variable is given by P (1, 1) = 0.28 P (2, 2) = 0.52, P (3, 3) = 0.2. Write the equation of CDF and find the marginal distribution functions x & y. **[8]**

b) Explain a 2D random variable along with an example. List its types and properties. **[8]**

Q8) a) What is Narrow band noise? Represent it in terms of its In-Phase and Quadrature components. **[5]**

b) Write a short note on 'Poission's Process'. **[5]**

c) Explain 2nd order statistics of a random process with respect to auto correlation function, autocovariance function. Derive the relation between them. **[6]**

Total No. of Questions : 8]

SEAT No.:

P1907

[Total No. of Pages : 2

[4165]-656
M.E. (E&TC) (Signal Processing)
SIGNAL PROCESSING TECHNIQUES
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find the unit step response of the system described by the difference equation y (n) – (1/6) y (n – 1) – (1/6) y (n – 2) = x (n). **[4]**

b) State the convolution property of z-transform and find the response of the filter with impulse response h (n) = $\{\underset{\uparrow}{1}, 1, 1\}$ and input applied, x (n) = $\{\underset{\uparrow}{1}, 2, 1\}$. **[4]**

c) Find IZT of $\frac{5-2z^{-1}+z^{-2}}{\left(1+z^{-1}\right)^2\left(1-z^{-1}\right)^2}$; ROC : |z| > 1. **[8]**

Q2) a) Explain the Frequency Sampling Method of designing an FIR filter. **[6]**

b) A Low pass filter has the desired response

$H_d(e^{j\omega}) = e^{-j8\omega}$, $0 \le \omega \le \Pi/2$

$= 1$, $\Pi/2 < |\omega| \le \Pi$.

Using the frequency sampling (Type _ I) Technique, determine the filter coefficients. The length of the filter M = 17. **[10]**

Q3) a) Find 8-point DFT using Radix-2 DIF FFT algorithm for the following sequence. x (n) = {1, 2, 3, 4, 4, 3, 2, 1}. **[10]**

b) Explain Overlap-add and Overlap-save method for filtering long length sequences. **[6]**

Q4) a) Explain Gibb's phenomenon. **[4]**

b) Explain windowing technique for design of FIR filter and list the desirable features of window function. **[6]**

P.T.O.

c) The desired frequency response of a low pass filter is
$H_d(e^{j\omega}) = e^{-j3\omega}$, $-3\Pi/4 \leq \omega \leq 3\Pi/4$
$= 0$, $3\Pi/4 < |\omega| \leq \Pi$
Determine the filter coefficients using Blackman window for M = 7. **[8]**

SECTION - II

Q5) a) Explain leakage effect in DFT? **[4]**

b) Determine IDFT of the sequence $X(k) = \{1, -2 - j, 0, -2 + j\}$. **[6]**

c) State applications of DFT and explain any one in detail. **[6]**

Q6) a) Find the unit impulse response, h (n) and zero state response, y (n) of an LTID system described by the equation
$y(n+2) - (0.5)\, y(n+1) - (0.26)\, y(n) = 4\, x(n+2)$ if the input $x(n) = 3^{-n}\, u(n)$. **[12]**

b) State the relationship between z-transform and DTFT. Determine DTFT of $x(n) = \gamma^{n}\, u(n)$. **[4]**

Q7) a) Obtain direct form II structures for the following filters : **[6]**

i) $y(n) + (3/4)\, y(n-1) + (1/8)\, y(n-2) = x(n) + 2\, x(n-1)$.

ii) $H(z) = (z^2 + 2z + 5)/[(z + 0.5)(z^2 + z + 1)]$.

b) Design a low pass Butterworth digital filter with the following specifications : **[10]**

i) Passband edge frequency, $\omega p = 0.4\ \Pi$.

ii) Stopband edge frequency, $\omega s = 0.6\ \Pi$.

iii) Passband ripple = 0.15.

iv) Stopband ripple = 0.25.

Assume T = 1 sec. Use the method of bilinear transformation.

Q8) a) Distinguish between Butterworth and Chebyshev (Type I) filter. **[4]**

b) Convert the analog filter to digital filter whose system function is $H(s) = 1/[(s + 1)(s + 2)]$. Use the impulse invariant technique. Assume T = 1 sec. **[4]**

c) Using the bilinear transform, design a high pass filter, monotonic in passband with cutoff frequency of 1200 Hz and down 11 dB at 400 Hz. The sampling frequency is 6000Hz. **[10]**

Total No. of Questions : 8]

SEAT No. :

P1908

[Total No. of Pages : 2

[4165]-657
M.E. (E & TC) (Signal Processing)
DIGITAL IMAGE PROCESSING
(2008 Course) (Elective - I (a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if required.***

SECTION - I

Q1) a) What is image sharpening? How it can be achieved? **[8]**

b) Explain techniques of image enhancement by intensity transformations. **[8]**

Q2) a) Explain the following properties of the 2D Fourier transform. **[8]**

i) Translation.
ii) Rotation.
iii) Scaling.
iv) Convolution.

b) Explain Hadamard transform. Obtain the Hadamard matrix H_N for N = 3. **[8]**

Q3) a) What is the image restoration? What are the differences between Image restoration and image enhancement? **[8]**

b) Explain restoration by inverse filtering. **[8]**

Q4) Explain the following : **[18]**

a) Brightness adaptation.

b) Photopic and Scotopic vision.

c) Types of pixel adjacency observed in images.

P.T.O.

SECTION - II

Q5) a) The binary image 'A' below is dilated using structuring element 'B'. Give output image. **[8]**

A

0	0	1	1	0	0
0	0	1	1	0	0
1	1	1	1	1	1
1	1	1	1	1	1
0	0	1	1	0	0
0	0	1	1	0	0

B

1	1	1

b) What is Hough transform? How it can be used for Boundary detection? **[8]**

Q6) a) Explain Image segmentation using motion. **[8]**

b) Explain image segmentation by region growing. **[8]**

Q7) a) Explain lossy and lossless image compression. Give their applications. **[8]**

b) Analyze the effect on visual quality of reconstructed image in following two situations. **[8]**

i) After taking 2D DCT of image, high frequency coefficients are changed to zero. Then inverse 2D DCT transform is obtained.

ii) After taking 2D DCT of image, low frequency coefficients are changed to zero. Then inverse 2D DCT transform is obtained. Justify your answer.

Q8) Write short notes on : **[18]**

a) HSI color model.

b) Finger print recognition.

c) Canny edge detector.

Total No. of Questions : 8]

P1911

SEAT No.:

[Total No. of Pages : 3

[4165]-663
M.E. (E & TC) (Signal Processing)
STATISTICAL SIGNAL PROCESSING
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Enlist the drawbacks of least square method. Explain how Pade and Prony's method remove these errors. **[6]**

b) Give the advantage of Shank's method over Prony's method. **[2]**

c) Given the signal x (n) = [1, 1.5, 0.75, 0.375, 0.1875, 0.0938]; Use Pade's approximation to find, second order all-pole model, a second order MA model and a (1, 1) ARMA model. **[8]**

Q2) a) Compare the computational complexity of Levinson Durbin with Levinson and Gaussian Elimination method. **[6]**

b) Justify the statement; Power spectrum is an important application of stochastic signal modeling. **[4]**

c) Use the method of spectral factorization to find a moving average model of order 2 for a process whose autocorrelation sequence is Rx = [3, 1.5, 1]. **[8]**

Q3) a) Compare Step-Up and Step-Down recursion. **[8]**

b) Let autocorrelation sequenced $r_x = [2, 0.5\ (1 + j), 0.5j]^T$. Use Levinson Durbin algorithm to solve autocorrelation normal equations for a second order all pole model. **[8]**

P.T.O.

Q4) a) Explain the pipelined structure for implementing Schur Algorithm. **[10]**

b) Without factoring any polynomial determine if the given filter is minimum phase. **[6]**

$$H(z)=\frac{1+0.8z^{-1}-.9z^{-2}+.3z^{-3}}{1-.9z^{-1}+0.8z^{-2}-.5z^{-3}}$$

SECTION - II

Q5) a) State true or false and justify the answer. **[8]**

i) Kalman Filter has wider application than Wiener Filter.

ii) Periodogram method is asymptotically unbiased and a consistent estimation of the power spectrum.

iii) Windows used in Modified Periodogram provide trade-off between spectral resolution and spectral masking.

iv) Parametric methods are not designed to incorporate information available about the process in the estimation procedure.

b) Find the closed form expression for the FIR least square inverse filter of length 2. Given :

$$G(z)=\frac{1}{1-\alpha z^{-1}};|\alpha|<1$$

[8]

Q6) a) Reflection coefficients for a two pole model are $\Gamma_1 = 0.25$, $\Gamma_2 = 0.25$, and modeling error $\varepsilon_2 = 9$, if $r_x(3) = 1$ find the error ε_3. If the signal values are multiplied by ½ find the reflection coefficients and modeling error for a two pole model. **[8]**

b) Compare different non-parametric methods of spectrum estimation on the basis of variability and figure of merit. **[8]**

Q7) a) Given the autocorrelation sequence Rx = [2, – 1, – 1/4, 1/8]. Use the Schur recursion to find all the reflection coefficients upto third order model. What is the final generator matrix and modeling error? How many computations are required in this recursion. **[8]**

b) Give the Wiener-Hopf equations for Causal Wiener filter. Derive the optimum causal Wiener Filter when the input to the filter has a rational power spectrum. **[8]**

Q8) a) What are the different applications of Wiener Filter? Explain any one in detail. **[8]**

b) Consider a signal x (n) = s (n) + w (n), where s (n) is an AR (1) process that satisfies the difference equation s (n) = 0.8s (n – 1) + v (n) where {v (n)} is a white noise sequence with variance $\sigma_v^2 = 0.49$ and {w (n)} is a white noise sequence with variance $\sigma_w^2 = 1$. The two noise processes are uncorrelated. Determine the system function for the non causal IIR Wiener filter for the signal and the corresponding MMSEnc. **[10]**

Total No. of Questions : 8]

SEAT No. :

P1914

[Total No. of Pages : 2

[4165] - 668

M.E. (E & TC) (Signal Processing)

MULTIMEDIA TECHNIQUES

(2008 Course) (Elective - III(c)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain different colour models and compare bitmap and vector image representation. **[8]**

b) Explain line-drawing and circle-drawing algorithms. **[8]**

Q2) a) With suitable example explain the building blocks of multimedia. **[8]**

b) Explain in brief hypertext and hyper media. **[8]**

Q3) a) What is a multimedia authoring tool. List different functions of multimedia authoring software. **[8]**

b) With respect to video display, explain following terms. **[8]**

i) Resolution

ii) Aspect Ratio

iii) Colour Depth

iv) Raster Scan

Q4) Write short note on: **[18]**

a) 3D animation.

b) Video signal formats.

c) MPEG-1 audio encoder.

P.T.O.

SECTION - II

Q5) a) Compare working of NTSC & SECAM encoder with suitable diagram. **[8]**

b) What are MIDI messages? **[8]**

Q6) a) What is GoP? Explain in detail encoding of various pictures in a GoP in MPEG - 1. **[8]**

b) Explain salient features of image processing software. **[8]**

Q7) a) Explain Psyco-acoustic model for voice. **[8]**

b) Explain Huffman coding in baseline JPEG. **[8]**

Q8) Write short notes on: **[18]**

a) Audio file formats.

b) File formats for Text.

c) WAVE file format.

Total No. of Questions : 8]

SEAT No. :

P1915

[Total No. of Pages : 2

[4165] - 671

M.E. (E & TC) (Signal Processing)

COMPUTER VISION

(2008 Course) (Elective - IV(c)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if required.***

SECTION - I

Q1) Explain following camera specifications **[18]**

a) Dynamic range
b) Resolution
c) Spectral response
d) Frame rate
e) Depth of field
f) Field of view

Q2) a) What is homogeneous coordinate system? How it is useful in computer vision? 3D homogeneous coordinates of point 'P' and 'Q' are given as $[2\ 3\ 4\ 1]^T$ and $[2\ 4\ 1\ 0]^T$ respectively. Find non homogeneous coordinates of point 'P' and 'Q'. **[8]**

b) Give homogeneous transformation matrix, which rotates the point about z axis by 90 degrees and translates along z axis by 2 units. **[8]**

Q3) a) Explain internal camera calibration parameters. **[8]**

b) M is the camera matrix and $M = M_{int} * M_{ext} = M_{int} * R[I \mid -T]$. Where M_{int} is the internal parameter matrix, R and T are the rotation and translation parameter matrices. If M is known explain the procedure to find M_{int}, R and T. **[8]**

Q4) a) With block diagram explain principal of tomography. **[8]**

b) An ideal pinhole camera has focal length 5mm. Each pixel is 0.02 mm* 0.02 mm and the image principal point is at pixel (500, 500). Pixel coordinates start at (0, 0) in the upper-left corner of the image. What is the camera calibration matrix, K, for this camera configuration? **[8]**

P.T.O.

SECTION - II

Q5) a) What is optical flow. What is the application of optical flow estimation? Explain aperture problem in optical flow estimation. **[8]**

b) How Kalman filter can be used for feature tracking using predict and update technique? Explain. **[8]**

Q6) a) Explain procedure of epipolar rectification. Why it is required? **[8]**

b) What is fundamental matrix? How it can be estimated. Show that for rectified image, fundamental matrix is **[8]**

0	0	0
0	0	–1
0	1	0

Q7) a) Explain metrics used to find correspondence in stereo imaging. **[8]**

b) Explain ordering constraint and continuity constraint in stereo correspondence problem. **[8]**

Q8) Write short notes **[18]**

a) Harris corner detector.

b) IR imaging applications.

c) Dynamic programming.

Total No. of Questions : 8]

SEAT No.:

P1917

[Total No. of Pages : 2

[4165]-674
M.E. (Electronics) (Digital Systems)
SIGNAL PROCESSING ARCHITECTURES
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data, wherever required.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) If the first 5 DFT outputs of the 8 point data sequence are 12, 2 + 0.5j, 3 + j, 4-0.1j, 5, find the last 3 DFT output values. **[2]**

b) What is real time linear filtering? Explain the algorithm to implement real time filtering. How is aliasing avoided? **[10]**

c) Justify the statement-Decimation in time FFT is a dual of decimation in frequency FFT. **[6]**

Q2) a) Compare different window functions used for the design of FIR filter design. Explain properties of Kaiser window. **[8]**

b) Find the coefficients of FIR BPF that has a pass band between 1000 Hz to 2000 Hz and the duration of the response is limited to 2.5ms. Sampling frequency is 8000 Hz. **[8]**

Q3) a) Explain the use of folding and retiming transformation to improve the throughput of the system. **[8]**

b) Explain the effect of quantization of filter coefficients. Can you reduce the effect of quantization using a cascade realization? **[8]**

Q4) a) Compare the performance of DCT with DFT. Why DCT is a near optimal transform? **[8]**

b) Explain the characteristics of Butterworth filters. How will you convert any analog Butterworth filter in Digital domain? **[8]**

P.T.O.

SECTION - II

Q5) a) Explain wavelet packet decomposition using a block schematic. What is the advantage of using wavelet packet decomposition? **[8]**

b) Describe a short time analysis of signals. What are the basis functions used in STFT? **[8]**

Q6) a) What is the meaning of barrel shifting? Draw a block diagram for a 4 bit barrel shifter. **[8]**

b) Compare VLIW architecture with Harvard architecture. **[8]**

Q7) a) Draw a poly phase interpolator. How are the poly phase structures efficient? **[8]**

b) Find the specifications of the filters in a two stage decimator to reduce the sampling frequency from 1024 KHz to 128 KHz. The band of interest is 0 to 60 KHz. **[10]**

Q8) a) Explain the use of circular buffers in DSP architecture. **[8]**

b) What is a MAC instruction? Explain execution of MAC in DSP. **[8]**

Total No. of Questions : 9]

SEAT No. :

P1921

[Total No. of Pages : 2

[4165] - 682

M.E. (Electronics) (Digital System)

COMMUNICATION NETWORK & SECURITY

(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each Section.***
2) ***Answer three questions from Section - I and three questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Your answers will be valued as a whole.***
7) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
8) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw and explain IEEE 802.11 phy frame using DSSS. **[8]**

b) Explain DCF and PCF in 802.11 for wireless n/w. **[8]**

Q2) a) Explain the issues in designing routing protocols for MANET. **[8]**

b) Explain IP - encapsulation for IP. **[8]**

Q3) a) Explain data dissimination, data gathering and sensor management in wireless sensor network. **[8]**

b) Discuss the issues for low power consumption is wireless sensor network. **[8]**

Q4) Write Notes on (any two): **[18]**

a) Protocols for Adhoc n/w in Mobile.

b) Adaptation layer in wireless n/w.

c) Limitations in blue-tooth & its security.

P.T.O

SECTION - II

Q5) a) Explain the principles of AES - standards. **[8]**

b) Explain HMAC and IPSec. **[8]**

Q6) a) Explain the pre-requisites for digital signatures and discuss its properties. **[8]**

b) Explain DES - Algorithm. **[8]**

Q7) a) Explain the principles of RSA & compare with Difie-Hellman algorithm. **[8]**

b) Explain IDEA symm key algorithm & list the application. **[8]**

Q8) a) Explain AAA service properties with suitable example. **[8]**

b) Explain the various security features offered by PGP. **[8]**

Q9) Write Notes on: **[18]**

a) SSL & TSL.

b) SMIME.

c) Secured Electronic transaction.

Total No. of Questions : 8]

SEAT No. :

P1923

[Total No. of Pages : 3

[4165] - 685

M.E. (Electronics) (Digital Systems)

BIO-MEDICAL SIGNALS AND SYSTEMS

(2008 Course) (Elective - III(b)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section I and 3 questions from Section II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw a three-channel schematic plot of simultaneous recordings of the ECG, PCG, and Carotid pulse signals for two cardiac cycles. Label the important waves in each signal and describe the related events in the cardiac cycle. Label the time axis with the typical durations of each wave.
Identify the interrelated waves or markers in the three signals and the relationships to cardiac events that they share. **[8]**

b) List three main objectives of biomedical signal analysis. For each objective that you list, give one example of a clinical application and describe the characteristics of the associated biomedical signal. **[8]**

Q2) a) A signal y (t) is observed as $y(t) = a^* x(t - t_1) + s(t)$, where x (t) is a signal of interest, a is a scalar, t_1 is a delay in time, and s(t) is an artifact. Write the definition of the Fourier transform of a continuous-time signal. Derive an expression for the Fourier transform of y (t) and explain how it is related to the Fourier transforms of x(t) and s(t). Show all steps of your derivation. **[8]**

b) Given a signal x(t), give the definition of the time-averaged autocorrelation function (ACF) $\phi(\tau)$. Derive the relationship between the Fourier transforms of x(t) and $\phi(\tau)$. Show all steps of your derivation. Provide an interpretation of your result. **[8]**

P.T.O.

Q3) a) Derive the transfer function of the filter in terms of the Laplace variable, that is , H(s). Use the bilinear transformation and obtain the transfer function H(z). Normalize the filter so as to have unit gain at DC. **[8]**

b) Explain how the equation characterizes the frequency response of the Wiener filter. In particular, explain how the response varies **[8]**

i) when the signal component at a particular frequency is zero

ii) when the noise component at a particular frequency is zero and

iii) when the noise component at a particular frequency is much stronger that the corresponding signal component.

Q4) a) Two linear, shift-invariant, discrete-time filters are specified in terms of their impulse responses as $\delta(n) - \delta(n-1)$; and $\delta(n) + \delta(n-1) + \delta(n-2)$.

A researcher prepares a new filter by connecting the two filters described above in series. **[10]**

i) Derive the transfer function of each filter.

ii) Derive the transfer function of the combined filter.

iii) Derive the impulse response of the combined filter.

iv) Does it matter which filter is placed first? Explain and justify your answer.

v) Draw the signal-flow diagram of the combined filter.

vi) Draw the pole-zero diagram of the combined filter.

vii) What is the gain of the combined filter at DC, $f_s/4$, and $f_s/2$, where f_s is the sampling frequency?

Give an interpretation of the nature of the combined filter.

b) Design a second-order Butterworth low pass filter with a -3 dB cutoff frequency of 80 Hz and sampling frequency of 200 Hz. **[8]**

SECTION - II

Q5) a) Give a mathematical expression to compute the autocorrelation function (ACF) of a single observation of a discrete-time signal $x(n)$. Give a mathematical expression to obtain the power spectral density (PSD) of the signal from the ACF. Explain how you could use the PSD of an EEG signal to detect the presence of **[8]**

i) The alpha rhythm ii) The beta rhythm

iii) The theta rhythm and iv) The delta rhythm

b) Propose a method to detect spike-and-wave complexes in an EEG signal. Give at least one equation and explain your approach. Give a step-by-step algorithm to implement your procedure. **[8]**

Q6) a) Describe a method to measure the heart rate and average RR interval from an ECG signal. **[8]**

b) Prove that the autocorrelation function (ACF) $\phi_{xx}(\tau)$ of any function $x(t)$ is maximum at $\tau = 0$. **[6]**

c) For a stationary process x, prove that the ACF is even symmetric, that is, $\phi_{xx}(\tau) = \phi_{xx}(-\tau)$. You may use the expectation or time-average definition of the ACF. **[4]**

Q7) a) Investigate the effect of the distribution of energy over the time axis on a signal's characteristics. Propose measures to parameterize the effects and study their use in the classification of ECG beats. **[8]**

b) Formulate algorithms to extract the envelope of an EMG or PCG signal to facilitate analysis of trends in the level of activity or energy in the signal. **[8]**

Q8) a) Propose a method to obtain averaged PSD estimates of the Systolic and Diastolic heart sounds. **[8]**

b) Derive parameters or measures from a Fourier spectrum or PSD that can help in the characterization of the spectral variations or features contained therein. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1925

[Total No. of Pages : 2

[4165] - 687

M.E. (Electronics) (Digital Systems)

RECONFIGURABLE COMPUTING

(Sem. - II) (2008 Course) (Elective - IV (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Draw and explain the architecture of DPGA. Explain each block in detail What are its limitations? **[16]**

Q2) a) Compare the architectures & capabilities of ASIC, PDSP, GPP, FPGA, and memory. **[10]**

b) What are the conventional FPGA interconnects? What are their limitations? **[6]**

Q3) a) With neat schematic explain canonical 4-LUT processing element of FPGA. **[8]**

b) Explain in brief the following pertaining to RD. **[8]**

i) Path delay.

ii) Interconnect Delay.

iii) Context switching delay.

iv) Intrinsic delay.

Q4) Write short notes on any three: **[18]**

a) Partial Reconfiguration.

b) Multicontext FPGA.

c) RALU.

d) Weak Upper Bound.

P.T.O.

SECTION - II

Q5) How is task switching innovative in TSFPGA? Explain the architectural blocks of TSFPGA in detail. What are its limitations? **[16]**

Q6) a) What are the common techniques employed to reduce instruction size and bandwidth. **[10]**

b) What are the general purpose computing issues? **[6]**

Q7) a) What are the effects of Interconnect Granularity? **[8]**

b) Compare various computing architectures w.r.t. multiplier operation. How will you locate reconfigurable device? Where? **[8]**

Q8) Write short notes on any three: **[18]**

a) Bus-based Communication.

b) Direct Communication.

c) Circuit Switching.

d) The Dynamic Network on Chip (DyNoC).

Total No. of Questions : 8]

SEAT No. :

P1926

[Total No. of Pages : 2

[4165] - 689

M.E. (Electronics) (Digital System)

DIGITAL SIGNAL COMPRESSION

(Sem. - II) (2008 Course) (Elective - IV (c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Consider a source emitting 5 letters with probabilities given as P (a_1) = P (a_2) = 0.2, P(a_3) = 0.4, P(a_4) = P(a_5) = 0.1. Find the Huffman code for each alphabet and find average value of code length. Also find minimum variance Huffman code for the same source. **[10]**

b) Explain what is meant by rate distortion bound. **[8]**

Q2) a) Explain how to implement optimal quantization in image and speech compression. **[8]**

b) Give an algorithm for arithmatic coding. Explain with the help of an example. **[8]**

Q3) a) Draw the block diagram of Lossy predictive coding system and the same in details. **[8]**

b) Explain the encoding process of LZW algorithm with suitable example. **[8]**

Q4) a) Explain any one adaptive quantization technique. Can you make use of statistics of the signal to design adaptive quantizer. **[8]**

b) What are advantages of ADPCM over PCM? Explain with block schematic. **[8]**

P.T.O

SECTION - II

Q5) a) What is streaming audio? What are its desirable features? Explain the use of MIDI. **[8]**

b) What is companding? What is the advantage of logarithmic curve for companding? Explain A-law and μ - law quantizers. **[8]**

Q6) a) What is motion vector? How it is useful for video compression. Explain any one method of estimating a motion vectors in video coding. **[10]**

b) Explain the use of DCT for image coding. How to quantize the DCT coefficients? Explain how it leads to compression of the data. **[8]**

Q7) a) Explain properties of Wavelet. Explain the method of decomposition using Haar Wavelet. What are the advantage of using Wavelet. **[8]**

b) Explain how to generate SPIHT chart. **[8]**

Q8) a) Consider a 4 x 4 image X given by **[10]**

$$X=\begin{bmatrix} 12 & 12 & 14 & 12 \\ 12 & 12 & 14 & 12 \\ 14 & 14 & 16 & 12 \\ 12 & 12 & 14 & 12 \end{bmatrix}$$

Find DWT coefficients for first level of decomposition using Haar Wavelet.

b) What is the meaning of perfect reconstruction filter bank? **[6]**

Total No. of Questions : 8]

SEAT No. :

P1928

[Total No. of Pages : 2

[4165]-695

M.E. (E & TC) (Communication Networks)

AD HOC NETWORKS

(2008 Course) (Elective - I (c)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Compare Cellular network and Ad hoc network. **[9]**

b) Enlist various applications of Ad hoc wireless Network and explain any one of them in brief. **[9]**

Q2) a) Give the classification of Routing Protocols and compare the table driven routing protocol and on-demand routing protocol. **[8]**

b) Discuss hidden and exposed terminal problem for routing protocol of ad hoc wireless network. **[8]**

Q3) a) Explain the following tree based multicast routing protocol. **[8]**
Bandwidth Efficient Multicast Routing Protocol (BEMRP).

b) What are the design issues of multicast routing protocol? **[8]**

Q4) Explain the following Routing Protocols. **[16]**

a) Location-Aided Routing Protocol (LAR).

b) Destination Sequenced Distance Vector Routing Protocol (DSDV).

SECTION - II

Q5) a) What are the energy management schemes? Explain the battery management schemes? **[9]**

b) What are the battery scheduling techniques? Explain. **[9]**
Round Robin technique.

P.T.O.

Q6) a) What are major security attacks in Ad hoc wireless Network? Explain routing attacks? **[8]**

b) What are the requirements of security protocol for ad hoc wireless network? **[8]**

Q7) a) Explain the ad hoc transport protocol (ATP). **[8]**

b) Give the classification tree of transport layer protocols? Explain the issues and challenges that TCP experiences when used in ad hoc wireless networks? How to overcome them? **[8]**

Q8) a) What are the issues and challenges for QoS support in ad hoc wireless network. **[8]**

b) Explain any one of the QoS frameworks. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1930

[Total No. of Pages : 2

[4165] - 700

M.E. (E & TC) (Communication Networks)

NETWORK TRAFFIC ANALYSIS AND QoS

(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain QoS Benefits & different QoS components? **[8]**

b) Explain Quality of Service Mechanisms in terms of QoS Service Models. **[8]**

Q2) a) What is congestion? Explain different reasons for congestion. **[8]**

b) Explain how congestion control & traffic management implemented in High speed network? **[8]**

Q3) a) Explain Bandwidth allocation in detail. **[8]**

b) Explain different traffic measurement parameters in detail. **[8]**

Q4) Write Short Notes on (Any Two): **[18]**

a) LAN traffic Management.

b) *QoS protocol* : *Differentiated services.*

c) Quality of perception (QoP),

P.T.O

SECTION - II

Q5) a) During 2 hours busy period, 2400 calls arrives at an exchange. Average holding time per call is 2 min calculate traffic load in **[8]**

i) Erlangs.

ii) CCS.

iii) CS&

iv) CM units.

b) Explain with neat diagram Leaky bucket traffic shaping technique. **[8]**

Q6) a) Explain with neat diagram token bucket traffic shaping technique. **[8]**

b) Explain Reservation Protocol (RSVP) in detail. **[8]**

Q7) a) Explain VOIP in detail with neat diagram. **[8]**

b) Explain video conferencing in detail. **[8]**

Q8) Write Short Notes on (Any Two): **[18]**

a) Types of network attack.

b) Network Protection mechanism.

c) Statical analysis for Real time traffic.

Total No. of Questions : 8]

SEAT No. :

P1932

[Total No. of Pages : 2

[4165] - 706

M.E. (E&TC) (Communication Networks)

NEURAL NETWORKS IN COMMUNICATIONS

(2008 Course) (Elective - IV (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail the basic models of artificial neural networks. **[8]**

b) Discuss the delta learning rule. State the error function for delta rule. **[8]**

Q2) a) Explain the architecture and training algorithm of perceptron net used for pattern classification. **[8]**

b) Generate the output of OR Logic function using MP model. **[8]**

Q3) a) Giving the architecture explain the training algorithm of an radial basis function Network. **[8]**

b) Develop a perceptron for the given training pattern: **[10]**

Input			Target
X1	X2	b	t
1	1	1	1
-1	1	1	-1
1	-1	1	-1
-1	-1	1	-1

Q4) a) Discuss in detail ATM traffic control using neural network. **[8]**

b) Write short notes on automatic language identification. **[8]**

P.T.O

SECTION - II

Q5) a) With architecture, explain the training algorithm used in Kohonen self organizing feature map. **[8]**

b) A hetero associative network is given. Find the weight matrix and test the network with training input vectors. **[8]**

S1 = (1 1 0 0) t1 = (1 0)

S2 = (0 1 0 0) t2 = (1 0)

S3 = (0 0 1 1) t3 = (0 1)

S4 = (0 0 1 0) t4 = (0 1)

Q6) a) Explain the architecture and training algorithm of discrete Hofield network. **[8]**

b) What is back propagation network? Describe in detail on the choice of parameters used in training the back propagation network. **[8]**

Q7) a) Discuss in detail the neural networks for switching. **[8]**

b) Explain the traffic density determination using self organizing feature map. **[8]**

Q8) Write short notes on (ANY THREE): **[18]**

a) Support vector machine.

b) Bidirectional associative memory.

c) Simulated annealing.

d) Applications of neural network in Telecommunication.

e) Neo cognitron.

Total No. of Questions : 8]

SEAT No. :

P1935

[Total No. of Pages : 2

[4165]-716
M.E. (Production)
SHEET METAL PROCESSING
(2008 Course) (Elective - II (b)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat sketches wherever required.***

SECTION - I

Q1) a) Explain different manufacturing method of sheet metal product. **[8]**

b) What do you mean by sheet metal forming lines. **[8]**

Q2) a) Discuss with suitable example the different steps for product design in sheet metal. **[8]**

b) Discuss different defects in sheet metal draw parts. **[8]**

Q3) a) Explain requirements of Press tools used in sheet metal operation and their selection. **[8]**

b) Explain concept for deep drawing of axissymetric parts. **[8]**

Q4) Write short notes on : **[18]**

a) Testing of sheet metal parts.

b) Strain path and strain distribution.

c) Plasma cutting.

SECTION - II

Q5) a) Explain different sheet joining processes. **[8]**

b) Explain with suitable example a part formed by roll forming. **[8]**

Q6) a) Explain the method of selection of press for a corrugated sheet forming. State specification for purchasing of press. **[8]**

P.T.O.

b) Identify possible accidental area in press shop. State necessary safety devices for it. **[8]**

Q7) a) Explain with suitable example how modeling is done of a sheet metal component. **[8]**

b) Explain how quality of sheet metal operation will improve by CAD/CAM. **[8]**

Q8) Write short notes on : **[18]**

a) Blank holding devices.

b) TWB forming.

c) Centre of pressure in press operation.

Total No. of Questions : 8]

SEAT No. :

P1936

[Total No. of Pages : 2

[4165]-718

M.E. (Production Engg.)

ENGINEERING ECONOMICS AND ACCOUNTING

(2008 Course) (Elective - II (d)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) "Managerial economics is the integration of economic theory with business practice for the purpose of facilitating decision-making and forward planning by management". Explain. **[8]**

b) Distinguish between macro-economics and micro-economics. How is macro-economics useful in managerial decision making. **[8]**

Q2) a) State and explain the Law of Demand. What are its exceptions? What is the significance of demand analysis to a sales manager of a business firm? **[10]**

b) Examine the 'Trend Projection' method and 'Collective Opinion' method of demand forecasting? **[6]**

Q3) a) Explain why the firm under perfect competition maximizes profit or minimizes loss by operating at the position where marginal cost and price are equal. **[8]**

b) Define 'Oligopoly'. Explain how price and output decisions are taken under conditions of oligopoly. **[8]**

Q4) Write a short note on any three of the following : **[18]**

a) Price leadership.
b) Main features of monopolistic competition
c) Price elasticity of demand.
d) Determinants of market demand.

P.T.O.

SECTION - II

Q5) a) Discuss the managerial uses of break-even analysis as a tool for profit planning. What are its limitations? **[8]**

b) Distinguish between Economic Forecasting and Business Forecasting. Discuss how economic forecasting is useful to a business firm? **[8]**

Q6) a) From the following particulars compute : **[8]**

i) Materials cost variance;
ii) Materials price variance;
iii) Materials usage variance.

Quantity of materials purchased :	3000 units
Value of materials purchased :	Rs. 9000
Standard quantity of materials required per tonne of output :	30 units
Standard rate of material:	Rs. 2.50 per unit
Opening stock of materials:	Nil.
Closing stock of materials:	500 units
Output during the period:	80 tonnes

b) 'Standard costs are bases for a proper managerial control of manufacturing operation.' Define standard cost and explain the above statement. **[8]**

Q7) a) Explain the following types of investment appraisal methods: **[12]**

i) Discounted cash flow.
ii) Net present value method.
iii) Internal rate of return method.

b) Distinguish between contribution and profit. **[4]**

Q8) Write a short note on any three of the following : **[18]**

a) Applications of marginal costing.
b) Classification of cost.
c) Labor variances.
d) Types of depreciation.

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Total No. of Questions : 10]

SEAT No. :

P1940

[Total No. of Pages : 3

[4165] - 727

M.E. (Production Engineering)

RESEARCH METHODOLOGIES

(2008 Course) (Elective - IV (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non programmable electronic calculators is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is research? What are objectives of Research? **[6]**

b) Explain research approaches in experimentation. **[5]**

c) What are external research suppliers? **[5]**

Q2) a) Explain Factorial Design of experiments. **[6]**

b) What is the need of research design? Describe features of good design. **[5]**

c) What are causal studies? Explain any causal model with suitable example. **[5]**

Q3) a) A normally distributed random variable has an unknown mean μ and a known variance $\sigma^2 = 9$. Find the sample size required to construct a 95 percent confidence interval on the mean that has total width of 1.0. **[6]**

b) What are the methods used data collection in research methods? **[5]**

c) What is the importance of pilot study and pretest of tools? **[5]**

Q4) a) What is Data Mining? Explain the evolution of Data Mining in brief. **[6]**

b) Describe the activities that a researcher must accomplish in order to conduct successful experimentation. **[5]**

c) What are the steps in sampling design? **[5]**

P.T.O

Q5) Write short notes on **any three** of the following: **[18]**

a) Primary and secondary data.

b) Meta analysis.

c) Likert scales.

d) Constructing Hypothesis.

e) Research proposal.

SECTION - II

Q6) a) How would you work out following statistical measures: **[6]**

i) Regression equation of X on Y.

ii) Coefficient of Variation.

b) Explain the meaning and significance of "Standard Error" in Sampling Analysis. **[5]**

c) The mean weight loss of n = 16 grinding balls after a certain length of time in mill slurry is 3.42 grams, with standard deviation of 0.68 grams. Construct a 99% confidence interval for true mean weight loss of such grinding balls under stated conditions (z = 2.57). **[5]**

Q7) a) Explain decision making technique of Analytical Hierarchy Process (AHP) with suitable example. **[8]**

b) How Neural Network method can be effectively used for research? **[8]**

Q8) a) What is the importance of interpretation in any research? What are the techniques of interpretation? **[8]**

b) The following data presents the yield in quintals of common 10 subdivisions of equal area of two agriculture plots. **[8]**

Plot 1	6.2	5.7	6.5	6.0	6.3	5.8	5.7	6.0	6.0	5.8
Plot 2	5.6	5.9	5.6	5.7	5.8	5.7	6.0	5.5	5.7	5.5

Test whether two samples taken from two random populations have the same variance (Given 5% point value of F is 3.18)

Q9) a) Describe the layout of a good research report. **[6]**

b) What are the referencing systems used in report writing? **[5]**

c) Describe in brief the Data Envelop Analysis (DEA) technique. **[5]**

10) Write short notes on any three of the following: **[18]**

a) Significance of report writing.

b) TOPSIS method.

c) Multivariate Analysis of Variance (MANOVA).

d) Statistical estimation.

e) Chi-square test.

Total No. of Questions : 10]

SEAT No.:

P1941

[Total No. of Pages : 2

[4165]-731
M.E. (Production - CAD/CAM)
OPTIMIZATION TECHNIQUES
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three questions from section-I.***
2) ***Attempt any three questions from section-II.***
3) ***Draw flow chart wherever necessary.***

SECTION - I

Q1) a) Discuss necessary conditions for single variable optimization. **[8]**

b) Find extreme points of the function. **[8]**

$f(x_1, x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$

Q2) a) Discuss Exhaustive search method. **[8]**

b) Use three iteration of the Golden section search method in order to maximize the function. **[8]**

$f(x) = 10 + x^3 - 2x - 5e^x$

Q3) a) Explain Evolutionary optimization method for multivariable optimization. **[8]**

b) Discuss Powell's conjugate direction method. **[8]**

Q4) a) Use two iteration of Newton's method in order to minimize the function.

$f(x_1, x_2) = (x_1^2 + x_2 - 11)^2 + (x_1 + x_2^2 - 7)^2$. **[8]**

b) How the constrained optimization problems are converted to unconstrained optimization problem by transformation? Discuss. **[8]**

P.T.O.

Q5) Write short notes (any three) : **[18]**

a) Langrage multiplier.

b) Fibonacci search method.

c) Cauchy's steepest descent method.

d) Penalty function method.

e) Kuhn-Tucker condition.

SECTION - II

Q6) a) A beam of uniform rectangular cross section is to be cut from a log having circular cross section of diameter 2a. The beam has to be used as the cantilever beam (the length is fixed) to carry a concentrated load at the free end. Find the dimension of the beam that correspond to maximum tensile (bending) stress carrying capacity. **[8]**

b) How theory of constraints differ from conventional optimization techniques? **[8]**

Q7) a) What is the concept behind Artificial Neural Network? Discuss its application. **[8]**

b) Discuss how ANN could be applied to four bar mechanism in view of input hidden and output layer. **[8]**

Q8) a) Discuss fitness function in view of Genetic Algorithm. **[8]**

b) State the algorithm for Simulated Annealing. Discuss the 'temperature' in view to SA. **[8]**

Q9) a) State the principles of O.P.T. Discuss any two principles in brief. **[8]**

b) "Increase in utilization may not effect in improvement in productivity". Discuss. **[8]**

Q10) Write short notes (any three) : **[18]**

a) Boltzmann constant in view to Simulated Annealing.

b) Coding in Genetic Algorithm.

c) Local and Global optimum.

d) Variable Metric method (DFP method).

e) Application of nontraditional optimization techniques.

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Total No. of Questions : 10]

SEAT No. :

P1942

[Total No. of Pages : 3

[4165]-732

M.E. (Production Engineering) (CAD/CAM)

ADVANCED STRESS ANALYSIS

(2008 Course) (Elective - I (a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, and non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Stress tensor at a point is given by

$$[\sigma_{ij}] = \begin{bmatrix} 5 & 0 & 0 \\ 0 & -6 & -12 \\ 0 & -12 & 1 \end{bmatrix}$$

Determine maximum shear stress at the point and show that it acts in a plane which bisects the maximum and minimum stress planes. **[8]**

b) Split the stress tensor $[\sigma_{ij}] = \begin{bmatrix} 11 & 3 & 0 \\ 3 & 8 & -1 \\ 0 & -1 & 4 \end{bmatrix}$ into its hydrostatic and deviator parts and find invariants of stress deviator. **[8]**

OR

Q2) Consider a rectangular cross-section cantilever beam of unit depth and thickness 2c. It is subjected to a shear loading on the free end, such that the average shear stress is equivalent to a vertical load, P. Consider $x = 0$ at the free end of the beam and at the fixed end $x = L$ and the top and bottom surfaces of the beam are at $y = \pm c$ respectively. Airy's stress function for this beam is approximated as $\phi(x, y) = Dxy^3 + Bxy$. **[16]**

Find the constants D and B from the boundary conditions.

P.T.O.

Q3) a) Determine the principal values and directions of the stress tensor. **[8]**

$$[\sigma_{ij}] = \begin{bmatrix} 9 & 5 & 0 \\ 5 & 5 & 7 \\ 0 & 7 & 3 \end{bmatrix}$$

b) Determine the principal deviator stress values for the stress tensor. **[8]**

$$[\sigma_{ij}] = \begin{bmatrix} 3 & -10 & 0 \\ -10 & 0 & 30 \\ 0 & 30 & -27 \end{bmatrix}$$

OR

Q4) Describe complex formulation of the plane elasticity problem. **[16]**

Q5) Write short notes on : **[18]**

a) Stress analysis using x-ray diffraction.

b) Airy's stress function.

c) Plane stress and plane strain conditions.

SECTION - II

Q6) A bar of steel has the minimum properties $S_e = 276$ MPa, $S_y = 413$ MPa, and $S_{ut} = 551$ MPa. The bar is subjected to a steady torsional stress of 103 MPa and an alternating bending stress of 172 MPa. Find the factor of safety guarding against static failure, and either the factor of safety guarding against a fatigue failure or the expected life of the part. For the fatigue analysis use: **[16]**

a) Modified Goodman criterion.

b) ASME-elliptic criterion.

OR

Q7) A steel bar undergoes cyclic loading such that $\sigma_{max} = 414$ MPa and $\sigma_{min} = -138$ MPa. For the material, $S_{ut} = 552$ MPa, $S_y = 450$ MPa, a fully corrected endurance limit of $S_e = 276$ MPa, and $f = 0.9$. Estimate the number of cycles to a fatigue failure using : **[16]**

a) Modified Goodman criterion.

b) Gerber criterion.

Q8) A material exhibits the following crack growth resistance behavior $R = 6.95 (a-a_0)^{0.5}$, where a_0 is the initial crack size. R has units of kJ/m^2 and crack size is in mm. The elastic modulus of this material is 207 GPa. Consider a wide plate with through crack ($a << W$) that is made from this material. If this plate fractures at 138 MPa, compute **[16]**

a) half crack size at failure
b) amount of stable crack growth that precedes failure.

OR

Q9) If plate described in question 8 has initial crack length ($2a_0$) of 50.8 mm and the plate is loaded to failure, compute

a) stress at failure
b) half crack size at failure **[16]**

Q10) Write short notes on fatigue life estimation using : **[18]**

a) Stress Life Method.
b) Strain Life Method and
c) LEFM Method.

Total No. of Questions : 8]

SEAT No.:

P1943

[Total No. of Pages : 2

[4165]-735
M.E. (Production) (CAD/CAM)
CONCURRENT PRODUCT DESIGN
(2008 Course) (Elective - I (d)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Solve any three questions from section-I and three questions from section-II.*
2) *Use separate answer books for each section.*
3) *Use of calculator, std. data table is allowed.*
4) *Assume suitable data if required.*

SECTION - I

Q1) a) Explain different phases in products life cycle and its advantages. **[8]**

b) Explain technology life cycle and its importance in product design. **[8]**

Q2) a) Explain suitable example the different functional requirement for product design. **[8]**

b) What is Axiomatic Design? Explain. **[8]**

Q3) a) State and explain the principles which are used to manage Design for Safety. **[8]**

b) What is meant by robustness? What is the importance of it in design? Discuss the various elements of Taguchi's system of robustness. **[8]**

Q4) Write a short note on : **[18]**

a) Importance of Benchmarking.

b) Selection of Material for product design.

c) Design for packaging.

SECTION - II

Q5) a) What is the Life Cycle Cost of product? Explain its importance in cost estimation. **[8]**

b) Explain different factors considered in calculating the product cost. **[8]**

P.T.O.

Q6) a) Explain different steps in product development. **[8]**

b) Explain different PDM tools. **[8]**

Q7) a) Explain with suitable example the use of concurrent engineering in electronic product design. **[8]**

b) Differentiate mechanical and electronic product design. **[8]**

Q8) Write a short note on : **[18]**

a) Cost capacity factor,

b) Modularity in product design.

c) Collaborative approach helps in development of product.

Total No. of Questions : 8]

SEAT No. :

P1946

[Total No. of Pages : 4

[4165] - 741
M.E. (Production) (CAD/CAM)
FINITE ELEMENT ANALYSIS
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

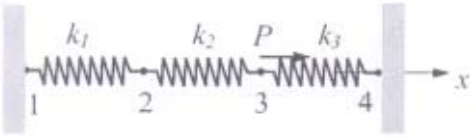
Instructions to candidates:

1) ***Answer any three questions from Section - I and any three questions from Section - II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assumptions made should be clearly stated and justified.***

SECTION - I

Q1) a) Explain the concept of FEM briefly and outline the procedure. **[6]**

b) **[10]**



Given : For the spring system shown above,
k_1 = 100 N/mm, k_2 = 200 N/mm, k_3 = 100 N/mm
P = 500 N, $u_1 = u_4 = 0$

Find : i) The global stiffness matrix.
ii) Displacements of nodes 2 and 3
iii) The reaction forces at nodes 1 and 4
iv) The force in the spring 2.

Q2) a) By direct stiffness matrix approach, determine stiffness matrix for beam element neglecting axial deformation. **[6]**

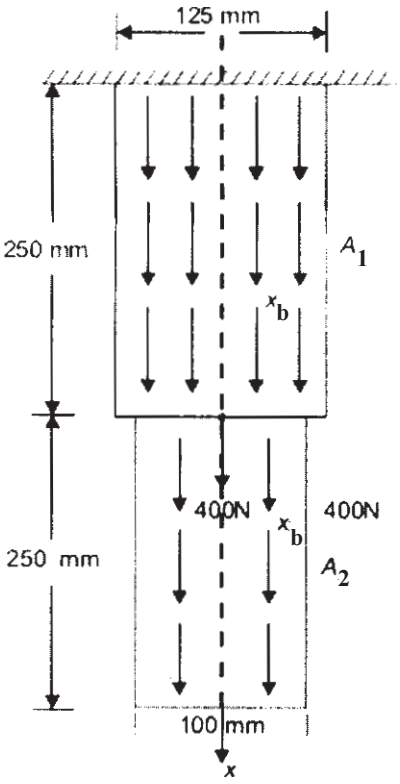
b) A beam of length 10 m, fixed at one end and supported by a roller at the other end carries a 20 kN concentrated load at the centre of the span. By taking the modulus of elasticity of material as 200 GPa and moment of inertia as 24 x 10^{-6} m^4. Determine: **[10]**

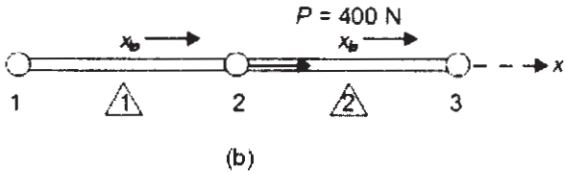
P.T.O

i) Deflection under load.
ii) Shear force and bending moment at mid span.
iii) Reactions at supports.

Q3) a) State and explain generalized Hook's law. **[6]**

b) The thin plate of uniform thickness 20 mm is as shown in Fig. In addition to the self weight, the plate is subjected to a point load of 400N at mid-depth. The Young's modulus $E = 2 \times 10^5$ N/mm^2 and unit weight $\rho = 0.8 \times 10^{-4}$ N/mm^2. Analyze the plate after modeling it with two elements and find the stresses in each element. Determine the support reactions also. **[12]**





(b)

Q4) a) Give the concept of 'Shape Functions' and explain its properties. **[8]**

b) Write short notes on (Any two): **[8]**

i) Geometric isotropy/Geometric Invariance.
ii) Galerkin's method.
iii) Variational principles.
iv) Boundary conditions.

SECTION - II

Q5) a) Solve the Differential equation by following methods. **[10]**

$$\frac{d^2u}{dx^2}+9u+6x=0 \qquad \text{B C.s:} u(0)=0 \qquad u(1)=0$$

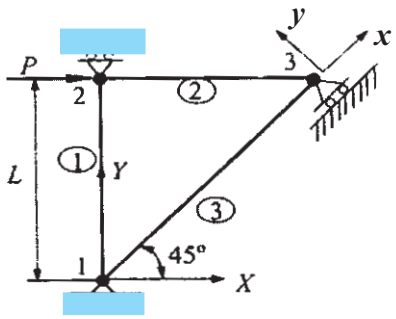
i) Finite Difference Method.

ii) Galerkin method.

b) Derive stiffness equation for a spar element oriented arbitrarily in a 2-dimensional plane. **[6]**

Q6) a) Explain the terms 'Plane stress' and 'Plane strain' problems. Give constitutive laws for these cases. **[6]**

b)



For the plane truss shown above,

$P = 1000$ kN, $L = 1m$, $E = 210\ GPa$, **[10]**

$A = 6.0 \times 10^{-4}\ m^2$ for elements 1 and 2,

$A = 6\sqrt{2} \times 10^{-4}\ m^2$ for element 3.

Determine the displacements and reaction forces.

Q7) a) Derive the expression for consistent load vector due to self weight in a CST element. **[6]**

b) The thermal conductivity of a stainless steel rod of 0.1 m length and area of cross section of 1 cm^2 is 20 W/m-°C. The rate of heat generation in the rod is 10^5 W/m^3. One end of the rod is kept at 0°C and the other end at 100°C. The rod is insulated except at the ends. Using finite element with two elements, find out the temperature at the mid-point of the rod. Also, find out the heat flow at the ends of the rod using FEM. Compare the results with the exact solution. **[12]**

Q8) Attempt any two: **[16]**

a) Skyline Storage Technique.

b) Solving a design problem using a FEA Package.

c) Uniqueness of mapping of isoparametric elements.

d) Differentiate between the terms ‘lumped loads’ and consistent loads.

Total No. of Questions : 8]

SEAT No.:

P1948

[Total No. of Pages : 2

[4165]-743
M.E. (Production) (CAD/CAM)
PRODUCT LIFE CYCLE MANAGEMENT
(2008 Course) (Elective - III (a)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is PLM? How it is implemented? And why it is required? **[8]**

b) What is mean by PLM strategies and how it helps in achieving PLM vision? **[8]**

Q2) Write short note on (any three) : **[18]**

a) Design for six sigma.

b) Mortality curve.

c) Design for manufacturing.

d) Design for environment.

Q3) a) Explain mathematical modeling versus physical prototyping with suitable examples. **[8]**

b) What is informal and formal model? **[8]**

Q4) a) Explain the steps in constructing product models for advanced method. **[10]**

b) What are the benefits of PLM? **[6]**

P.T.O.

SECTION - II

Q5) a) Explain, what is mean by design for disassembly. **[8]**

b) What is FMEA? Explain the steps in conducting FMEA. **[8]**

Q6) a) What are the benefits of reuse of information? **[8]**

b) What are the basic components of a PDM system? **[8]**

Q7) a) Explain how soft computing facilities are used to create knowledge based product and process models. **[8]**

b) Explain the different types of softwares used in product development process. **[8]**

Q8) Write short note on (any three) : **[18]**

a) Design for assembly.

b) PDM benefits.

c) Taguchi method.

d) Design for machining.

Total No. of Questions : 8]

P1949

SEAT No.:

[Total No. of Pages : 2

[4165]-744
M.E. (Production) (CAD/CAM)
ADVANCED MATERIALS AND PROCESSING
(2008 Course) (Elective - III (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is high-strength, low alloy (HSLA) steel? And how it is designated? **[8]**

b) Explain the methods of heat treatment of non ferrous alloy and stainless steel. **[8]**

Q2) a) What are nanometals? Why are they being developed? **[5]**

b) What is super conductor? Explain different types of super conductor materials. **[6]**

c) Explain properties and application of Ni and Ti aluminides. **[5]**

Q3) a) What effect does an additives have on a polymer. **[5]**

b) Explain the reasons for which elestomers wave developed. Are there any substitute for elestomers? Explain. **[6]**

c) Explain general properties and applications of ceramics. **[5]**

Q4) a) What are super alloys? Why are they so named? **[9]**

b) Describe your opinion regarding the recycling of plastics Vs the development of plastics that are biodegradable. **[9]**

P.T.O.

SECTION - II

Q5) a) What are Sheet Moulding Component (SMC) and Bulk Moulding Component (BMC)? Explain. **[8]**

b) Explain chemical and physical vapour deposition of matrix on fiber. **[8]**

Q6) Explain ultrasonic machining unit with neat sketch and process parameter. **[16]**

Q7) a) List the process parameter in wire EDM and explain its effect on the process. **[8]**

b) Explain in detail electrochemical grinding process. **[8]**

Q8) a) Explain the difference between thermal spray and plasma spray. **[9]**

b) Explain Infiltration and Squeez Casting in processing of metal matrix polymers. **[9]**

Total No. of Questions : 8]

SEAT No.:

P1950

[Total No. of Pages : 2

[4165]-746
M.E. (Production Engineering) (CAD/CAM)
QUALITY & RELIABILITY ENGINEERING
(2008 Course) (Elective - III (d)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Describe 3 phase programme suggested by Taguchi for designing quality into products and processes. **[8]**

b) What is quality loss? State and explain loss function. **[8]**

Q2) a) Comment on following quality affecting factors. **[8]**

i) Controllable factors.
ii) Non controllable factors.

b) Describe method for arranging experiment to estimate S/N ratio using orthogonal arrays. **[8]**

Q3) a) i) Describe steps in robust design.
ii) Draw relationship between factors of an engineered system. **[8]**

b) Explain concept of first order model of response surface methodology. **[8]**

Q4) Write short notes on (any three) : **[18]**

a) On line and offline quality control.
b) Concept of quality engineering.
c) Quality characteristics and objective functions.
d) Control factors and their levels.

P.T.O.

SECTION - II

Q5) a) Define reliability function and describe bath tub curve. State distributions used for modeling different phases of bath tub curve. **[10]**

b) What is MTTF? How it is useful in reliability studies. **[6]**

Q6) a) Derive expressions for computing reliability of system having components in parallel. **[8]**

b) Describe : **[8]**

i) Active redundancy.

ii) Stand by redundancy.

Q7) a) What is reliability centered maintenance? How is it different from breakdown maintenance? **[8]**

b) Define : **[8]**

i) Availability.

ii) MTBF.

Q8) Write short notes on (any three) : **[18]**

a) Condition monitoring techniques.

b) K out of m models.

c) Fault tree approach to system modeling.

d) Predictive maintenance.

Total No. of Questions : 10]

P1951

SEAT No. :

[Total No. of Pages : 4

[4165] - 747

M.E. (Production) (CAD/CAM)

COMPUTER AIDED PRODUCTION PLANNING

(2008 Course) (Elective - IV(a)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in two different answer books.***
3) ***Figures on rights show marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss different measures of forecast errors. **[6]**

b) The demand for the product for last 10 years is given below. Estimate the demand for next two years by regression method **[10]**

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Units	124	135	145	150	167	157	161	170	187	168

Q2) a) Explain ALDEP use in facility planning. **[8]**

b) Discuss use of quadratic assignment model adding new machines to existing facility. **[8]**

Q3) a) Explain how the GT cell is formed? Discuss with example. **[8]**

b) Discuss GT benefits and limitations. **[8]**

Q4) a) Explain Generative type of Computer Aided Process Planning (CAPP). **[8]**

b) Discuss the development of CAPP and its limitations. **[8]**

P.T.O.

Q5) Write short notes (any three) : **[18]**

a) Exponential Smoothing.

b) Assignment method for adding a new facility planning.

c) Parts classification and coding.

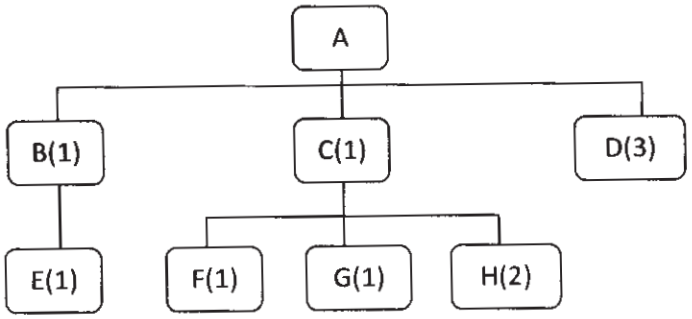
d) Software for facility planning.

e) Operations management.

SECTION - II

Q6) a) How capacity planning is done? **[6]**

b) Product structure is as below : **[10]**



Inventory status of individual components are as shown

Product	Lead Time	EOQ	Opening stock	On Order
A	3	500	50	0
B	5	700	100	0
C	4	800	20	0
D	2	3000	2000	0
E	6	1200	0	0
F	3	900	70	0
G	2	1000	0	0
H	3	4000	3300	0

The demand for the product 'A' is 500 on day 16. Prepare MRP for all items.

Q7) a) Discuss objectives of the MRP system. **[6]**

b) Four jobs are to be processed using three machines. The time required on machine 'j' for job 'i' is given in the table below : **[12]**

Job	Time required on		
i	Machine A	Machine B	Machine C
1	5	8	20
2	6	30	6
3	30	4	5
4	2	5	3

How should the jobs be scheduled so as to minimize the total time required to complete all the jobs?

Q8) a) Discuss ERP implementation issues. **[8]**

b) Find the sequence that will minimize total time required to complete the following tasks **[8]**

Task	1	2	3	4	5	6	7	8
Machine I	2	5	4	9	6	8	7	5
Machine II	6	8	7	4	3	9	3	8

Q9) a) Discuss evaluation of heuristics in view of production scheduling. **[8]**

b) The weekly demand for the product has the following distribution : **[8]**

Demand	1000	1100	1200	1300	1400	1500
Probability	0.03	0.17	0.27	0.28	0.18	0.07

Simulate for 10 weeks and find expected demand. (Use random numbers from calculator)

Q10) Write short notes (any three) : **[18]**

a) MRP II.

b) Gantt chart.

c) Software for ERP.

d) CDS algorithm for sequencing.

e) Random number generation.

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Total No. of Questions : 8]

SEAT No. :

P1954

[Total No. of Pages : 2

[4165]-753

M.E. (Computer Engineering) (Common to Network Engineering)

PRINCIPLES AND PRACTICES FOR IT MANAGEMENT

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the need of strategic management in IT? Explain with example. **[8]**

b) Explain the purpose of various principles of management. **[8]**

Q2) a) How to define and document the project goals? Explain the method used in IT industries. **[8]**

b) Explain the process of creating work breakdown structure for an IT project. **[8]**

Q3) a) Explain the process involved in defining the project schedule and preparing the project network diagram with suitable example. **[10]**

b) What are different team issues and how the role of Team leader is important to handle the team issues. **[6]**

Q4) Write notes on any THREE : **[18]**

a) Business ethics and social responsibilities of IT employees.

b) Project priorities.

c) Change control.

d) Scheduling and Tracking project progress.

P.T.O.

SECTION - II

Q5) Explain with example : **[16]**

a) Theories of group formation.

b) Formal and informal group.

c) Importance of teams.

d) Constructive and destructive conflicts.

Q6) Explain the following with example : **[16]**

a) Intellectual property rights.

b) Cyber crimes and cyber laws.

c) Technology management.

d) Quality standards.

Q7) a) Explain the application of IT in Net banking with suitable example. **[8]**

b) How IT tools and techniques help in quality control in product development? Explain in brief. **[8]**

Q8) Write notes on any THREE : **[18]**

a) Conflict management.

b) Stress management.

c) Learning organizations.

d) Change management.

Total No. of Questions : 8]

SEAT No.:

P1955

[Total No. of Pages : 2

[4165]-754
M.E. (Computer Engineering)
ADVANCED SOFTWARE ENGINEERING
(2008 Course) (Sem. - I) (Elective - I (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Give the importance of dependability in critical systems with dimensions of system dependability. **[6]**

b) Explain the stages of change management in requirement engineering. **[6]**

c) How object models are used in analysis? **[4]**

Q2) a) What are the features of centralised control? Explain with example. **[8]**

b) How do you apply event processing architecture for editing system? **[8]**

Q3) a) What are types of prototyping? Give the application of each in software project with example **[6]**

b) Differentiate between reengineering and reverse engineering. Give the process of reverse engineering. **[6]**

c) Give the significance of COTS in software project. **[4]**

Q4) Write short notes on :

a) Formal Specification. **[6]**

b) Design issues in user interface. **[6]**

c) Fault tolerant architecture. **[6]**

P.T.O.

SECTION - II

Q5) a) Explain automated static analysis in verification and validation of software system. **[6]**

b) How test cases are derived in structural testing? **[6]**

c) Give the significance of documentation standards in software project. **[4]**

Q6) a) Explain CMMI process improvement framework. **[8]**

b) What is Agility? How extreme programming supports Agility? **[8]**

Q7) a) Write SRS of any software project with suitable modelling and template. **[8]**

b) Give the list of software quality metrics. Explain one of them with an example. **[8]**

Q8) Write short notes on :

a) COCOMO Model. **[6]**

b) Formal methods. **[6]**

c) Size oriented metrics. **[6]**

Total No. of Questions : 8]

SEAT No.:

P1956

[Total No. of Pages : 2

[4165]-755
M.E. (Computer Engineering)
INTELLIGENT SYSTEMS
(2008 Course) (Elective - I (b)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain a model-based reflex agent with internal state by describing an agent program with an example. **[8]**

b) How a task environment is specified? Specify it with the examples of agent types and their PEAS description. **[8]**

Q2) a) Compare the uninformed search strategies based on evaluation criteria's. **[8]**

b) How problem solving agent formulates a goal and a problem. Explain it by giving pseudo-code. **[8]**

Q3) a) Explain iterative deepening search algorithm with example. **[6]**

b) What is Constraint Satisfaction Problem (CSP)? **[6]**

c) Compare memory bounded search strategies. **[6]**

Q4) a) Explain planning with state-space search. **[8]**

b) Compare STRIPS and ADL languages for representing planning problems. **[8]**

SECTION - II

Q5) a) Explain the four Components of partial order plan (POP). **[8]**

b) Explain partial-order plan for solving the spare tire problem. **[8]**

P.T.O.

Q6) a) How to modify the planner for decomposition? Explain it for House-building problem. **[10]**

b) Discuss the four planning methods for handling nondeterministic domains. **[8]**

Q7) a) What is the use of multiagent planning? Explain it for the doubles tennis problem. **[10]**

b) Discuss execution monitoring and replanning agents. **[6]**

Q8) a) How to represent a decision problem with a decision network. Write the steps for evaluating decision network. **[8]**

b) How Bayesian network is used in probabilistic reasoning. Explain a method for constructing Bayesian network. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1958

[Total No. of Pages : 2

[4165] - 759
M.E. (Computer Engineering)
ADVANCED COMPILERS
(2008 Course) (Sem. - I) (Elective - II (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail following design issues related to a compiler: number of passes, phases, source language features, intermediate language formats, nature of target machine. **[8]**

b) Explain role of regular expression and CFG with respect to LEX and YACC tools. Support your answer with proper examples from C language. **[8]**

Q2) a) Explain: code generator generator. **[8]**

b) What are major issues in code generation for pipelined machines? **[8]**

Q3) a) Explain : SSA form. **[8]**

b) Explain following code optimization techniques with example: **[8]**

Constant folding, Common sub-expression elimination, Code motion, Reduction in strength.

Q4) Write short notes: **[18]**

a) Semantic Analysis.

b) Unified algorithm for data flow analysis.

c) Directed Acyclic Graph (DAG).

P.T.O

SECTION - II

Q5) a) Explain: data dependence, direction vectors, loop carried and loop independent dependences. **[8]**

b) What are different factors to be considered while designing symbol table for a parallel compiler. **[4]**

c) What is need for code optimization? **[4]**

Q6) a) Explain: Machine optimization, Dynamic compilation. **[8]**

b) Compare the design issues with traditional compiler and compiler for distributed machines? **[8]**

Q7) a) Explain: JIT compilers. **[8]**

b) Explain: Role of various tools in compiler implementation. **[8]**

Q8) Write short notes: **[18]**

a) Auto scheduling compilers.

b) Structure of parallelizing compiler.

c) Instruction scheduling in compilation for distributed machines.

Total No. of Questions : 8]

SEAT No. :

P1959

[Total No. of Pages : 2

[4165] - 760
M.E. (Computer Engg.)
WEB SERVICES AND SOA
(2008 Course) (Sem. - I) (Elective - II (c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) What are the key features of the following technologies? In SOA context, what is the role played by each technology. Explain with EXAMPLES from a hypothetical website that sells books online. **[16]**

a) SOAP message, SOAP message with attachment.

b) HTTP, HTTPS.

c) BPEL.

d) Web service.

Q2) a) Explain what you understand by service orientation. Explain with a non-software example from real life like college library. **[4]**

b) What do you understand by service level agreement. **[4]**

c) Consider a web service that gives you CURRENT time in hours, minutes, seconds. Make suitable assumptions. Show a WSDL description of the service. **[4]**

d) What do you understand by performance, availability of an application. **[4]**

Q3) Explain what happens, what activities are carried out and what are the goals in following stages of SOA lifecycle? **[16]**

a) Analysis.

b) Design.

c) Implementation.

d) Deployment.

P.T.O

Q4) Write short notes on ANY THREE: **[18]**

a) IBM ON DEMAND operating environment.

b) Software architecture.

c) Evolution of SOA.

d) UDDI.

e) Use of SOA for Interoperability, integration of applications.

f) Service discoverability, service composability.

SECTION - II

Q5) Answer all questions below: **[16]**

a) Compare HTML and AJAX for website development.

b) Write in brief, on need and features of Enterprise service bus.

c) What are the responsibilities of client and server side in web applications?

d) How do technologies like .NET or J2EE help in SOA applications?

Q6) Imagine that you have to design a hypothetical website for a typical CRICKET sports website. For this website discuss. **[16]**

a) Who are the different actors/stakeholders/users who will use your website and how. What features will each require?

b) How can your website support latest news, Latest scores?

c) How can you secure your website?

d) Can SOA be used for your site, how?

Q7) Discuss the need, concepts, application of following terms: **[16]**

a) WIKIS to share knowledge amongst students.

b) Personal BLOGS.

c) Legacy application.

d) Asynchronous aspect of AJAX.

Q8) Write Short Notes on ANY THREE: **[18]**

a) SOA's advantages for businesses (Hint: ROI, agility ,..)

b) REUSABILITY : the need, technology, advantages.

c) Compare and contrast FUNCTIONS, COMPONENTS, REMOTE METHODS, WEBSERVICES.

d) Applications of blogs, rss feeds in a site like FACEBOOK.

e) HTML, DHTML, HTML 5.

f) Distributed applications.

Total No. of Questions : 8]

SEAT No. :

P1960

[Total No. of Pages : 2

[4165] - 761
M.E. (Computer Engg.)
EMBEDDED SYSTEM DESIGN
(2008 Course) (Elective - II (d)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) State the various design metrics for an embedded system. How the performance of a system is measured? **[8]**

b) State the terms FPGA, CPLD, PLA and PAL. What is the role of RAM in embedded system? **[8]**

Q2) a) With architecture discuss the features of 32-bit ARM9 Processor. **[10]**

b) Compare the features of IBM power PC with MIPS R5000 processor w.r.t. embedded system. **[8]**

Q3) a) Discuss the salient features of parallel PCI Bus with different standards. **[8]**

b) Compare the I^2C and CAN Bus. Discuss its data frame formats. **[8]**

Q4) a) Explain a typical ASIC CPLD architecture with important features. **[8]**

b) How RTOS is different than the conventional OS? What is its necessity in embedded system? **[8]**

P.T.O.

SECTION - II

Q5) a) With example discuss scheduling of multiple tasks in Real time by RTOS. **[8]**

b) Explain the features of Vx Works. **[10]**

Q6) a) What are the various performance metrics used in scheduling models for different RTOS tasks? Explain in brief. **[8]**

b) Compare C++ and Java w.r.t. embedded programming. **[8]**

Q7) a) What is the use of source code engineering tool? Discuss its important features. **[8]**

b) Explain the following declarations in embedded C: **[8]**

i) Static.

ii) Volatile.

iii) Interrupt.

Q8) a) Why do we need a cross compiler? Discuss the important features of embedded C. **[8]**

b) State and explain the various activities for software design during an embedded software development process. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1962

[Total No. of Pages : 2

[4165] - 763

M.E. (Computer Engg.) (Common to Network Engg.)

HIGH PERFORMANCE DATABASE SYSTEMS

(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each Section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain in detail tunable parameters. **[8]**

b) Explain TP-Monitor architecture and its components with neat diagram. **[5]**

c) Why TPC-D benchmark was replaced by TPC-H and TPC-R benchmark. **[3]**

Q2) a) Describe cost based, dynamic programming and heuristic query optimization techniques. **[8]**

b) Explain how to use a histogram to estimate the size of a selection of the form $\sigma_{A \leq V}(r)$. **[5]**

c) List down at least six equivalence rules used in query optimization. **[3]**

Q3) a) Explain shadow paging in detail and write its advantages and disadvantages. **[8]**

b) Write 2PC protocol and explain how 2PC protocol responds to various types of failures. **[8]**

Q4) a) Discuss various issues associated with creating and maintaining data warehouse. **[8]**

b) State and explain OLAP operations. **[6]**

c) What is materialized views? Explain the way to maintain materialized view. **[4]**

P.T.O

SECTION - II

Q5) a) Explain classification process in detail with example. **[8]**

b) Discuss major clustering approaches. **[8]**

Q6) a) Discuss various SQL extensions in detail. **[8]**

b) Explain Active and Deductive databases. Explain its merits and demerits. **[8]**

Q7) a) Explain LDAP data model. **[4]**

b) Explain XML schemes and DTD in detail. **[8]**

c) Discuss advantages and disadvantages of ORDBMS. **[4]**

Q8) Write short notes on (any 3): **[18]**

a) Hibernate.

b) OR database.

c) XML application.

d) Decision Tree.

Total No. of Questions : 8]

SEAT No.:

P1964

[Total No. of Pages : 2

[4165]-765
M.E. (Computer Engineering)
SOFTWARE DESIGN AND ARCHITECTURE
(2008 Course) (Elective - III (a)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Question Nos. 4 and 8 are compulsory. Out of the remaining.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is design? Explain the role of the design activity. **[4]**

b) Draw and explain the major phases of software design process. **[4]**

c) What are the quality attributes of the design product? Explain with example. **[4]**

d) Explain the need of sharing knowledge. **[4]**

Q2) a) Explain any two JSP (Jackson Structured Programming) programming heuristics with diagram. **[8]**

b) Explain the stepwise refinement process. What are the strength and weaknesses of the stepwise strategy? **[8]**

Q3) a) What is Software architecture? Explain how architecture specifics component communication with suitable example. **[8]**

b) What is architectural requirement? Explain how architecture addresses non-functional requirements. **[8]**

Q4) Write short notes on :

a) Design reuse. **[3]**

b) Prototyping. **[3]**

c) Performance as software quality attribute. **[4]**

d) Architecture is abstraction. **[4]**

e) Call and Return architectural style. **[4]**

P.T.O.

SECTION - II

Q5) a) Explain with suitable example, design activities for the code architecture view. **[8]**

b) Discuss in detail the elements, relations and properties for the component-connector viewtype. **[8]**

Q6) a) Explain in brief, why to document behaviour. **[8]**

b) What are three major aspects of documentation beyond views? Explain, how the documentation is organized to serve a stakeholder. **[8]**

Q7) a) Explain product archetype pattern. **[8]**

b) For the literate modeling, explain the comprehensibility and accessibility of UML models. **[8]**

Q8) Discuss in brief the following :

a) Organizational factors for IS2000. **[3]**

b) Archetypes and business. **[3]**

c) Pattern Configuration rules. **[4]**

d) Loose coupling between views. **[4]**

e) The rules of sound documentation. **[4]**

Total No. of Questions : 8]

SEAT No.:

P1965

[Total No. of Pages : 2

[4165]-766
M.E. (Computer Engineering)
PATTERN RECOGNITION AND MACHINE VISION
(2008 Course) (Elective - III (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the maximum-likelihood estimates in unsupervised learning. Compare it with Least Squares Estimation.

b) Find least-squares parabola for the four points (– 3, 3), (0, 1), (2, 1), and (4, 3). **[16]**

Q2) a) Explain Levenberg-Marquardt algorithm.

b) What is the significance of Classification? Explain Classification using Mahalanobis distance function and Discriminant function. **[16]**

Q3) a) Assuming a set of values, apply Nearest Neighbor algorithm and explain its performance.

b) Explain Non Linear Regression with an example. **[16]**

Q4) a) Explain Principal Component Analysis (PCA). Justify the significance of PCA with an application.

b) Explain the projective transformation for Image Formation.

P.T.O.

c) A series of eight samples gave the following result :

A	0	1
A	1	0
A	0	1
B	0	1
B	1	0
B	1	0
C	0	1
C	1	1

Estimate the probabilities of the classes A, B and C for an unknown sample with x = 0 and y = 1. **[18]**

SECTION - II

Q5) a) Discuss the role of brightness adaption curve in human vision system.

b) List the applications of pattern recognition. State and prove Baye's theorem as applied to pattern recognition. **[16]**

Q6) a) What is tracking? Discuss in detail about Kalman filtering for motion estimation.

b) Discuss the following :

i) Color constancy.
ii) Methods of texture analysis.
iii) Dynamic scene analysis.
iv) Detection of changes in successive frames of a sequence. **[16]**

Q7) a) Write a block of pseudo-code for convolving an image with a feature-detecting Kernel.

b) Define Region Identification. Give an Algorithm for Region Identification.

c) When a camera is moving, all points in the environment are getting displaced in an image. How can you segment a dynamic scene to determine moving objects in case of a moving camera? **[18]**

Q8) a) Explain the following w.r.t. object recognition :

i) Invariant for plane figures.
ii) Affine Invariants for co-planar point.

b) What is Verification? What are the various approaches for verification? **[16]**

Total No. of Questions : 8]

SEAT No.:

P1966

[Total No. of Pages : 2

[4165]-767
M.E. (Computer Engineering)
NETWORK PROGRAMMING
(2008 Course) (Elective - III (c)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With neat diagram explain TCP state transition with respect to suitable application level example/protocol? **[8]**

b) Give comparative analysis of various socket address structures? **[8]**

Q2) a) Write multithreaded echo server and echo client program in 'C'. **[8]**

b) Which are various methods/commands to access routing table in Unix? Explain data link socket address structure? **[8]**

Q3) a) Compare the multiple client handling mechanism in TCP with UDP? **[8]**

b) How gethostbyname () function is different than getaddrinfo () function. **[8]**

Q4) Write short notes (any three) : **[18]**

a) Sysctl operations.

b) Socket byte ordering functions.

c) Socket calls/functions for UDP client and sever.

d) Request/response mechanism in Domain name system.

SECTION - II

Q5) a) Explain how interoperability can be achieved between IPv6 client and IPv4 server? **[8]**

b) With neat diagram compare unicast and broadcast packet and frame formats? **[8]**

P.T.O.

Q6) a) Explain multicasting mechanism in WAN? **[8]**

b) Write 'C' program to join and leave multicast group? **[8]**

Q7) a) Analyze the performance of preforked TCP server with prethreaded TCP server with suitable example. **[8]**

b) Write a 'C' program to implement TCP preforked server having file locking around accept system call? **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Unicast, multicast and broadcast addresses in IPv4 and IPv6.

b) Thread functions.

c) IPv6 address testing macros.

d) IP fragmentation in unicast and broadcast.

☒☒☒☒

Total No. of Questions : 8]

P1970

SEAT No.:

[Total No. of Pages : 2

[4165]-776
M.E. (Computer) (Computer Networks Engineering)
INTERNET ROUTING DESIGN
(2008 Course) (Elective - I (a)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three question from each section.***
2) ***Answers to the two section should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) What are the fundamental problems faced by Internet Routers? Explain the cause by scale and services in details. **[8]**

b) What is Network Algorithmic? Explain the important aspects of Network algorithmic. **[8]**

Q2) a) Explain the Shortest Path Computation with Candidate Path Caching algorithm with the help of suitable psudecode. **[8]**

b) In what ways, are the Bellman-Ford algorithm and the distance vector algorithm different? What are the main differences between shortest path routing and widest path routing? **[8]**

Q3) a) Consider a seven-node ring network : **[10]**

i) If a distance vector protocol is used, determine how long it will take for all nodes to have the same routing information if updates are done every 10 sec.

ii) If a link state protocol is used, how long will it take before every node has the identical link-state database if flooding is done every 5 sec. Determine how many link state messages in total are flooded till the time when all nodes have the identical database.

b) How is the router ID determined in OSPF? How about IS-IS? **[8]**

P.T.O.

Q4) a) What is the relation between an AS and an ISP? Is policy routing checked on the inbound or the outbound interface of a BGP speaker? **[8]**

b) What are the basic functions of a router? Discuss the strengths and weaknesses of various router architectures. **[8]**

SECTION - II

Q5) a) Show that a unibit trie with text strings to compress one-way branches can have at most $2N$ trie nodes and $2N$ text strings. Extend your analysis to multibit trie nodes with a fixed stride. How would you implement text string compression in such tries? **[10]**

b) What lookup algorithms can be used for ARP caches? Explain the algorithm with suitable illustration. **[8]**

Q6) a) In the grid of tries, the only role played by the destination trie is in determining the longest-matching destination prefix. Show how to use other lookup techniques to obtain a total search time of $(\log W + W)$ for destination-source rules instead of $2W$? **[8]**

b) The equivalenced cross-producting idea in RFC leaves unspecified how to choose a combining tree. One technique is to compute all possible combining trees and then to pick the tree with the smallest storage. Describe an algorithm based on dynamic programming to find the optimal tree. Compare the running times of the two algorithms. **[8]**

Q7) a) What is the relation between caching paths for alternate routing and inaccuracy in information available due to periodic link state update? For example, if there is no path caching, how would this inaccuracy effect routing performance? **[8]**

b) What are different goals of QoS routings? Describe a General Framework for Source-Based QoS Routing with Path Caching. **[8]**

Q8) a) Discuss where and how MPLS-based IP/MPLS traffic engineering is different from "pure" IP traffic engineering. **[8]**

b) Write a note on layer 2 VPN Traffic engineering. **[8]**

Total No. of Questions : 8]

SEAT No.:

P1971

[Total No. of Pages : 2

[4165]-777
M.E. (Computer Engineering) (Computer Networking)
ADVANCED TCP/IP
(2008 Course) (Elective - I (b)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three question from each section.***
2) ***Answers to the two section should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain the need of byte order conversation. Explain the library functions (System calls) provided by BSD Unix for byte order conversions. **[8]**

b) Explain the procedure to access the domain name system on the local system. **[8]**

Q2) a) What is spoofing? Can DHCP guarantee that a client is not spoofing? Explain the same for BOOTP along with reason. **[8]**

b) Explain how DHCP client and server can agree on lease duration without having synchronized clocks. Support your answer with pseudocode.**[8]**

Q3) a) Explain how to obtain official descriptions of the domain name system of any specific URLs. Write a program to build the client and obtain the official descriptions of DNS. **[8]**

b) If we extended the domain name syntax to include a dot after the top level domain, name and abbreviations would by unambiguous. What are the advantages and disadvantages of the extension? **[10]**

Q4) a) Explain the TELNET standard and find out how the SYNCH operation works. **[8]**

b) Explain the mechanism of TELNET, how it forces the remote operating system to respond to control functions quickly. **[8]**

P.T.O.

SECTION - II

Q5) a) Why should file transfer transport protocols compute a checksum on the file data they receive, even when using a reliable end-to-end stream transfer protocol like TCP? Explain the advantages of using separate TCP connections for control and data transfer. **[8]**

b) What are the differences between FTP and NFS? Compare the rate of transfer issues in FTP and NFS. **[8]**

Q6) a) Write a program to implement SMTP client. Explain how it delivers the mail message to receiver. **[10]**

b) Find out how the UNIX *sendmail* program can be used to implement the mail gateway. **[6]**

Q7) a) Explain most important browser headers, in terms of end-user performance : **[8]**

i) HTTP version (HTTP/1.0 or HTTP/1.1)
ii) Accept-Encoding : gzip, deflate.
iii) Connection : Keep-Alive.
iv) If - * headers.
v) Cache-Control or Pragma no-cache.

b) Differentiate between HTTP and HTTPS. Explain under what condition proxy cache web pages, when using HTTPS. **[8]**

Q8) a) What is the need of real time transmission? Explain the characteristics and functionalities of RTP. **[8]**

b) Write a note on RCTP application defined packet format with labeled diagram. **[10]**

Total No. of Questions : 8]

SEAT No. :

P1972

[Total No. of Pages : 2

[4165] - 778
M.E. (Computer Networks)
WIRELESS TECHNOLOGY
(2008 Course) (Elective - II (a)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer 3 questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain step by step various milestones in wireless communication technology. **[8]**

b) With neat diagram explain mathematical relationship between sinusoidal wave and square wave. **[8]**

Q2) a) Give comparative analysis of various wireless transmission media. **[8]**

b) A microwave transmitter has an o/p of 0.1 W at 2 Ghz. Assume that this transmitter is used in a microwave communication system where the transmitting & receiving antennas are parabolas, each 1.2m in diameter, find **[8]**

i) What is the gain of each antenna in decibels.

ii) What is the effective radiated power of the transmitted signal.

iii) If the receiving antenna is located 30 km from the transmitting antenna, find the available signal power out of the receiving antenna in dBm units.

Q3) a) Explain fading and fading channel in the mobile environment. **[8]**

b) Explain IEEE 802 family & its relation to OSI model. **[8]**

P.T.O

Q4) Write short notes (any three): **[18]**

a) Line of signt transmission.

b) DAMA-FDMA.

c) Distribution system in wireless LAN.

d) 802.11 network operations.

SECTION - II

Q5) a) Discuss various challenges/issues in designing MAC layer in wireless networks? How these issues can be handled? **[8]**

b) Explain in detail 802.11 frame format. **[8]**

Q6) a) Explain TDMA with its frame format used in satellite communication. **[8]**

b) Explain GSM signalling protocol architecture. How is it different than CDMA? **[8]**

Q7) a) Explain IEEE 802.16 architecture. Give examples of IEEE 802.16 networks. **[8]**

b) Explain WEP cryptographic operations with suitable example. **[8]**

Q8) Write short notes (Any three): **[18]**

a) FAMA - FDMA.

b) Mobile IP.

c) TCP - snoop.

d) Problems with WEP and solutions.

Total No. of Questions : 8]

SEAT No. :

P1973

[Total No. of Pages : 2

[4165] - 779

M.E. (Computer) (Computer Networks)

INFORMATION SECURITY AUDIT AND MANAGEMENT

(2008 Course) (Elective - II (b)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is C.I.A. triangle? Define each of its component parts. **[8]**

b) Define Project Management. Why project management is of particular interest in the field of information security? **[8]**

Q2) a) Explain the roles and responsibilities of CIO and CISO in the implementation of the information security. **[8]**

b) Explain Security System Life Cycle (SecSDLC). **[8]**

Q3) a) Explain the fundamentals of Contingency Planning. **[8]**

b) Explain Testing contingency plan. **[8]**

Q4) Write short notes on any THREE of the followings: **[18]**

a) Project management tools.

b) CNSS Security Model.

c) Types of attacks on assets of an organization.

d) ISO 17799 - 2005 Information standard.

P.T.O

SECTION - II

Q5) a) Why Policy? Differentiate amongst the various policies. **[8]**

b) Explain the guidelines for effective information security policy development. **[8]**

Q6) a) How security is implemented in Large, Mid-sized and Small size organizations? **[8]**

b) Explain the performance measures in the information security management. **[8]**

Q7) a) What is Risk Management? Explain the steps involved in selecting a risk control strategy. **[8]**

b) Explain Security models: **[8]**

i) Biba Integrity Model.

ii) Harrison-Ruzzo-Ullman Model.

Q8) Write short notes on any THREE of the followings: **[18]**

a) COBIT Security Model.

b) Certification and Accreditation.

c) Risk Mitigation.

d) Ethics Vs. Law.

Total No. of Questions : 8]

SEAT No.:

P1976

[Total No. of Pages : 2

[4165]-784
M.E. (Computer) (Computer Networking)
NETWORK DESIGN MODELING AND ANALYSIS
(2008 Course) (Elective - III (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail Gaussian Probability function with its suitable application. **[7]**

b) There are 150 terminals feeding a network node. Each terminal sends one transaction every 3 minutes, while the node can only process 60 transactions per minute. What is the probability that there are no more than 60 transactions per minute. What is the probability that there are no more than 60 transactions arrival per minute? **[7]**

c) Explain relation between CDF and pdf with suitable diagram. **[4]**

Q2) a) Explain with suitable example effect of message length distribution in M/G/l Queue? **[8]**

b) Messages arrive independently to a system at the rate of 1 message in 5 seconds. The lengths of messages are exponentially distributed with an average 2400 characters. The channel used for transmission has rate of 9600 bps, character is represented by ASCII format. Find :

i) Average service time.
ii) Arrival rate.
iii) Service rate.
iv) Utilization of server.
v) Average number of messages. **[8]**

P.T.O.

Q3) a) What is terminal concentrator? Explain in detail features of terminal concentrator in computer network? **[8]**

b) State and prove Little's theorem. **[8]**

Q4) Write short notes on (any three) : **[16]**

a) Bernoulli random variable.

b) Priority queuing.

c) Approximation of finite buffer system by infinite buffer model.

d) Networks of queues.

SECTION - II

Q5) a) An ISP is granted a block of addresses starting with 150.80.0.0/16. The ISP wants to distribute these blocks to 2600 customers as follows :

i) The first group has 200 medium-size businesses; each needs 16 addresses.

ii) The second group has 400 small businesses; each needs 8 addresses.

iii) The third group has 2000 households; each needs 4 addresses.

Design the sub blocks and give the slash notation for each sub block. Show how these sub blocks will be connected to the ISP. Find out how many IP addresses are still available after these allocations. **[10]**

b) Explain in detail Unified algorithm. **[8]**

Q6) a) Explain with examples open queuing networks and closed queuing networks? **[8]**

b) Explain Bin packing algorithm with example? **[8]**

Q7) a) What is terminal assignment? Enlist and compare different terminal assignment algorithms? **[8]**

b) Define minimum spanning tree? Explain with suitable example its application in network? **[8]**

Q8) Write short notes on (any three) : **[16]**

a) Network bandwidth management tools.

b) Multipoint line layout heuristics.

c) Esau-William's algorithm.

d) Compare Sub-netting and super-netting.

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Total No. of Questions : 8]

P1977

SEAT No. : ____

[Total No. of Pages : 2

[4165] - 786
M.E. (Computer) (Computer Networks)
CONVERGENCE TECHNOLOGY
(2008 Course) (Elective - IV(b)) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare Circuit switching, Packet switching and Cell switching on the following aspects nature of connection, header overhead, resource utilization, and congestion control. **[8]**

b) What is contention resolution? Explain D channel contention resolution algorithm. **[8]**

Q2) a) In Frame Relay network explain Queue length Averaging Algorithm for network notification of congestion, also explain window-based control in FECN. **[8]**

b) The addressing method used at data link layer in traditional computer networks is not suitable in ISDN networks, Justify? Explain addressing method used at data link layer in ISDN network. **[8]**

Q3) a) Differentiate between ISDN, Frame Relay and ATM. **[8]**

b) What is the cell Delineation procedure? In this procedure, explain clearly the safeguards against false misalignments due to bit-error and against false delineation during resynchronization, Comment on how the values of ALPHA and DELTA affect misalignments and resynchronization. **[8]**

P.T.O.

Q4) Write short notes on any three of the followings : **[18]**

a) SS7 control plane and information plane.

b) The UNI ATM Cell Header.

c) Comparison X.25, TCP/IP reference model, and ISDN at Network layer.

d) Benefits of VoIP and IP Telephony.

SECTION - II

Q5) a) Why various types of AAL's required in ATM Networks? Explain example of AAL5 transmission. **[8]**

b) What are the different traffic parameters in ATM? Describe these parameters in brief. What is the need of so many parameters? **[8]**

Q6) a) Explain the ATM Signaling reference model and discuss the role of different protocols in this model. **[8]**

b) During traffic contract management what is the role of CAC? Justify that the CAC mechanism acts as a preventive congestion control mechanism. **[8]**

Q7) a) In a real time system if we digitize voice at 8000 samples per second where each sample is one byte, how long will it take to fill 500 byte packet? For interactive voice if delay of 100ms is considered the limit, what fraction of this 100ms is spent in packetization? **[8]**

b) What are the key aspects of Classical IP over ATM? Explain with reference to the followings : Address Resolution, Caching and MTU size. **[8]**

Q8) Write short notes on any three of the followings : **[18]**

a) PSTN, VoIP and IPTel Gateways.

b) A call setup based on SIP signalling.

c) Dynamical Bandwidth Circuit Emulation Services (DBCES).

d) H.323 protocols.

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Total No. of Questions : 8]

SEAT No. :

P1979

[Total No. of Pages : 2

[4165]-790

M.E. (Chemical Engineering)

ADVANCED SEPARATION PROCESSES

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are different types of separation process? Discuss advantages and disadvantages of membrane separation process. **[8]**

b) Explain the principle of Cross Flow Filtration and state its various advantages. **[6]**

c) What is donnan dialysis? Explain how it is different from dialysis? **[4]**

Q2) a) Discuss various recent advantages in separation techniques based on size and surface properties. **[8]**

b) Describe Sirofloc Filter with schematic diagram? **[8]**

Q3) a) Enlist various modules used for membrane separation and describe general design requirement for any membrane system. **[8]**

b) Describe spiral wound module with schematic diagram and compare various module configuration based on properties. **[8]**

Q4) a) What are different chromatographic techniques? Describe High performance liquid chromatography techniques with schematic flow diagram? **[12]**

b) What is adsorption isotherm? Discuss various types and choice of adsorbent. **[4]**

P.T.O.

SECTION - II

Q5) a) The permeability of a methane through a certain membrane has been determined at various temperatures and pressures from 5 bar to 15 bar. It was found that the permeability does not change with pressure the values of permeability at various temperature are as follows : **[10]**

Temp. (ok)	283	293	303	313
P (bars)	1.8	3.9	6.9	11.4

i) Is the material glassy or elastomer?

ii) Determine the activation energy?

b) What is membrane fouling? Discuss various methods to reduce fouling? **[8]**

Q6) a) Discuss dielectrophoresis and dielectrofiltration process and enlist various applications of these process. **[8]**

b) Describe Hallow fibre module with schematic diagram and state various advantages & disadvantages of spiral wound module system. **[8]**

Q7) a) What is liquid membrane? Describe various types and mechanism of liquid membrane process. **[8]**

b) What is Crystallization? Describe the process of adductive crystallization? **[8]**

Q8) a) Describe industrial effluent treatment by modern techniques? **[8]**

b) What is oil spilling? Describe oil-spill management techniques with suitable examples. **[8]**

Total No. of Questions : 8]

P1980

SEAT No.:

[Total No. of Pages : 3

[4165]-791
M.E. (Chemical)
COMPUTATIONAL FLUID DYNAMICS
(2008 Course) (Elective - I (a)) (Sem. - I)

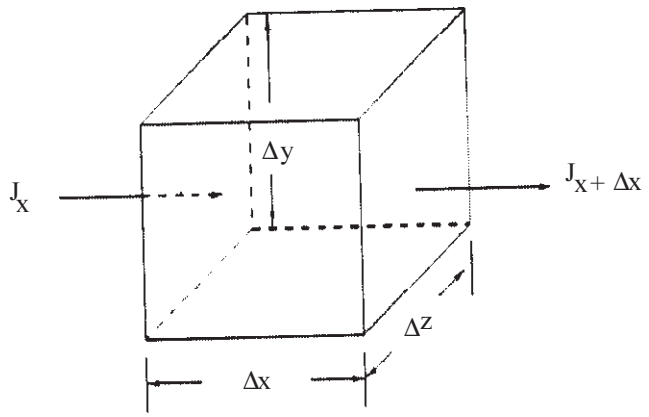
Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Quantity (mass, energy or momentum) per unit volume given by Φ is entering the volume element $\Delta x\ \Delta y\ \Delta z$ as shown in the figure below. The transfer of Φ is being effected by means of molecular diffusion (due to diffusivity Γ in m^2/sec) and bulk transport (due to average velocities u, v, w in x, y, z directions) through the elemental thicknesses Δx, Δy and Δz. The total transport flux, J is the sum of the fluxes by molecular diffusion and bulk movement of Φ. The rate of generation of Φ in the volume element is given by S [Quantity/(volume. time)].



P.T.O.

Applying the fundamental law of conservation for Φ over the elemental volume, derive the following relation :

$\partial \Phi/\partial t + \partial/\partial x(u\Phi) + \partial/\partial y(v\Phi) + \partial/\partial z(w\Phi) = \Gamma [\partial^2\Phi/\partial x^2 + \partial^2\Phi/\partial y^2 + \partial^2\Phi/\partial z^2] + S.$ **[16]**

Q2) Starting from the fundamental principles, derive Navier-Stoke's equation using volume integral method. Use usual notations for the terms involved in the derivation. **[16]**

Q3) a) Explain various stages involved in CFD process. Give the names of commercial softwares involved in each stage. **[8]**

b) Explain Lagrangean and Eulerian approach to fluid flow phenomena and relation between the two. **[8]**

Q4) Write short notes (any three) : **[18]**

a) Reynolds Transport Theorem.

b) Governing equations and boundary conditions for Conjugate Heat Transfer.

c) Mesh generation methods.

d) Parametric representation of curves and surfaces.

e) Conservative and Non-conservative forms of continuity equation.

SECTION - II

Q5) Unsteady one dimensional heat conduction through a metal slab is given by $\alpha \partial T/\partial t = (\partial^2 T/\partial x^2)$.

Where, α is thermal diffusivity to be assumed constant ($\alpha = 1.5 m^2/sec$). Left end of the metal slab is at temperature of 100ºC and right end is at 30ºC. If the length of the slab is 0.05m,

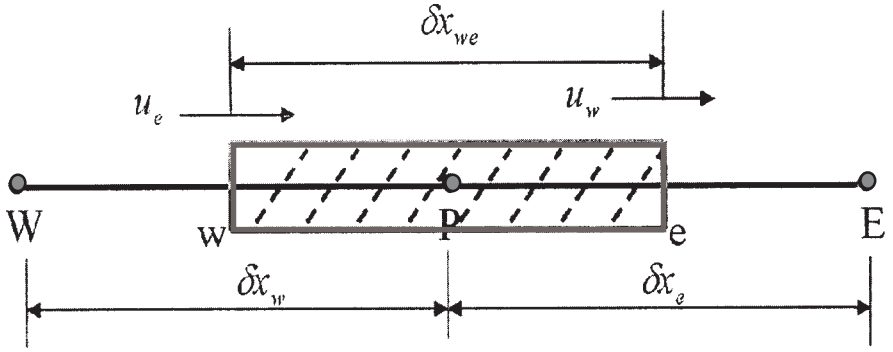
a) Discretize above equation EXPLICITLY using forward time and central space (FTCS) differencing.

b) Find out temperature distribution in the slab from t = 0 to t = 10 sec. Take step size as $\Delta t = 2.5$ sec and $\Delta x = 0.01$m. **[16]**

Q6) a) What are flow patterns in two phase vapor-liquid flow in horizontal circular channel? **[6]**

b) What is appropriate multiphase flow model for separated gas-liquid flow? Describe in detail with the help of governing equations. **[10]**

Q7) A control volume (as shown in the following figure) is used to discretise 1-D diffusion equation $d/dx(pu\Phi) = d/dx(D_v\, d\Phi/dx)$ Where D_v is the diffusion coefficient (m^2/sec).



a) What are the various methods to discretise the given equation? Which method is most accurate?

b) Discretize the given equation using Finite Volume Method with central differencing scheme. **[16]**

Q8) Write short notes (any three) : **[18]**

a) Post processing in CFD analysis.

b) Time averaged Navier-Stokes equations for turbulence modeling.

c) Discretization using Finite Volume Method.

d) Implicit Finite Difference Scheme.

e) Consistency and stability of Numerical Method.

☒☒☒☒

Total No. of Questions : 8]

SEAT No.:

P1981

[Total No. of Pages : 2

[4165]-792
M.E. (Chemical)
PROCESS DESIGN AND SYNTHESIS
(2008 Course) (Elective - I (b)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer any three questions from each section.*
2) *Figures to the right indicate full marks.*

SECTION - I

Q1) a) How process industrial project evaluation is done? **[8]**

b) Discuss - trade off and utilities. **[8]**

Q2) a) Discuss the various factors related to environmental concerns considered during process design. **[8]**

b) Describe the pinch point approach. **[8]**

Q3) a) Explain with example the steps involved in heat exchangers network synthesis. **[8]**

b) Discuss the various engineering ethics. **[8]**

Q4) Write short notes on : **[18]**

a) Life cycle assessment of a process.

b) Product design.

c) Green Engineering.

SECTION - II

Q5) a) Describe residue curve maps in detail with topological analysis. **[10]**

b) Explain Attainable Region approach. **[6]**

Q6) a) Discuss non ideal distillation synthesis with suitable example. **[8]**

b) Describe pressure swing separation. **[8]**

Q7) a) Describe basics of column sequencing with example. **[10]**

b) Explain sequencing and phase diagram for 4 components mixture. **[6]**

P.T.O.

Q8) Write short notes on : **[18]**

a) Attainable region in higher dimensions.

b) Reactive residue curve maps.

c) Equipments sequencing in vapor liquid equilibrium separation.

Total No. of Questions : 8]

SEAT No.:

P1982

[Total No. of Pages : 2

[4165]-794
M.E. (Chemical)
COMPUTER AIDED DESIGN
(2008 Course) (Elective - I (d)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Assume suitable data wherever necessary.***
2) ***Solve any three questions out of four from each section.***

SECTION - I

Q1) a) Explain the importance of computer aided design in chemical engg. **[10]**

b) Enlist various numerical methods used in solving chemical engg. problems. **[8]**

Q2) a) Enlist various softwares used in chemical engg. applications. **[8]**

b) Write a flow chart for computer aided design of Binary distillation column. **[8]**

Q3) a) Write a flow chart for computer aided design of a reactor. (CSTR). **[8]**

b) Differentiate between steady state and dyanamic simulation with suitable examples.
Also list the changes required to transit from steady to dynamic simulation. **[8]**

Q4) a) Write a short note on application of ordinary and partial differential equations in chemical engineering practice. **[6]**

b) What are various numerical methods used for solving partial differential eqns. Explain finite difference method in detail. **[10]**

SECTION - II

Q5) a) Write a short note on stiff differential eqn system and method used for solving that equation. **[6]**

b) What are applications of orthogonal collocation and weighted residual techniques in heat and mass transfer systems. **[6]**

c) Differentiate between : **[4]**

i) initial value and
ii) boundary value problems.

P.T.O.

Q6) a) Write a flow chart for Newton Raphson method used for determining root of eqn. **[6]**

b) Write a computer program in 'C' for finding root of a eqn. $f(x) = exp(x) - 4x$ using regula falsi method. **[10]**

Q7) a) Explain elements of computer system in detail. **[6]**

b) Write short note on : **[12]**

i) Data storage.

ii) Alphaneumaric input and output in computer system.

iii) Graphical input/output basic software.

Q8) a) Write various models used for property estimation in simulators explain each with its application area in detail. **[8]**

b) Enlist and explain various components (main 4) of any commercial softwares. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1983

[Total No. of Pages : 3

[4165] - 795

M.E. (Chemical Engg.)

INDUSTRIAL POLLUTION CONTROL

(2008 Course) (Elective - II (a)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) It has been estimated that the emission of SO_2 from coal fired power plant is 1656.2 g/s. At 3km downwind on an overcast summer afternoon, what is the centreline concentration of SO_2 if the wind speed is 4.50 m/s.

Data - Stack parameters –

Height = 120m, Diameter = 1.2m,

Exit velocity = 10m/s, Temperature = 315ºC.

Atmospheric conditions

Pressure = 95 kPa, Temperature = 25ºC.

A = 0.13, B = 0.392, P = 0.636. **[8]**

b) Explain the phenomena of inversion. **[6]**

c) One cubic meter sample of air was found to contain $80\mu g/m^3$ of SO_2. The temperature and pressure were 25ºC and 103.193 kPa. When the air sample was taken. What was the SO_2 Concentration in PPM? **[4]**

Q2) a) Coal is burnt at a rate of 1.00 kg per second. If the analysis of coal reveals a sulfur content of 3.00%, what is the annual rate of emission of SO_2 if the sulfur in the ash is 5% of input sulfur? **[8]**

b) Write a note on Ozone depletion. **[4]**

P.T.O.

c) Determine the collection efficiency of electrostatic precipitator with following specifications for a particle 154 μm in diameter having a drift velocity of 0.184 m/s. ESP specifications – **[4]**

Height = 7.32 m,

Length = 6.10 m,

Plate spacing = 0.28 m

Number of passages = 5,

Gas flow rate = 19.73 m^3/s.

Q3) a) Describe the elements of conceptual process design. For wastewater treatment plant. **[8]**

b) Explain reverse Osmosis as an advanced wastewater treatment method. **[8]**

Q4) Explain in brief the pollution caused due to pulp and paper industry and discuss the various methods and equipments which can be used for controlling the same. **[16]**

SECTION - II

Q5) a) Derive an equation for finding the concentration of substrate in the effluent in 9 complete mix reactor without recycle. **[8]**

b) A completing mixed activated sludge system is expected to meet an effluent standard of 30 mg/L BOD_5 and 30 mg/L suspended solids. Assuming that the BOD_5 of the suspended solids may be estimated as 63% of suspended solids concentration, estimate the required volume of the aeration tank. The following data can be used.

Flow = 0.150 m^3/s, BOD_5 = 84 mg/L,

k_s = 100 mg/L BOD_5, μm = 2.5 d^{-1},

k_d = 0.050 d^{-1} Y = 0.50 mg vss/mg BOD_5 removed mixed liquer volatile suspended solids can be taken as 2000 mg/L. **[10]**

Q6) a) Determine BOD_5 of the effluent from 9 low rate trickling filter that has a diameter of 35 m and a depth of 1.5m if the hydraulic loading is 1900m^3/d and the influent BOD_5 is 150 mg/L. Assume the rate constant is 2.3 $(m/d)^n/m$ and n = 0.67. **[8]**

b) Describe the most common methods of sludge disposal. **[8]**

Q7) a) Explain various methods of landfilling. **[10]**

b) Write a short note on composting. **[6]**

Q8) a) Explain in detail the methods of collection and transportation of solid waste. **[8]**

b) Define waste minimisation and explain the necessity of waste minimisation with some examples. **[8]**

Total No. of Questions : 8]

SEAT No. :

P1984

[Total No. of Pages : 2

[4165] - 798
M.E. (Chemical)
FLUIDIZATION ENGINEERING
(Elective - II (d)) (2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) What are the applications of fluidization system? **[8]**

b) Discuss the operating models for fluidization system. **[8]**

Q2) a) Define fluidized state and discuss the hydrodynamics of fluidization system. **[8]**

b) Discuss the pressure drop across the fluidized coloumn versus fluid velocity. Draw a neat sketch. **[8]**

Q3) Enlist the different flow models. Discuss the generalized wake model and Davidson model. **[18]**

Q4) Explain the following in detail: **[16]**

a) Mixing-segregation equilibrium.

b) Pressure fluidization.

P.T.O

SECTION - II

Q5) Derive the kinetic model for conversion of shrinking and growing particle in fluidization. **[16]**

Q6) Explain the following in detail.

a) Liquid - Solid Mass transfer in fluidization. **[8]**

b) 2 phase and 3 phase inverse fluidized bed. **[8]**

Q7) Write short notes on (any two): **[16]**

a) Conical fluidized bed.

b) Modeling by bed collapsing.

c) Geldart's classification for power assessment.

Q8) Discuss the following in detail: **[18]**

a) Incipient fluidization.

b) Draft tube system.

c) Semi-fluidized bed.

Total No. of Questions : 8]

SEAT No. :

P1986

[Total No. of Pages : 2

[4165] - 800
M.E. (Chemical Engg.)
ADVANCED TRANSPORT PHENOMENA
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How can you estimate the Lennard-Jones potential for a binary mixture, if you know the parameters for the two components of the mixture. **[8]**

b) Describe the factors affecting the transition from laminar to turbulent flow with their influence. **[8]**

Q2) a) Explain contravarient, covarient and mixed tensors. **[8]**

b) Derive the expressions for $(\nabla.\mu)$ and $\nabla\mu$ in the cylindrical coordinates systems? **[8]**

Q3) a) Derive the equation of motion for Spherical Co-ordinate Systems. **[10]**

b) Derive the equation of continuity and compaire these equations with Curvilinear coordinates. **[6]**

Q4) a) A Newtonian fluid is in laminar flow in a narrow slit formed by two parallel walls a distance 2B apart. It is understood that B<<W, so that "edge effects" are unimportant make a differential momentum balance and obtain the following expressions for momentum-flux and velocity distributions;

$$\tau_{xy} = \left(\frac{p_o - p_L}{L} \right) x$$

P.T.O

$$v_z = \frac{(p_o - p_L)B^2}{2\mu L}\left[1-\left(\frac{x}{B}\right)^2\right]$$

In these expressions $P = p + \rho gh = p - \rho gz$.

b) What is the ratio of average velocity to maximum velocity for this flow?

c) Obtain the slit analog of the Hagen-Poiseuille equation.

d) Draw a meaningful sketch to show why the above analysis is inapplicable if B = W.

[18]

SECTION - II

Q5) a) Obtain the equations of a continuity for a multicomponent mixture. Assume binary systems with constant $\rho.DAB$, with constant C^{DAB} or with zero velocity. **[10]**

b) Describe the boundary layer concept and Navier-stokes equations for incompressible two dimentional flow over a flat plate. **[6]**

Q6) a) Derive the expression for temperature distribution with more than one independent variables. **[12]**

b) What is fluctuations and derive time smoothened equations for velocity. **[4]**

Q7) Water at 50ºF enters a heat - exchanger tube having an inside diameter of 1 in. and a length of 10 ft. The water flows at 20 gal/min. For a constant wall temperature of 210ºF, estimate the exit temperature of water using **[16]**

a) The Reynolds analogy.

b) The colburn analogy.

c) The Prandtl analogy. The Entrance effects are to be neglected, and the properties of water may be evaluated at the arithmetic-mean bulk temperature.

Q8) a) What is the significance of momentum, heat and mass transfer analogies? Describe Chilton-Colburn analogy with suitable examples? **[8]**

b) Describe potential flow with schematic diagram? Describe at what point on the surface of the circular cylinder in a potential flow does the pressure equal the free-stream pressure? **[10]**

Total No. of Questions : 8]

SEAT No.:

P1987

[Total No. of Pages : 2

[4165]-802
M.E. (Chemical)
CATALYSIS AND SURFACE PHENOMENA
(2008 Course) (Elective - III (a)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the importance of pore structure and surface area in heterogeneous catalysis? **[8]**

b) Derive Elovich equation. **[8]**

Q2) Draw the structured development of zeolite structure starting from silica and alumina and discuss the various methods for zeolite modifications. **[16]**

Q3) a) Give the stepwise procedure for determination of pore size distribution in process catalysts. **[10]**

b) Write a note on selection of support materials for catalysts. **[6]**

Q4) a) Write a short note on necessity of characterisation of catalysts. **[6]**

b) Explain the following catalyst characterisation techniques. **[12]**

i) UPS.

ii) XRF.

iii) XRE.

P.T.O.

SECTION - II

Q5) a) Give classification, description and applicability of adsorption isotherms. **[10]**

b) Write a note on dual functional catalysts. **[6]**

Q6) Derive the equation for temperature rise in interphase-intraphase nonisothermal transport processes. **[16]**

Q7) a) Write a short note on effictiveness factor and Thiele modulus. **[8]**

b) State briefly on chemistry of mechanism of fouling. **[4]**

c) Describe chemisorption method for determining metal surface area in supported metal catalyst. **[6]**

Q8) a) What are spinnels? State their characteristics. **[8]**

b) State and explain the different methods by which catalyst deactivation may occur. **[8]**

Total No. of Questions : 8]

SEAT No.:

P1988

[Total No. of Pages : 2

[4165]-803
M.E. (Chemical)
ADVANCED REACTION ENGINEERING
(2008 Course) (Elective - III (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain the shrinking core model in detail and develop the expression for time to complete regeneration of the particle in the light of catalyst regeneration. **[16]**

Q2) Kerosene and gasoline are pumped successively at 1.1m/s through a 25.5cm. ID pipeline 1000km long. Calculate the 5/95% –95/5% contaminated width at the exit of the pipe given that the kinematic viscosity for the 50/50% mixture is $\frac{\mu}{\rho} = 0.9 \times 10^{-6} m^2/s$. **[16]**

Q3) What are the relative rates of transport of A through stagnant gas and equal molar counter diffusion for the same concentration boundary conditions. Obtain equation of flux through stagnant film. Explain both analytically and with help of plot of y_A (mole fraction of solute in film) Vs z/δ (dimensionless distance in film) where δ = film thickness, in what regions of z/δ does diffuse flux dominates bulk flux. Explain why? **[16]**

Q4) Write short notes on : **[18]**

a) Mass Transfer-Limited reactions in packed bed.

b) Steps in modeling diffusion with chemical reaction.

c) Scale up of a reactor.

P.T.O.

SECTION - II

Q5) What is effectiveness factor, η. How its value influences design of reactor. Derive the relation $\eta = \frac{3}{\phi_1^2}\ [\phi_1 \coth \phi_1 - 1]$. What is a characteristics length of a catalyst pellet. **[16]**

Q6) A gas phase reaction, $A + B \rightleftharpoons C$ is carried out in an adiabatic packed bed reactor. The feed composition is 40% A and 60% B. The rate equation is given by, $r_v = k_1 C_A C_B - K_2 C_c^{0.5}$ and the rate constants are given by

$K_1 = 1 \times 10^3 \exp(-10000/T)$ and

$K_2 = 1 \times 10^2 \exp(-40000/T)$

The reaction is exothermic and the heat of reaction is given by -5×10^{11} k cal/k mole. The bulk density of the catalyst bed is 50 kg/m^3, and the diameter of reactor is 1.2m. The average heat capacity of the mixture may be taken as, 0.2 k cal per mole per degree kelvin. It is desired to produce 1000kg of C per day. The operating pressure is 1 atm, and the inlet temperature of the reactant mixture is 350ºC. Molecular weights of A, B and C are 50, 60 and 110 respectively. Calculate the length of the catalyst bed for 98% conversion of A and the amount of catalyst required. **[16]**

Q7) Develop the model equations for trickle bed reactor to obtain the weight of catalyst bed, W and conversion of A and B. **[16]**

Q8) Write short notes on : **[18]**

a) Diffusion through stagnant gas.

b) Slurry reactor model.

c) RTD in PFR.

Total No. of Questions : 8]

SEAT No.:

P1993

[Total No. of Pages : 2

[4165]-811
M.E. (Chemical) (Environmental Engineering)
ENVIRONMENTAL CHEMISTRY
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Discuss the adsorption of contaminants in soil and discuss soil pollution by mining. **[16]**

Q2) Give the classification of surfactants and pesticides and comment on the pollution due to pesticides. **[16]**

Q3) a) Discuss the environmental effects of hydrocarbons.
b) What is the biochemistry of proteins. **[18]**

Q4) Write short notes on : **[16]**
a) Hydrogen bonding in biological system.
b) Methods of water quality parameter testing.

SECTION - II

Q5) Define the following terms and explain the method of determination in detail.
a) BOD.
b) COD. **[18]**

Q6) Explain the principle, construction and working of : **[16]**
a) HPLC.
b) GLC.

P.T.O.

Q7) Discuss Ion Exchange chromatography and explain it for industrial contaminants. **[16]**

Q8) Write short notes on : **[16]**

a) Isotope dilution analysis.

b) Neutron activation analysis.

Total No. of Questions : 8]

SEAT No.:

P1994

[Total No. of Pages : 2

[4165]-827

M.E. (Chemical) (Environmental Engg.)

GROUND WATER CONTAMINATION & POLLUTION CONTROL

(2008 Course) (Elective - IV) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer three questions from section-I and three questions from section-II.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define and explain the following with necessary sketch : **[6]**

i) Water bearing formation.
ii) Common range of natural water velocity.
iii) Coastal aquifer.

b) What are the main factor that produce change in groundwater quality? What are the effect of aquiclude and aquitard in this respect? **[6]**

c) Discuss the factors that effect safe yield of a formation. **[6]**

Q2) a) Explain Recharge and discharge of groundwater. **[4]**

b) Discuss the effect of void ratio, arrangement and size variation of grain on storage of aquifer with neat sketch. **[6]**

c) Explain the necessity of simulation by model in study of flow pattern of ground water. Explain any one model for study of groundwater flow. **[6]**

Q3) a) Discuss the various driving forces in geomechanical process and enumerate their effect locally and globally. **[8]**

b) What are the term : **[8]**

i) Hydraulic conductivity and
ii) Physical permeability? What are the factor on which the hydraulic conductivity depend? Develop a relation between seepage velocity and Darcian velocity.

P.T.O.

Q4) a) Show that for a steady ground water flow in homogenous, isotropic medium, Laplace equation is satisfied. **[6]**

b) Differentiate between isotropic and anisotropic aquifers. Develop an equation for discharge through isotropic aquifer. Also show how you would account for non isotropic aquifer. **[6]**

c) An flownet analysis for an aquifer pumped for 5 hours gave following results.

No of flow channel = 6, No of potential drop = 15 Head drop between successive equipotential line is 8m. Find the discharge/m run, find also the transmissibility. Take permeability of aquifer medium = 5×10^{-6} m/s. **[4]**

SECTION - II

Q5) a) What is the necessity of artificial recharge and distinguish it with natural recharge? What are the prime factor which should be considered for artificial recharge. **[6]**

b) What is idealisation of aquifer and what is its necessity discuss in detail? **[4]**

c) Why does groundwater fluctuation occur? Discuss the necessity of adjustment of drawdown data to determine hydraulic property of aquifer. **[6]**

Q6) a) Discuss various types of model studies in connection with salt water intrusion. Discuss the relative merits and demerits of each. **[8]**

b) Explain groundwater pollution transportation phemenon. What are the different methods of pollutant migration, discuss briefly mass transport model and finite difference technique for quantification of pollutant migration. **[8]**

Q7) a) What are chemical isotopes and its application? What are the commonly used isotopes. Discuss (i) Isotope partitioning, ratio, delta (d) & permils (%). **[8]**

b) What is the utility of hydrochemical facies in context to solution to contamination problem? **[4]**

c) Discuss occurence and movement of groundwater in crystalline rock terrain. **[4]**

Q8) Explain the following (Any Three) : **[18]**

a) Factor affecting occurence of salt water.

b) Artificial Recharge by induced infiltration.

c) Disposal of solid waste by land filling with its advantage and disadvantage.

d) Adsorption process.

Total No. of Questions : 8]

P1995

SEAT No.:

[Total No. of Pages : 2

[4165]-815
M.E. (Chemical) (Environmental Engineering)
AIR AND NOISE POLLUTION CONTROL
(2008 Course) (Elective - I (d)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define "air pollution" as given by Indian standards. **[4]**

b) Classify the air pollutants according to source. **[4]**

c) Differentiate between primary and secondary pollutants. **[4]**

d) Explain the economical losses due to air pollution. **[6]**

Q2) What is lapse rate? Write the different types of lapse rate and discuss how the lapse rate are used to determine the atmospheric stability. **[16]**

Q3) Explain the principle, working and design of the following equipments. **[16]**

a) Cyclone separator.

b) Venturi Scrubber.

Q4) Discuss the behaviour of plumes, with neat figure. **[16]**

SECTION - II

Q5) a) What is Gaussian plume model for estimation of concentration of air pollutants.

b) Discuss about Air Pollution Laws and Regulations. **[18]**

P.T.O.

Q6) Give the characteristics, sources and effects of Noise pollution. Discuss the action plan to control noise pollution pertaining to any industry. **[16]**

Q7) Explain the methods for the removal of SOX with neat figure in detail. **[16]**

Q8) Write notes on : **[16]**

a) Vehicular emission.

b) Air sampling Train.

Total No. of Questions : 8]

SEAT No. :

P1996

[Total No. of Pages : 2

[4165]-816

M.E. (Chemical) (Environmental Engg.)

MEMBRANE TECHNOLOGY IN ENVIRONMENTAL ENGINEERING

(2008 Course) (Elective - II (a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain conventional filteration and membrane filteration process. How membrane separation processes are classified? **[8]**

b) Explain industrial applications of membrane processes. **[5]**

c) Discuss essential features of membrane process. **[5]**

Q2) a) Explain controlling factors for the selection of polymers for the membrane preparation. **[12]**

b) Explain phase inversion process on a ternary diagram in brief. **[4]**

Q3) a) Explain classification of separation process with suitable example in detail. **[8]**

b) Explain how performance of a membrane is determined? **[8]**

P.T.O.

Q4) Write short notes on the following : **[16]**

a) Natural membranes.

b) Charged membranes.

c) Necessity of modules.

d) Polymer coating process.

SECTION - II

Q5) a) Explain various methods used for membrane preparation. **[8]**

b) Explain ultrafilteration and state its industrial applications. **[10]**

Q6) a) Explain Sol-Gel process for inorganic composite membrane. **[8]**

b) Explain dead-end operation and cross flow operation. What is a 'tapered design' of module in system? **[8]**

Q7) a) What is mean by fouling of membrane and explain the methods used for cleaning of membrane. **[8]**

b) Explain electro dialysis process in detail **[8]**

Q8) Write short notes on the following : **[16]**

a) Reverse osmosis.

b) Liquid membranes.

c) Ion exchange process.

d) Membrane Bioreactor.

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Total No. of Questions : 8] **SEAT No. :**

P1999 **[Total No. of Pages : 2**

[4165] - 824

M.E. (Chemical) (Environmental Engg.)

WATER QUALITY MODELING

(Elective - III(b)) (2008 Course) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the main difference between lumped parameter and distributed parameter model. **[8]**

b) When is a system reaches to a steady state condition? Explain in detail with suitable example. **[8]**

Q2) Develop a model for Dissolved Oxygen Sag analysis. **[16]**

Q3) a) Explain non point source of pollution in terms of Acid mine drainage waste. **[8]**

b) What is model validation. **[8]**

Q4) a) Discuss Hierarchy of water resource scheme (WRS) model. **[9]**

b) Explain sensitivity testing in detail. **[9]**

SECTION - II

Q5) a) It is desired to model the concentration of suspended solids m_s in water. Write the model equation stating its significance. **[6]**

b) A sodium chloride tracer resulting in a concentration of 5000 mg/L in a discharged effluent of a sewage treatment plant is used to determine the dispersion coefficient, E_{XX}. The concentration of sodium chloride in the background stream is 50 mg/L. If the plant flow is 200 m^3/day and that of the stream is 2456 m^3/day. What is the resulting salt concentration in the mixed stream. **[10]**

P.T.O.

Q6) A municipal wastewater having a BOD of 250 g/m^3 is to be treated by a two stage trickling filter. The desired effluent quality is 25 g/m^3 of BOD. If both of the filter depths are to be 1.83m and the recirculation ratio is 2:1. Find the required filter diameters.

Data: Flowrate 7570 m^3/d.

Wastewater temperature = 20ºC

BOD removal in primary sedimentation = 35%

$E_1 = E_2$ **[16]**

Q7) Determine the effect of reducing the surface area of an aerated lagoon from 1,00,000 to 50,000 ft^2 by doubling the depth for the following conditions

Wastewater flow rate Q = 1 Mgal/d

Wastewater temperature T_i = 60 ºF

Air temperature Ta, = 20 ºF

Proportionality constant, f = 12×10^{-6} **[16]**

Q8) Explain modeling treatment process kinetics for **[18]**

a) Batch reactor with reaction.

b) Nonideal plug flow reactor.

Total No. of Questions : 8]

SEAT No. :

P2000

[Total No. of Pages : 3

[4165]-3

M.E. (Civil) (Construction & Management)

MANAGEMENT & PROJECT PLANNING IN CONSTRUCTION

(2002 Course)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) *Answer 3 questions from Section - I and 3 questions from Section - II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) The cost duration data for the various activities of a small construction project are given in the following table. **[18]**

Activity code i – j	Normal		Crash	
	Duration days	Cost Rs.	Duration days	Cost Rs.
1 – 2	8	6000	6	6600
1 – 3	6	4800	6	4800
1 – 5	10	15000	6	18400
2 – 4	8	7200	6	7600
3 – 6	12	5200	8	6200
4 – 7	12	16000	8	21000
5 – 6	20	28800	12	36000
6 – 7	14	16800	8	19800
6 – 8	18	17200	8	26800
7 – 9	16	25600	10	35200
8 – 9	4	2200	2	2500
9 – 10	6	3200	4	4200

P.T.O.

a) Draw the network, find normal project duration and the critical path. Also find the corresponding total project cost if the indirect costs are Rs. 1000/- per day.

b) Carry out stage by stage compression and find

i) The optimal duration and the corresponding minimum cost.

ii) All crash solution.

c) Plot a graph of costs verses time.

Q2) a) Explain the work Breakdown structure for a hospital building. **[6]**

b) Explain the merits of precedence network compared to CPM network. **[4]**

c) Explain Taylor's ideas of scientific management. **[6]**

Q3) a) Explain LOB technique with suitable examples. **[6]**

b) Explain how monitoring of a construction project can be done. **[6]**

c) What are the advantages of using project management software in construction scheduling? **[4]**

Q4) a) How will you mobilize the site for the construction of a flyover over a busy area? **[8]**

b) What is the importance of training construction managers? **[4]**

c) What are the applications of MIS to construction? **[4]**

SECTION - II

Q5) Explain importance of conducting project feasibility studies. Explain with examples following feasibility types. **[4 + 7 + 7]**

a) Socio-politics-enviro feasibility.

b) Techno-economic-financial feasibility.

Q6) Highlight the various problems which occur on a major construction project if the expected co-ordination between civil-electrical and mechanical works do not exist. How is this problem solved? Elaborate. **[16]**

Q7) a) Discuss objectives of work study and explain the method of time and motion study **[3 + 5]**

b) Enlist and explain the various duties and role of a project manager with a practical example. **[8]**

Q8) Explain in brief :

a) PMC role post tender stage. **[4]**

b) Project life cycle costing approach. **[4]**

c) Konkan Railway Project - Failure or Success? **[4]**

d) EIA and EMP. **[4]**

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Total No. of Questions : 6]

SEAT No.:

P2003

[Total No. of Pages : 2

[4165]-35
M.E. (Civil) (Structures)
REINFORCED CONCRETE AND PRESTRESSED CONCRETE DESIGN
(2002 Course)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IS 456, IS 1343, IS 3370 and non programmable calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data if necessary.***

SECTION - I

Q1) a) Design a grid slab for a floor of hall 13.5m × 15m c/c having square grid of 1.5m. Use M20 Fe500 take Live load = 4.5kN/m^2 and floor finish load = 0.75 kN/m^2. Apply the required check and draw reinforcement details. **[15]**

b) Design a slab for a hall of size 5m × 5mc/c fixed at all supports using yield line theory. Use M20 Fe500 take Live load = 4kN/m^2 and floor finish load = 0.75kN/m^2. Draw reinforcement details. **[10]**

Q2) Design a bell type RCC shear wall for length 4m, thickness 230mm for the following Axial forces of 1800kN and 200kN due to dead and live load and due to seismic load respectively bending moment of 500kNm and 4000kNm due to dead and live load and due to seismic load respectively use M20 Fe415, draw reinforcement details. **[25]**

Q3) Design a Intze type ESR for 4 lakh liters with staging height 15m using M25, Fe500 design must include analysis and design calculations of top dome, top ring beam, cylindrical wall, Middle level ring beam, Conical and bottom dome of the tank draw the reinf. details. **[25]**

P.T.O.

SECTION - II

Q4) Design intermediate post tensioned prestressed concrete Tee or 'I' section roof beam of theatre for flexure and shear for the following :

Clear span = 15m, width of support = 430mm, spacing of beams 3.2m c/c, RCC slab thickness 120mm, live load on slab 2.0kN/m^2, water proofing load on slab = 1kN/m^2, concrete grade M45 and multi-strand cables with fy = 1900N/mm^2 or Freryssinet cables 12/5 or 12/7 with appropriate yield stress. Do not consider the composite action.

Design must include detail load, bending moment calculation, check fiber stresses in concrete and deflection. Draw sketches showing cable profiles. **[25]**

Q5) a) The cross section a composite beam of a T section having a pre-tensioned rib cast in situ RCC slab (flange). The rib is 200mm wide and 400mm depth with M45 and is prestressed with one No. of 12/7 with ultimate tensile stress of 1500N/mm^2. The flange 1200mm wide and 110mm thick with M20. Calculate the moment of resistance of the composite section assuming that there is sufficient vertical reinforcement at the junction. **[15]**

b) Explain in detail with proper sketches, merits and demerits of continuous prestressed concrete beam over simply supported beams. **[10]**

Q6) a) Design post tensioned prestressed concrete slab for a commercial floor for the following. Isolated clear spans of 8 × 8m width of supporting beam on all sides 450mm, live load on slab 5kN/m^2, floor finish load on slab = 1.2kN/m^2, concrete grade M40 HT steel is cables are S3 of cross sectional area 300mm^2 with fy = 1950N/mm^2.

Design must include check fiber stresses in concrete and deflection design of end block. Draw sketches showing cable profiles. **[18]**

b) Explain in detail with proper sketches, process of manufacturing prestressed poles. **[7]**

Total No. of Questions : 6]

SEAT No. :

P2004

[Total No. of Pages : 2

[4165] - 36
M.E. (Civil) (Structures)
ADVANCED DESIGN OF STEEL STRUCTURES
(2002 Course)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any two questions from each Section.***
2) ***Answers to two sections should be written in separate answer books.***
3) ***Use of IS. 800,875,1915,1761 is allowed.***
4) ***Use of non programmable calculator is allowed.***

SECTION - I

Q1) For a single broad gauge track a through type plate girder is provided. Spacing of cross girders is 2.5 c/c. Span of girder between bearings is 25m. The EUDLL for bending moment is 2500kN per track & for shear is 2000kN. Main girders are 5m c/c. Stringer beams are at 2m spacing. Concrete sleepers are spaced at 1m c/c. Stock rail load is 0.6 kN/M, check rail load 0.4 kN/M, Impact factor is 0.48. Draw schematic arrangement for this track. Design the section required for plate girder. **[25]**

Q2) a) Explain various lateral load resisting systems for framed structure. Illustrate with suitable sketches & state its suitability. **[5]**

b) Explain concept of shear wall. **[5]**

c) Explain behaviour of moment resisting frame & shear wall for structural stability. **[5]**

d) Design moment resisting connection of beam and column junction for a beam ISMB 300 & ISSC 350 column to carry moment of 125 kNM & shear of 100 kN. **[10]**

Q3) a) Explain the concept of stiffened, unstiffened element of light gauge section. State merits & demerits of stiffening. **[6]**

b) Explain behaviour of light gauge strip when subjected to axial compression. **[7]**

c) Explain merits & demerits of light gauge sections with rolled sections. **[6]**

d) What are available light gauge sections as structural components. **[6]**

P.T.O

SECTION - II

Q4) Design the central top chord member, bottom chord member & inclined member at mid span of N type truss bridge with 10 panels of 3m each. Depth of truss is 3.0m. The live load of truss is 30 kN/M. Impact factor is 0.45. **[25]**

Q5) a) State advantages & disadvantages using tubular structural sections over other sections. **[8]**

b) Write the classification of structural tubes. **[8]**

c) Explain with reference to I.S. code the design steps for tubular structural member. Used for Scaffolding structure. **[9]**

Q6) Analyse the frame ABCD for collapse load AB = 4M = CD, Beam BC = 3.5M, Moment of resistance of AB = CD = Mp while for BC = 1.5 Mp. Span AB is loaded with lateral load 40 kN at mid span. Beam BC is loaded with 10 kN at 1/3 rd of span BC from C. **[25]**

Total No. of Questions : 6]

SEAT No.:

P2005

[Total No. of Pages : 3

[4165]-38
M.E. (Civil) (Structures)
BRIDGE ENGINEERING
(2002 Course) (Elective - I(a))

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of IRC codes, IS 1343, IS 456-2000 and non programmable calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Assume any other data if necessary.***

SECTION - I

Q1) a) Write detail note box girder bridge. **[8]**

b) Write short note on Forces on Abutments. **[8]**

c) What are the factors affecting the span of bridge. **[9]**

Q2) Design intermediate post tensioned prestressed concrete Tee Beam Bridge girder for the following : **[25]**

Effective span = 15m, width of carriageway = 7.5m, No. of beams 3, equally spaced along the carriageway width, Spacing of cross girders = 3.75m c/c, No footpath on either side loading class = IRC class AA, kerb size = 150 × 600mm, concrete grade M45 Design should include detail load, bending moment calculation, check fiber stresses in concrete Draw sketches showing cable profiles.

Q3) a) Compare simply supported PSC girder with balanced cantilever PSC girder. **[5]**

b) Design the culvert with the data : **[20]**

Clear span of the culvert = 5m

Clear carriage way width = 7.5m

Size of kerb = 300mm × 600mm

P.T.O.

Average thickness of wearing coat 100mm

Use material M25, Fe500

Loading class A

Draw the cross section showing details of reinforcement at mid-span and at junction of the slab are kerb.

SECTION - II

Q4) a) Describe different factor affecting the type of bridge foundations. **[8]**

b) List the different forces to be considered for design of bridge abutment desing, explain importance of each. **[8]**

c) Explain with sketches, how tilting of sinking well foundation is corrected. **[9]**

Q5) a) List merits and demerits pile type well type foundation used for bridge. **[5]**

b) Design wall type RCC pier for the following : **[20]**

Top width of pier = 1m with semicircular ends

Length of pier = 7m excluding the semicircular part

Height of above footing = 10m

HFL above the top of footing = 8m

Total DL Reaction = 2000kN

Total LL Reaction = 1100kN

Tractive force = 130kN

C/C distance of bearing on either side of centre line of pier = 1m

BM in traffic direction due to unequal DL & LL = 600kN-m

Material of pier and footing = M40 & Fe500

Safe bearing capacity = 200kN/m^2

Velocity of water current = 4m/s consider the cross current also Design the RCC footing and reinforcement in pier, check the stresses at the bottom of pier.

Q6) a) Write a short note on metallic bearing, draw sketches. Explain its merits and demerits. **[5]**

b) Design a reinforced elastomeric bearing at a pinned end of a plate girder of a bridge with following data. **[20]**

Maximum vertical load = 900 kN
Dynamic vertical load = 80 kN
Transverse lateral load = 40 kN
Longitudinal load = 60kN
Longitudinal total translation 12mm
Rotation at support 0.003°
Shear modulus of elastomeric bearing = 1.2N/mm^2
Allowable comp. stress for concrete = 8N/mm^2
Allowable comp. stress for elastomer = 10N/mm^2

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Total No. of Questions : 6]

SEAT No.:

P2006

[Total No. of Pages : 2

[4165]-40
M.E. (Civil) (Structures)
NONLINEAR ANALYSIS OF STRUCTURES
(2002 Course) (Elective - I(c))

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section, use separate answer sheet for each section.***
2) ***Use of stability coefficient table is permitted.***

SECTION - I

Q1) a) Explain linearity and nonlinearity of structure. State and explain types of Nonlinearity. **[7]**

b) From first principles derive moment curvature relationship for beam with nonlinear behaviour. **[8]**

c) State steps of approximate solution for nonlinear analysis of beam. **[10]**

Q2) a) Illustrate use of stress function approach in nonlinear analysis. **[8]**

b) Write strain energies due to stretching and bending for plate. Derive necessary governing equation. **[8]**

c) Obtain load deflection relation for nonlinear analysis of orthotropic rectangular plate. **[9]**

Q3) a) Explain nonlinear behaviour of plate in flexure. **[8]**

b) Analyse cantilever beam with point load at free end for non linear behaviour. **[9]**

c) What are methods to solve nonlinear equations in structural analysis. Explain any one method in detail. **[8]**

SECTION - II

Q4) a) Derive nonlinear stiffness matrix for plane frame member using usual notations. **[12]**

b) Plane frame ABCD with columns AB = CD = 4m and beam BC = 4m, EI is constant for all members. BC has point load 'W' at midspan. Derive the stiffness matrix. **[13]**

P.T.O.

Q5) a) Write steps in elastic plastic analysis of plane frame member. **[8]**

b) Explain Nonlinear behaviour of thin plate using stress - strain relations. **[8]**

c) Analyse propped cantilever 3m. long for elasto-plastic behaviour. It supports point load of 10kN at 1m from propped end. Take E = 200GPa and beam has 100 × 100mm section. **[9]**

Q6) Develop stiffness matrix for nonlinear analysis of plane frame. EI is constant for both members. Refer figure.6 **[25]**

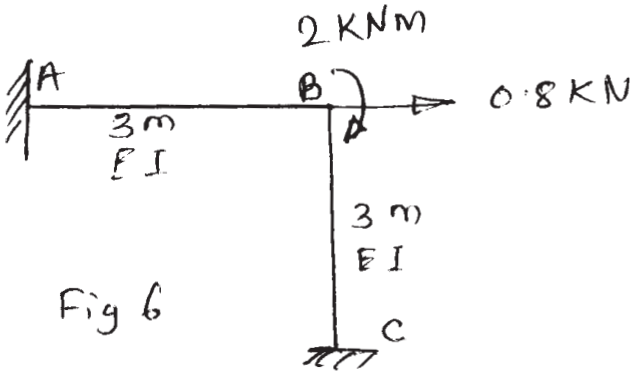

Fig 6

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Total No. of Questions : 8]

SEAT No. :

P2007

[Total No. of Pages : 2

[4165]-48

M.E. (Mechanical) (Common to Heat Power & Design Engg.)

INSTRUMENTATION & AUTOMATIC CONTROL

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section - I and 3 question from Section - II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

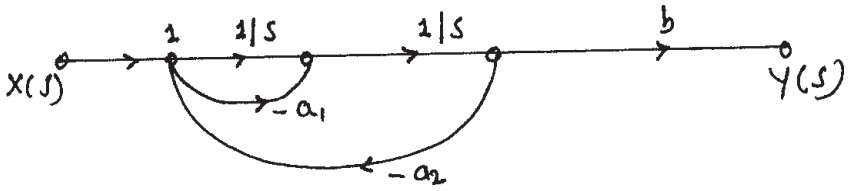
SECTION - I

Q1) a) Explain transfer function & advantages. **[8]**

b) Discuss different sources of error in measurement. **[8]**

Q2) a) Discuss with the help of block diagram of generalised measurement system. **[10]**

b) Obtain overall T.F. of system shown in fig.1. **[8]**



Q3) a) Explain the architecture of PLC system. **[8]**

b) Draw a ladder diagram for batch water heating system. The control system has two push buttons. The start push button is NO type and NC contacts are provided for sensing high level & low level of water. **[8]**

Q4) a) Discuss a control system used for an air compressor control system with minor feedback loop. **[6]**

b) Explain pneumatic P + Z + D controller. **[10]**

P.T.O.

SECTION - II

Q5) a) Explain the construction & working of electromagnetic flow meter. **[8]**

b) Compare ramp response of first and second order system. **[8]**

Q6) a) Explain the working of MC leod gauge for measuring low pressure. **[8]**

b) Explain the installation of strain gauges. **[8]**

Q7) a) Explain step response of first order system. **[8]**

b) Explain the differences between thermistor & thermocouples. **[8]**

Q8) Write short notes on any THREE : **[18]**

a) A/D Convertor.

b) Feed forward control system.

c) Hot wine anemometer.

d) Static characteristics of instrument.

Total No. of Questions : 8]

SEAT No. :

P2008

[Total No. of Pages : 2

[4165] - 49

M.E. (Mechanical) (Heat Power Engg.)

THERMAL AND MECHANICAL DESIGN OF HEAT EXCHANGERS

(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any THREE questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary and mention it clearly.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, non programmable electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Show that for counterflow heat exchanger when, **[8]**

$\frac{C_{min}}{C_{max}}=1$, effectiveness is given by $\varepsilon=\frac{NTU}{1+NTU}$ with standard notation.

b) Write a short note on: Gasketed plate heat exchanger. **[8]**

Q2) a) Discuss the various types of heat exchangers used in thermal power plants. **[8]**

b) Explain the heat exchanger design methodology with flowchart. **[8]**

Q3) A fluid of specific heat 3.6 kJ/kgK flowing at a rate of 30000 kg/h enters the parallel flow heat exchanger at 100ºC. The cooling water at the rate of 50000 kg/h is circulated for cooling purpose with inlet temperature of 30ºC. The effective heat exchanger area is $10m^2$ and overall heat transfer coefficient is 1150 W/m^2K. Find **[16]**

a) Outlet temperature of water and hot fluid.

b) Effectiveness of heat exchanger.

c) If the flow quantities and temperature drop for water and hot fluid are maintained with a counter flow heat exchanger, then find the area required for the counter flow.

The maximum temperature drop possible in the hot fluid with parallel flow arrangement.

P.T.O

Q4) Write short notes on (any three): **[18]**

a) Regenerators.

b) Rating and sizing of heat exchangers.

c) Causes and effects of fouling.

d) Temperature approach, meet and cross.

SECTION - II

Q5) a) What are the various correction (j) factors considered for shell side heat transfer coefficient in Bell Delaware method? **[8]**

b) Explain Kern method for shell and tube heat exchanger design. **[8]**

Q6) a) Enlist and explain the standards used in heat exchanger design. **[6]**

b) A double pipe heat exchanger is used to condense steam at a rate of 0.03 kg/s at 50ºC. Cooling water enters through the tubes at a rate of 0.9 kg/s at 10ºC. The specific enthalpy of phase change h_{fg} of water is 2382.7 kJ/kg and the specific heat of water is 4.18 kJ/kg K. The tube (M.S. with k = 45W/mK) OD and ID are 25.4 mm and 22.1 mm respectively. The heat transfer coefficient on the steam side is 10000 W/m^2 K and that of on the cooling water side is 8000 W/m^2 K. Inside and outside fouling resistances are 0.176 and 0.088 m^2 K/kW, respectively.

Determine the outside surface area and length required for the plain tube for clean and fouled heat exchangers. **[10]**

Q7) a) Discuss the various techniques to enhance inner and outer surface heat transfer coefficient in heat exchanger. **[8]**

b) With suitable example, explain use of CFD in heat exchanger design. **[8]**

Q8) Write short notes on (any three): **[18]**

a) Heat exchangers in electronic cooling applications.

b) Heat pipe heat exchanger.

c) TEMA standards.

d) Rod baffle heat exchangers.

Total No. of Questions : 8]

SEAT No. :

P2009

[Total No. of Pages : 2

[4165] - 51

M.E. (Mechanical - Heat Power Engg.)

ENERGY CONSERVATION AND MANAGEMENT

(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each Section.***
2) ***Answer of two sections should be written in separate answer books. .***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator log tables and electronic calculator is allowed.***

SECTION - I

Q1) a) Explain the Energy scenario in India. **[8]**

b) What are the various steps in implementation of the energy management in an organization? **[8]**

Q2) a) Explain the energy management program for industrial applications. **[8]**

b) What are the benefits of benchmarking the energy consumption in industry? **[8]**

Q3) a) With the help of example explain payback period and life cycle costing. **[8]**

b) Write in short the steps involved in energy audit of refrigeration system in industrial application. **[8]**

Q4) Write a short note on (any three): **[18]**

a) Energy conservation act 2003.

b) Energy audit of Boiler.

c) Sources of World Energy.

d) Effects of energy audit.

P.T.O

SECTION - II

Q5) Explain any three of the following: **[18]**

a) Energy efficient windows.

b) Importance of performance monitoring in energy economics.

c) Automatic power factor controller.

d) Energy economics of power plant.

Q6) a) Write notes on (any two): **[8]**

i) Lighting levels in various applications.

ii) Power factor correction.

iii) Energy efficient motors.

b) Two lamps are to be compared:

i) Cost of first lamp is Rs. 1 and it takes 100 Watts.

ii) Cost of second lamp is Rs. 4 and it takes 60 Watts.

Both the lamps are of same candlepower and each has the useful life of 100hr. Which lamp will prove economical if the energy is charged at Rs. 70 per kW of maximum demand per year plus Rs. 0.05 per kWh? **[8]**

Q7) a) Explain the waste heat recovery systems used in boiler and explain how efficiency of the plant increases. **[8]**

b) Explain the energy conservation opportunities in refrigeration systems. **[8]**

Q8) a) Explain in detail cogeneration systems in sugar industry. **[8]**

b) List the advantages and limitations of cogeneration in gas turbine power plant and diesel generating sets. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2013

[Total No. of Pages : 2

[4165] - 57

M.E. (Mechanical) (Heat Power Engg.)

I.C. ENGINES - II

(Compression Ignition Engines)

(2002 Course) (Elective - II(a))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare Diesel and Dual cycles on basis of Compression ratio, Maximum Pressure, Heat supplied, heat rejected and Network. **[8]**

b) In an engine working on Dual Cycle, the temperature and pressure at the beginning of the cycle are 90ºC and 1 bar respectively. The compression ratio is 9. The maximum pressure is limited to 68 bar and total heat supplied per kg of air is 1750 kJ. Determine: **[10]**

i) Pressure and Temperature at all salient points.

ii) Air standard Efficiency.

iii) Mean effective pressure.

Q2) a) Explain the stages of Combustion in CI engines and factors affecting it.**[8]**

b) A single cylinder, four stroke diesel engine having bore 18 cm and stroke 36 cm yielding the following results; speed 285 rpm, brake torque, 393 Nm; indicated mep 7.2 bar; fuel consumption 3.5 kg/hr; cooling water flow: 4.5 kg/min; cooling water temperature rise 36ºC; air-fuel ratio by mass, 25; exhaust gas temperature, 415ºC; barometric pressure, 1.013 bar; room temperature 21ºC. The fuel has a calorific value of 45200 kJ/kg and contains 15% by mass of hydrogen. Determine: **[8]**

i) The indicated thermal efficiency.

ii) The volumetric efficiency based on atmospheric conditions.

P.T.O.

Draw up a heat balance sheet in terms of in terms of kJ/min and % basis. Take R = 0.287 kJ/kg K, C_v for dry exhaust gases = 1.005 kJ/kg K and for supersaturated steam C_p = 2.05 kJ/kg K.

Q3) a) Explain clearly the reasons for looking for alternate fuels for CI engines. **[8]**

b) Discuss Biodiesel as an option for Energy Security in India. **[8]**

Q4) a) Explain spray formation and droplet size distribution with the help of a neat sketch. How does one reduce the mean droplet size? **[8]**

b) Draw a schematic diagram of a Bosch type fuel pump and explain its construction and working. **[8]**

SECTION - II

Q5) a) Explain the construction and working of a turbocharger with a neat sketch. **[8]**

b) The air flow to a four cylinder oil engine is measured by means of a 5 cm diameter orifice, having a coefficient of discharge of 0.6. During a test on the engine the following data were recorded:
Bore, 10.5 cm; stroke 12.5 cm; engine speed, 1200 rpm; brake torque, 147 Nm; fuel consumption, 5.5 kg/hr; calorific value of fuel 43100 kJ/hr; head across orifice, 5.7 cm of water; ambient temperature and pressure, 20ºC and 1.013 bar respectively. Calculate: **[10]**

i) The thermal efficiency on B.P. basis.
ii) The brake mean effective pressure.
iii) The volumetric efficiency based on free air condition.

Q6) a) Make the thermodynamic analysis of a Turbocharged CI engine cycle. **[8]**

b) What do we mean by supercharging? Differentiate supercharged and non-supercharged engines. **[8]**

Q7) a) Explain different methods of diesel particulate filter regeneration. **[8]**

b) Explain Exhaust Gas Recirculation. **[8]**

Q8) Write short notes on (any three): **[16]**

a) Heat Release Programme
b) Trade-off between PM and NO_x emissions
c) CI engine rating
d) Solid fuels for IC engines

Total No. of Questions : 8]

SEAT No. :

P2014

[Total No. of Pages : 3

[4165] - 59

M.E. (Mechanical) (Heat Power Engg.)

ADVANCED AIR CONDITIONING, HEATING AND VENTILATION

(2002 Course) (Elective - II(c))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary and mention it clearly.***

SECTION - I

Q1) a) Air at 10ºC DBT and 8ºC WBT is supplied at the rate of 15 m^3/ min. It is brought to 20ºC DBT and 60% RH by heating and then by adiabatic humidification. **[8]**

Find

i) Capacity of heating coil in kW

ii) Surface temperature of coil, if bypass factor is 0.3

iii) Capacity of humidifier

b) Define and explain the term 'Bypass Factor'. State advantages and disadvantages of low Bypass Factor. **[8]**

Q2) a) Explain the working of Air washer. Draw the various processes on pshychrometric chart that can be achieved in air washer. **[10]**

b) Explain thermal exchange of the body with thermal environment. **[6]**

Q3) An office having a capacity of 30 occupants has the data related to air conditioning as follows: **[16]**

Room design	-	24 ºC, 50% RH
Outside conditions	-	35 ºC DBT, 24 ºC WBT
Solar load	-	10 kW
Sensible and latent heat gain per occupants W(respectively)	-	92W & 108
Sensible load from other sources	-	13.8 kW
Lighting load	-	3kW
Infiltration load	-	15.5 m^3/min

P.T.O.

Assuming 65% recirculated air mixing before the cooling coil with bypass factor 0.2, determine

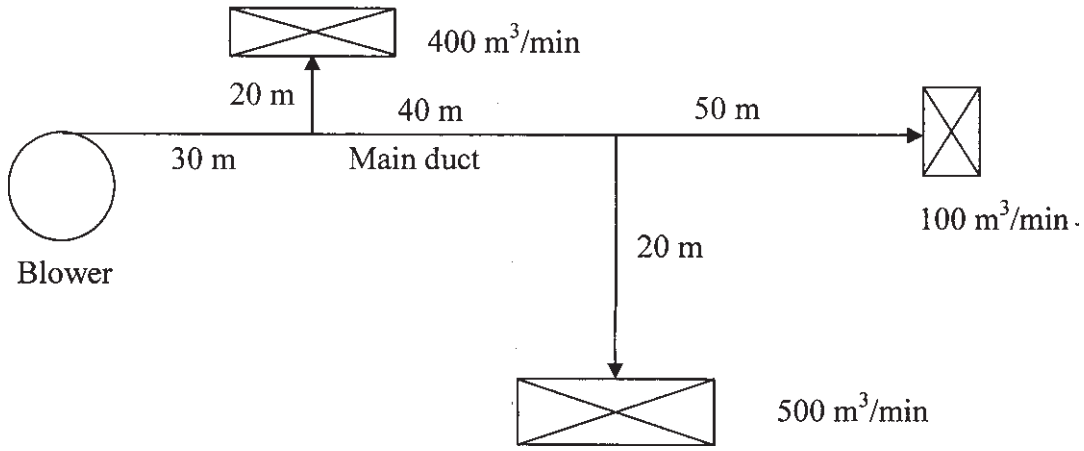
a) Supply air conditions.
b) Coil ADP
c) Capacity of cooling coil in TR
d) Supply air conditions
e) Quantity of dehumidified air

Q4) Write short notes on (any three): **[18]**

a) Significance of ESHF.
b) Methods of dehumidification.
c) Fuzzy logic control in current window air conditioner.
d) Comfort Chart.

SECTION - II

Q5) Following data refers to an Air Distribution system for an industrial complex as shown on fig. The velocity in the main duct should not exceed 6.5 m/s. Assume equal pressure drop in main line and balanced pressure drop in branch line and take the depth of duct = 2000 mm throughout. Determine the duct dimensions, total pressure drop and power for the blower if the overall efficiency is 0.70. **[16]**



Q6) a) Explain all air system with neat schematic. Compare all air and all water stating its advantages and disadvantages. **[8]**

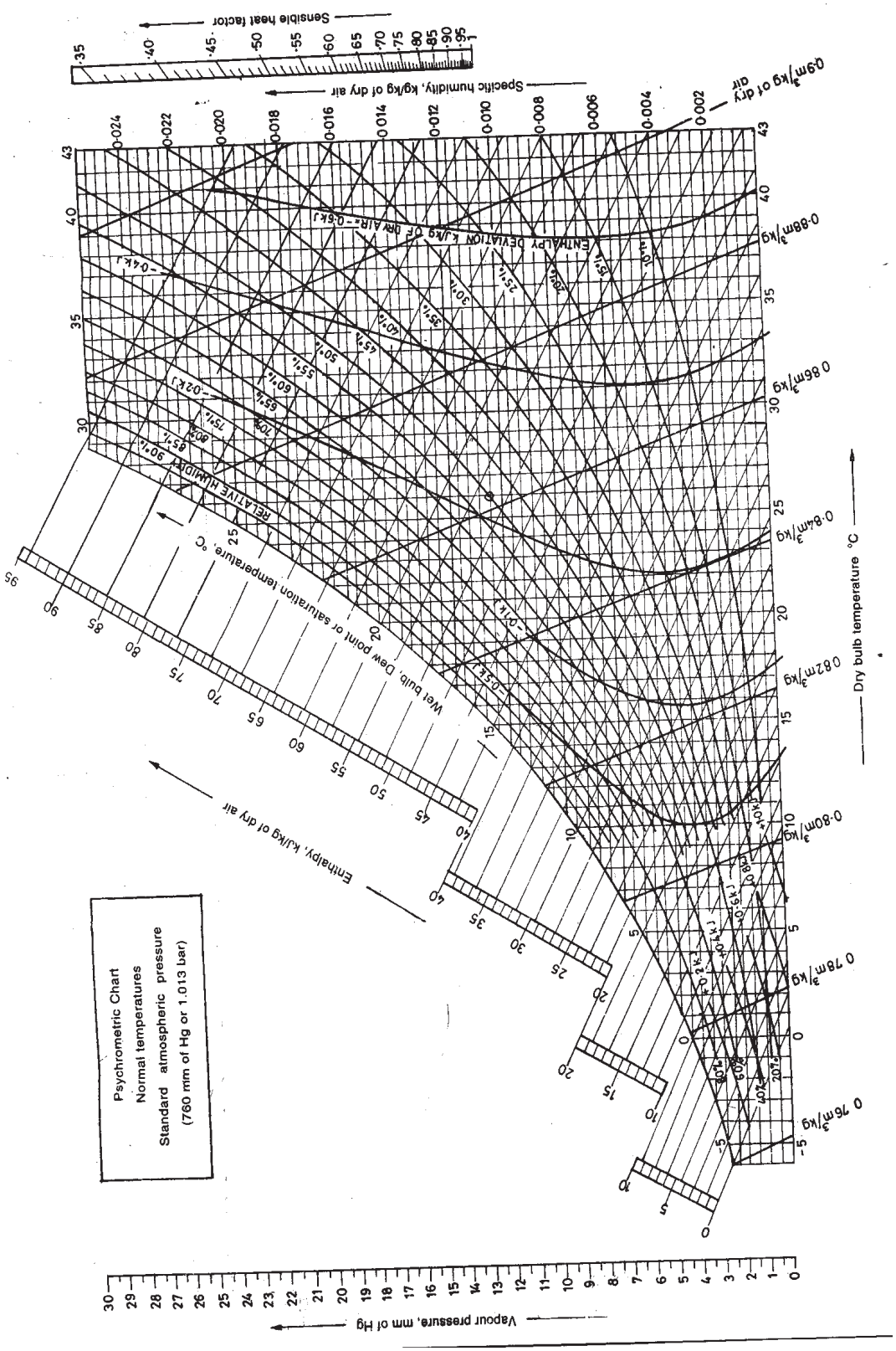
b) Discuss the applications of heat pump system. **[8]**

Q7) a) What are the different air filters are used in Air conditioning? Explain the construction and working of HEPA filter. **[8]**

b) What do you mean by infiltration and ventilation air. Discuss the ventilation rates for different applications. **[8]**

Q8) Write short notes on (any three): **[18]**

a) Air conditioning for hospitals
b) VAV methods
c) Thermostat
d) Evaporative cooling



Total No. of Questions : 8]

SEAT No. :

P2015

[Total No. of Pages : 2

[4165] - 72

M.E. (Mechanical) (Design Engineering)

COMPUTER AIDED DESIGN

(2002 Course) (Elective - II(b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any Three questions from each section.***
2) ***Answers to the two Sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Show that **[8]**

i) Scaling and 2D rotation about Z axis are commutative.

ii) Translation is commutative.

iii) Mirror and 2D rotation about Z axis are not commutative.

b) A rectangle PQRS with vertices P (0, 0), Q(4, 0), R(4, 4) and S(0, 4) is to be rotated by 30º CCW about point A(2, 2). Determine: **[8]**

i) The composite transformation matrix; and

ii) The coordinates of the vertices for a reflected triangle.

Q2) a) Derive a concatenated transformation matrix for reflection about arbitrary point. **[5]**

b) Given the two lines are L1 and L2. The end points for line L1 are P1(3, 4, 7) and P2 (5, 6, 1). The end points for line L2 are P3(1, 5, –2) and P4(2, 9, 0). **[6]**

i) Find the equations of the lines. Show the parametrization directions.

ii) Are the two lines parallel or perpendicular?

c) Compare the various testing methods of IGES processors. Which test is the most comprehensive? Why? **[5]**

Q3) a) What are the different pitfalls in the simulation? How they can be avoided? **[5]**

b) Derive transformation matrix for Isometric Projection and perspective projection. **[5]**

c) Briefly describe various Solid manipulations. **[6]**

P.T.O.

Q4) a) Plot the Bezier curve having end points P0(1, 3) and P3(7, 2). The other control points are P1(5, 6) and P2(6, 0). Plot for values of u = 0, .2, .4, .6, .8 and 1, if the characteristic polygon is drawn in the sequence P0 - P1 - P2 - P3. **[8]**

b) Short Notes on **[10]**

i) Coons Surfaces

ii) Engineering Animation

SECTION - II

Q5) a) Derive stiffness matrix for 1-D element using "Potential-Energy Approach". **[8]**

b) What do you understand by parametric representation of curve? Discuss the advantages of parametric representation. **[8]**

Q6) a) Briefly explain the non structural areas of engineering where the finite element method is used. **[6]**

b) Derive a relation to determine the Jacobian function for CST element. **[6]**

c) Discuss as when the simulation is appropriate tool. **[4]**

Q7) a) Explain the important CAD modeling techniques. What is Hybrid approach? **[8]**

b) What are types of boundary conditions and how they are treated in finite element method? **[8]**

Q8) a) Discuss the requirement of product data exchange between dissimilar CAD/CAM systems. **[6]**

b) Explain C^0, C^1 and C^2 parametric continuity. **[6]**

c) Explain B-spline surface, its properties and parametric representation. **[6]**

Total No. of Questions : 8]

SEAT No. :

P2016

[Total No. of Pages : 2

[4165]-120
M.E. (E & TC) (Microwave)
STATISTICAL SIGNAL ANALYSIS AND STOCHASTIC PROCESSES
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the classification of discrete time systems with an example each. **[10]**

b) With the help of suitable expressions, explain correlation. Also state its significance. **[8]**

Q2) a) Write an algorithm for decimation in time FFT. **[8]**

b) Explain how the signal can be detected in the presence of noise. **[8]**

Q3) a) Discuss correlation receiver with the help of a neat block diagram. **[8]**

b) Explain the concepts and criteria for waveform estimation. **[8]**

Q4) a) Describe matched filter receiver with the help of a neat block diagram. **[8]**

b) Write a note on maximum likelihood estimation. **[8]**

SECTION - II

Q5) a) Explain linear mean square estimation technique. **[8]**

b) Write a note on Weiner filter for waveform estimation. **[10]**

Q6) a) Explain Kalman filter. **[8]**

b) Explain forward linear prediction. **[8]**

P.T.O.

Q7) a) What is the difference between spectrum and cepstrum? **[6]**

b) Explain RADAR signal processing with the help of a neat block diagram. **[10]**

Q8) a) Discuss AR Lattice structure. **[8]**

b) Consider the ARMA process generated by the difference equation **[8]**

$x(n) = 1.6\ x(n\text{-}1) - 0.63\ x(n\text{-}2) + w(n) + 0.9\ w(n\text{-}1)$

Determine :

i) System function of the whitening filter and its poles and zeros.

ii) Power density spectrum of $\{x(n)\}$.

Total No. of Questions : 6]

SEAT No. :

P2017

[Total No. of Pages : 2

[4165]-125
M.E. (E & TC) (Microwave)
ANTENNA & RADIATING SYSTEMS
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 2 questions from each section.***
2) ***Answer 2 questions from Section - I and 2 questions from Section - II.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write short note on : **[12]**

i) Field regions.
ii) Radiation resistance.
iii) Antenna beam efficiency.
iv) Friis transmission formula.

b) Calculate directivity $D(\theta,\phi)$ for the three unidirectional sources with power pattern as follows $U(\theta,\phi)=U_0 \sin\theta \sin^2\phi$, where $U(\theta,\phi)$ lies between $0 \le \theta \le \pi$ and $0 \le \phi \le \pi$ and U_0 = maximum radiation intensity. **[13]**

Q2) a) A magnetic field strength of 5 μA/m is required at a point on $\theta = \pi/2$ and 2km away from an antenna in free space. Neglecting ohmic loss, how much power must the antenna transmit if it is a **[15]**

i) Hertzian dipole of length $\lambda/25$?
ii) Half wave dipole?
iii) Quarter wave monopole?

b) Derive the expression for the radiation resistance and directivity of Loop antenna. **[10]**

Q3) a) Derive the condition for broad-side, end fire radiation and directivity of N element isotropic linear uniform array. **[8]**

P.T.O.

b) Explain construction and working of Helix antenna. Calculate directivity of 60 turn helix with $\alpha = 12^{o}$ and circumference equal to one wavelength. **[12]**

c) Obtain Helmholtz's equation for vector potential & specify Lorentz condition. **[5]**

SECTION - II

Q4) a) An end fire array of identical antennas consists of 8 isotropic radiators separated by distance $\lambda/2$. Find radiation field in a plane containing the line of array showing direction of maxima and null. **[10]**

b) A microstrip antenna with overall dimensions of L = 0.906 cm, W = 1.186 cm, substrate height h = 0.1588 cm and dielectric constant $\varepsilon_r = 2.2$ is operating at 10 GHz. Find **[15]**

i) Input impedance.

ii) Position of the feed point where input impedance is $50\,\Omega$.

Q5) a) Determine length 'ρ' of horn antenna in H plane aperture & flare angles of θ_E and θ_H (in E and H plane respectively) of a pyramidal horn for which E-plane aperture is 10λ. The horn is fed with TE_{10} mode. Let $\delta = 0.2\lambda$ in E plane & 0.375λ in H plane. Calculate beam width and directivity. **[10]**

b) Explain log periodic antenna. **[5]**

c) Find the radiation efficiency of a single turn and 4 turns circular loop each of radius $\lambda/10\pi$ and operating at 10MHz. The radius of wire is $10^{-3}\lambda$ and the turns are spaced $3\times10^{-3}\lambda$ apart. Assume the wire is copper with conductivity of 5.7×10^{7} s/m and the antenna is radiating into free space. **[10]**

Q6) Write short note on any four : **[25]**

a) Microstrip patch antenna.

b) Horn antenna.

c) Anechoic chamber.

d) Pattern multiplication.

e) Whip antenna.

f) Antenna temperature.

Total No. of Questions : 8]

SEAT No. :

P2018

[Total No. of Pages : 2

[4165]-132
M.E. (E & TC) (VLSI & Embedded Systems)
SYSTEM DESIGN USING PLDs
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, whenever necessary.***

SECTION - I

Q1) a) What are the application areas of typical ASICs and PLDs? Give suitable example. **[8]**

b) With the help of block diagram, describe the function/s of each section of the typical CPLD architecture in detail. **[10]**

Q2) a) What are the different programming technologies used in FPGA? **[12]**

b) Describe features of the typical CPLD. **[4]**

Q3) Design a PLD based 'Data acquisition' system with following specifications. **[16]**

a) 8 bit ADC interface.

b) 4 × 4 keyboard interface.

c) LCD interface.

Specify the features of PLD required for this application.

Q4) a) Describe the role of I/O section in the CPLD. **[10]**

b) Describe the construction of the microcell within function block of the CPLD XC9500 XV. **[6]**

P.T.O.

SECTION - II

Q5) a) With the help of block diagram, describe the function/s of each section of the typical FPGA architecture in detail. **[10]**

b) What are the reasons for clock skew? How it can be minimized in the FPGA? **[8]**

Q6) a) Describe the architecture of CLB slice used in FPGA. **[6]**

b) Routing in FPGA is a complex design aspect. Explain why? How the care of routing is taken in typical FPGA architecture **[10]**

Q7) a) In case of volatile programming technology in FPGA, how programming is carried out in practical system? Describe a typical scheme. **[10]**

b) Describe the various output logic levels supported by Spartan series of FPGA. **[6]**

Q8) Describe in detail the typical design flow used for PLD based system implementation. **[16]**

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Total No. of Questions : 8]

SEAT No.:

P2019

[Total No. of Pages : 2

[4165]-135
M.E. (E & TC) (VLSI & Embedded Systems)
REAL TIME OPERATING SYSTEMS
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to right indicate full marks.***
5) ***Assume suitable data whenever necessary.***

SECTION - I

Q1) a) Describe various software architecture used in practice with their merits and demerits. **[12]**

b) What features of RTOS makes it suitable for Embedded System? **[6]**

Q2) a) What are the reasons for dead lock situations in RTOS? Describe with suitable example. **[10]**

b) Why it is necessary to have dynamic priority allocation in RTOS? Justify the answer with suitable example. **[6]**

Q3) a) Describe the various inter task communication mechanisms used in RTOS. **[10]**

b) Describe the various delay generation mechanisms used in RTOS? **[6]**

Q4) Write short notes on : **[16]**

a) Shared data problem in RTOS.

b) Interrupt management in RTOS.

c) Reentrant functions.

d) Priority inversion and inheritance.

P.T.O.

SECTION - II

Q5) a) Describe task state diagram related to the functionality of μCOS-II. **[8]**

b) Describe the features of Linux Kernel. **[8]**

Q6) a) Describe rate monotonic scheduling algorithm. **[8]**

b) Describe the procedure and essential aspects for writing code using μCOS-II. **[8]**

Q7) a) Describe the usefulness of Integrated Development Environment (IDE) tool in the design and development of the Embedded System. **[8]**

b) Describe the features of μCOS-II. **[8]**

Q8) Write short notes on : **[18]**

a) Inter task communication services supported by μCOS-II.

b) File handling in LINUX.

c) Porting of μCOS-II.

Total No. of Questions : 8]

SEAT No. :

P2020

[Total No. of Pages : 2

[4165] - 161

M.E. (Electronics) (Computer)

HIGH PERFORMANCE COMPUTER NETWORKS

(2002 Course) (Elective - I(b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss various approaches used for network design. **[6]**

b) Draw a block diagram showing structural view of the network design tools and explain. **[10]**

Q2) a) Discuss the importance of Node Placement, Link Topology and Routing. **[10]**

b) Explain various Switching Modes that are used in Computer Network. **[6]**

Q3) a) Discuss protocol (s) used for the transport of voice media over IP networks. **[8]**

b) Write a note on IP quality of service for voice. **[8]**

Q4) Write Short Notes on (Any Three): **[18]**

a) VOIP Applications

b) CDMA

c) Distributed Data Networks

d) SCSI Protocols and architectures

P.T.O.

SECTION - II

Q5) a) What is a firewall? Discuss its design Principles. **[4]**

b) Consider the following character string, and assume that the relative probabilities of the symbols are reflected in this string **[12]**

aa bbb cccc ddddd eeeeee fffffff gggggggg

Show the code for this string for the following:

i) Huffman ii) LZW

iii) Arithmetic

Q6) a) Discuss Web security and Network Management Security. **[8]**

b) What are Digital Signatures? Explain Key management. **[8]**

Q7) a) What do you meant by Passive and Active attacks? **[8]**

b) Draw a neat diagram showing model for network security and explain. **[8]**

Q8) Write Short Notes on (any three): **[18]**

a) Run-Length Encoding

b) Cryptography

c) Fiber channel attached storage

d) Support Data for design of a network

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Total No. of Questions : 6]

SEAT No. :

P2021

[Total No. of Pages : 2

[4165]-164

M.E. (Electrical Power Systems)

MICROCONTROLLER AND APPLICATION IN POWER SYSTEM

(Common to Control Systems)

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from Section - I and Section - II.***
2) ***Draw neat and labelled diagram.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Draw and explain the architecture and pin diagram of 8051 microcontroller. **[15]**

b) List various addressing modes of 8051 with one example. **[10]**

Q2) a) Explain internal RAM organization of 8051 microcontroller. Draw the internal RAM structure. **[10]**

b) Explain use of subroutines in 8051 programs. **[5]**

c) With proper block diagram, explain how timer/counter of 8051 microcontroller can be controlled through hardware and software. **[10]**

Q3) a) Explain various interrupts in 8051. Draw and discuss the format of IP and IE registers. **[15]**

b) Write an assembly language program to find the smallest number in an array. **[10]**

SECTION - II

Q4) a) Design an 8051 based system to receive the data from serial port through RS232 from PC. **[10]**

b) Draw the interfacing diagram for the following : **[15]**

i) Speed control of DC motor.

ii) Pressure measurement.

P.T.O.

Q5) a) Explain and draw the schematic block diagram for measurement of Flow using 8051 microcontroller. **[10]**

b) Explain and draw the schematic block diagram for stepper motor control. Write program to rotate stepper motor in clockwise direction. Mention the look-up table. **[15]**

Q6) a) Explain the features of MCS-96 family microcontroller. **[10]**

b) Explain the internal memory structure and the PWM output generation using 8096. **[10]**

c) Draw the functional block diagram of 8096. **[5]**

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Total No. of Questions : 6]

SEAT No. :

P2022

[Total No. of Pages : 2

[4165]-176
M.E. (Electrical) (Power System)
POWER SYSTEM PROTECTION
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare electromagnetic relays, static relays and digital relays. **[9]**

b) Explain directional over current relay. **[8]**

c) Explain under frequency relay. **[8]**

Q2) a) Explain modelling and standards of CT^s and PT^s. **[10]**

b) Explain working of CVT. **[8]**

c) Explain ratio and phase angle errors. **[7]**

Q3) a) Derive from fundamentals, the generalised expression for radius of circle and co-ordinates of the centre of a dual input amplitude comparator. **[13]**

b) Define reach of distance relay. Explain the effect of over reach of a relay. **[6]**

c) Explain PILOT relaying scheme. **[6]**

SECTION - II

Q4) a) Explain protective scheme of high speed alternators against unbalanced loading. Explain the role of negative sequence currents double frequency currents injected in rotor. **[16]**

b) Explain effect of power swing on protection of transmission line. **[9]**

P.T.O.

Q5) a) Explain Modern bus bar protection scheme. **[13]**

b) Explain digital protection of synchronous generator based on second harmonic current injection in rotor circuit. **[12]**

Q6) a) Explain Buchholtz relay. **[8]**

b) Explain over fluxing protection of transformer. **[8]**

c) Explain percentage differential protection scheme of transformer. **[9]**

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Total No. of Questions : 6]

SEAT No. :

P2023

[Total No. of Pages : 2

[4165] - 180

M.E. (Electrical) (Power System)

POWER SYSTEM OPERATION AND CONTROL

(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any Two questions from each Section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the optimal generation scheduling. State the effect of transmission losses on the optimal scheduling of power plants. Derive the exact coordination equation. Express transmission loss as a function of generator powers through B coefficients. Derive the solution for P_{Gi} explaining its iterative procedure. **[15]**

b) Explain economic dispatch by Gradient's method. **[10]**

Q2) a) What is unit commitment? Explain how Priority list method is used to solve the problem of unit commitment. **[13]**

b) Explain Dynamic programming method of unit commitment. **[12]**

Q3) Explain the following: **[25]**

a) Reliability considerations in unit commitment and Patton's security function.

b) Hydro thermal scheduling.

SECTION - II

Q4) a) From the complete block diagram of load frequency control of single area system, explain steady state analysis for **[13]**

P.T.O

i) $\Delta Pc = 0$.

ii) $\Delta P_D = 0$.

iii) $\Delta Pc = \Delta P_D$.

Draw steady state frequency characteristic with change in the load.

b) Explain in details two area load frequency control. **[12]**

Q5) a) What is real time control? Explain Supervisory Control and Data Acquisition (SCADA) system. Draw its block diagram. Explain the components of SCADA and various functions performed by it. **[13]**

b) Explain methods of data transmission and different modes of communication. **[6]**

c) Explain application of SCADA in context with any power system problem. **[6]**

Q6) a) Explain the various methods of control of reactive power in the power system. **[12]**

b) Explain energy control and types of energy interchanges or exchanges. **[13]**

Total No. of Questions : 6]

SEAT No. :

P2024

[Total No. of Pages : 2

[4165] - 183

M.E. (Electrical) (Power Systems)

SPECIAL TOPICS IN HIGH VOLTAGE ENGINEERING

(2002 Course) (Elective (a))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicates full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain different theories of breakdown of liquid dielectric material. **[15]**

b) Explain the breakdown phenomenon due to 'treeing & tracking' and 'partial discharge' in case of solid dielectric material. **[10]**

Q2) a) Explain with schematic diagram the generation of high A.C. voltage using cascade transformer. Also explain the advantages of cascade transformer. **[8]**

b) Explain the working of Vande Groff generator with diagram for generation of high d.c. voltage. **[8]**

c) Explain the Marx circuit for generation of impulse voltage. **[9]**

Q3) Write short note on any five out of following: **[25]**

a) Wave shaping circuit

b) Voltage doubler circuit

c) Impulse current generator

d) Sources of switching impulse voltage

e) Resonant transformer

f) Breakdown of gaseous dielectric materials.

P.T.O.

SECTION - II

Q4) a) Explain the necessity of following with reference to high voltage Laboratories: **[9]**

i) Fencing

ii) Earthing

iii) Shielding

b) Explain the necessity and functions of high voltage resistors, capacitors, sphere gaps and high voltage electrodes in case of high voltage laboratories. **[8]**

c) Explain the safety measures required for high voltage lab. **[8]**

Q5) a) Explain the concept of radio interference and describe the method to measure the radio interference. **[8]**

b) Explain with schematic diagram, the measurement of dielectric loss. **[8]**

c) Explain the measurement of comparative tracking index. **[9]**

Q6) a) Explain artificial pollution test on high voltage insulators. **[8]**

b) List and describe the technical equipments, specifications, dimensions of high voltage test lab. **[8]**

c) Explain different components of partial discharge test set up. **[9]**

Total No. of Questions : 10]

SEAT No. :

P2025

[Total No. of Pages : 3

[4165]-190
M.E. (Production)
HARD AND SOFT AUTOMATION
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are different layouts of Automated production line? **[8]**

b) In a seven station Geneva mechanism the driver rotates at 6 RPM. **[8]**

Determine :-

i) Cycle time of Indexing Mechanism.
ii) Process time.
iii) Time spend by each cycle in indexing the table to the next working position.

Q2) a) Define the following terms, related to problems on assembly line balancing: **[8]**

i) Precedence diagram.
ii) Precedence Matrix.
iii) Balance Delay.
iv) Smoothness Index.

b) A 10 station transfer line has an ideal time $T_C = 0.8$ min. The probability of stations breakdowns per cycle is equal for all stations and P = 0.005 breakdowns/sec. **[8]**

P.T.O.

The average down time per line is 0.6 min.
For each of upper bound and lower bound approaches determine :

i) Frequency of line stop cycle.
ii) Average actual production rate.

Q3) a) Explain the basic terminology for analysis of transfer line with no internal storage. **[8]**

b) Explain different types of AGVS used in automated industries. **[8]**

Q4) a) Explain normal principles of working of the guidance technologies commonly used in AGV. **[8]**

b) How sensors are classified? Explain proximity sensors used in robotics. **[8]**

Q5) Write Short Notes on (Any Three) : **[18]**

a) Motor type relay.

b) Butter stock simulation.

c) Routh Hurwitz criterion.

d) Difference between automation and soft automation.

e) Transfer Line Monitoring System (TLMS).

SECTION - II

Q6) a) For automatic reciprocating movement of table, draw sketch to show the feed mechanism using solenoid operated relay, direction control limit switches and the necessary means of controlling the motion. Reciprocating motion assumed to be consisting of slow feed motion and rapid return motion. **[8]**

b) Explain feedback control system in brief. **[8]**

Q7) a) With the help of neat sketches discuss different methods of obtaining low cost hard automation. **[8]**

b) Explain the principles of Heuristic Algorithm for introducing a new sophisticated machine in a traditional shop, already having a number of existing machines in fixed locations. **[8]**

Q8) a) Explain P.F.A. analysis used with Muther's classification. **[8]**

b) What is "line tracking"? Explain its advantages and disadvantages. **[8]**

Q9) a) Show at least two different "on line" inspection equipment for controlling the essential dimensions of the part. **[8]**

b) Explain Adaptive control system in brief. **[8]**

Q10) Write Short Notes on (Any three) : **[18]**

a) Cellular Manufacturing system.

b) Robotised inspection commonly available with vision system.

c) Levels of Automation & Control.

d) FMM, FMC and FMS.

e) Petri-Nets.

Total No. of Questions : 8]

SEAT No. :

P2026

[Total No. of Pages : 2

[4165] - 194
M.E. (Production)
CIM AND ADVANCED MANUFACTURING PROCESSES
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from each Section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat sketches wherever required.***

SECTION - I

Q1) a) What is a CAPP system? Explain Generative Process Planning Technique with suitable example by considering any engineering components. **[8]**

b) Explain CAT. How correlate it with CAM? **[8]**

Q2) a) Explain different types of flexibility. **[8]**

b) What is meant by CAE? Compare it with CIMS and list advantages of both of them. **[8]**

Q3) a) Discuss the main elements of CIMS and its evolution. **[8]**

b) Explain the role of PLC in designing of an automated system. **[8]**

Q4) Write short notes on any three: **[18]**

a) Combined CNC/DNC systems.

b) Selection of AGV system.

c) ERP.

d) Network topology in CIMS.

P.T.O

SECTION - II

Q5) a) Explain with neat sketch ECDM along with its process parameters. **[8]**

b) Explain building block concept for used in setting up aggregate machines. **[8]**

Q6) a) Explain the process of PLASMA machining. State the relationship between surface speed and MRR in PLASMA arc machining. **[8]**

b) What is micromachining? Explain any one method to achieve it. **[8]**

Q7) a) What is meant by Rapid tooling? Classify and explain rapid tooling. **[8]**

b) Explain solid base curing process of rapid prototyping along with Advantages, limitation. **[8]**

Q8) Write short notes on any three: **[18]**

a) High speed machining.

b) Steriolithography Rapid prototyping.

c) ECM process.

d) Lean manufacturing.

Total No. of Questions : 8]

SEAT No. :

P2027

[Total No. of Pages : 3

[4165]-195
M.E. (Production)
CAD-CAM-FMS
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find the inverse of the square matrix given below by Gauss Jordan Method. **[10]**

$$[K]=\begin{bmatrix} 12 & -6 & -6 & -1.5 \\ -6 & 4 & 3 & 0.5 \\ -6 & 3 & 6 & 1.5 \\ -1.5 & 0.5 & 1.5 & 1 \end{bmatrix}$$

b) What are different techniques for image generation on CRT? Why raster scanning is preferred to storage tube in display of graphic information?**[6]**

Q2) a) For the given system **[10]**

$$[K]=\begin{bmatrix} 5 & -4 & 1 & 0 & 0 \\ -4 & 6 & -4 & 1 & 0 \\ 1 & -4 & 6 & -4 & 1 \\ 0 & 1 & -4 & 6 & -4 \\ 0 & 0 & 1 & -4 & 5 \end{bmatrix} \quad [M]=\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ 0 & 0 & 3 & 0 & 0 \\ 0 & 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

Compute the first two natural frequencies by Sturm sequence and bisection technique.

b) What are the advantages and disadvantages of various interactive input/ output devices? **[6]**

P.T.O.

Q3) a) Describe commonly used elements in FEA analysis. **[6]**

b) Compute the response of the system given below by modal superposition technique **[5]**

$$\ddot{x}_1 + 2x_1 + 2x_2 = 10$$
$$2x_2 + \ddot{x}_2 + 5x_2 = 0$$

Where x_1 and x_2 are the responses of the system. Initial conditions are $x_i = 0$ and $\dot{x}_i = 0$ at $t = 0$.

c) How grid and snap settings are done in AutoCAD? **[5]**

Q4) a) Explain with help of program, the procedure for data transfer from PC to CNC machine using serial communication mode. **[10]**

b) What is error estimation in FEA? Describe the adaptive meshing technique in brief. **[8]**

SECTION - II

Q5) a) A machine shop processes seven parts on five machines. The machines on which the parts are processed and the sequence of operations is as shown below. Find the appropriate machine-part grouping by similarity Coefficient method. Also draw the block diagram of cellular layout. **[10]**

	P1	P2	P3	P4	P5	P6	P7
M1		1		1	1	1	
M2	1		1				
M3	2		2				1
M4		2		2		2	
M5	3						2

b) Compare the advantages and suitability of various methods of work piece transport in FMS. **[6]**

Q6) a) Describe the role of RS232C, DNC, LAN and MAP in integrating various components of FMS. **[8]**

b) What is machine vision system? Describe its function with suitable block diagram. **[8]**

Q7) a) An automated guided vehicle system has an average travel distance per delivery = 500 ft. And an average empty travel distance = 300 ft. The system must make a total 75 deliveries/hr. The load and unload times are

both 0.5 min and speed of vehicles is 150 ft/min. The traffic factor for system is 0.85. Determine : **[8]**

i) The average total time per delivery, the handling system efficiency and resulting average number of deliveries per hour for a vehicle.

ii) How many vehicles are required to satisfy the 75 deliveries/hr.

b) Describe the concept of intelligent machines and its design using modular units. **[8]**

Q8) Write short notes on any three of the following : **[18]**

a) Classification & Coding systems in GT.

b) Adaptive Control System in FMS.

c) Neural network applications in manufacturing.

d) Tool magazines in FMS.

e) Guidance systems for AGVs.

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Total No. of Questions : 8]

SEAT No. :

P2028

[Total No. of Pages : 3

[4165]-203
M.E. (Computer)
ADVANCED DATABASE MANAGEMENT SYSTEMS
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain with examples following concepts in the context of databases. **[16]**

a) Keys (Hint: candidate, primary, foreign..).

b) Joins.

c) Distributed databases.

d) Database VIEWS, materialized views.

Q2) In context of databases give examples, advantages and disadvantages of following Database concepts. WRITE on ANY FOUR. **[16]**

a) Partitioning of databases.

b) Mobile databases.

c) Speedup and scaleup.

d) Relational databases.

e) Distribution of data to multiple sites.

f) LDAP and directories.

Q3) Explain ANY FOUR of the following concepts with examples. **[16]**

a) Draw a diagram to show 'shared nothing' and 'shared disk' architectures.

b) Draw an ER diagram for a hypothetical library system.

P.T.O.

c) What do you understand by database recovery (Hint: log..)

d) Explain full syntax of SQL WHERE query with examples of your own.

e) SQL insert, update, delete commands.

Q4) Write Short Notes on ANY THREE : **[18]**

a) Relation algebra.

b) Compare and contrast parallel databases and relational databases.

c) Storage of data : hashing, indexes.

d) Locks, deadlocks, Role of lock manager.

e) Applications of databases in government applications.

f) Legacy systems.

SECTION - II

Q5) Write SHORT NOTES on ANY THREE : **[18]**

a) Use of Databases in Hospitals.

b) Security of data.

c) Data warehousing and data marts.

d) ODBC, JDBC.

e) E-COMMERCE as application of databases.

f) Client server databases.

Q6) Give example and applications of following. WRITE on ANY FOUR. **[16]**

a) Data mining.

b) SQL queries, sub queries.

c) MAPPING systems (Hint: google maps..)

d) Decision trees.

e) Unstructured data (Hint: documents..)

Q7) Write on following : **[16]**

a) How databases can help in college ALLUMNI system.

b) Draw an ER diagram for hypothetical RESTAURANT system.

c) What kind of data is searched by search engines, what are the challenges in such searches?

d) ORACLE.

Q8) With suitable examples, explain ANY FOUR of the following : **[16]**

a) Application of databases for ONLINE BANKING.

b) Use of XML to store, query and exchange data.

c) ER diagrams: notation, examples, need.

d) Privacy and confidentiality of personal data on internet.

e) SQL CREATE TABLE.

f) Throughput and response time.

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Total No. of Questions : 8]

SEAT No.:

P2029

[Total No. of Pages : 1

[4165]-206
M.E. (Computer)
ADVANCED COMPUTER ARCHITECTURE
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various EPIC architectures with the features. **[8]**
b) Explain UltraSPARC III/IV architecture. **[8]**

Q2) a) Compare architectural differences between SMP and MPP. **[8]**
b) Draw and explain CCNUMA architecture. **[8]**

Q3) Write notes on Myrinet, Quadrics, PARAMnet. **[18]**

Q4) a) Explain POWER5 architecture. **[8]**
b) Explain system interconnect as a gigabit ethernet. **[8]**

SECTION - II

Q5) Compare between Storage Area Network and Network attached storage. **[16]**

Q6) a) Compare between MPI and PVM. **[8]**
b) Explain Single System Image in Cluster Architecture. **[8]**

Q7) a) Explain Cluster Monitoring and Management Tools. **[8]**
b) Explain Digital true Unix cluster. **[8]**

Q8) Write notes on : **[18]**
a) Bewoulf cluster.
b) PARAM 10000 (CDAC).

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Total No. of Questions : 8]

SEAT No. :

P2030

[Total No. of Pages : 2

[4165] - 207
M.E. (Computer)
GEOMETRIC & SOLID MODELING
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer three questions from each Section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the geometry problem arises in solid modeling? How do we solve these problems using mathematical and algorithmic infrastructure? **[4]**

b) Explain the process of construction of CSG object in details. (assume suitable solid model) **[8]**

c) Explain various Euler's operator to create and modify the close surfaces. **[6]**

Q2) a) What are the different classes of manifolds? What is the relation between different shapes and manifolds? **[8]**

b) Explain the winged edge representation technique for representing the boundary of polyhedron. **[8]**

Q3) a) Explain the following with space decomposition. **[12]**

- Affine Cell decomposition.
- Simplicial decomposition.
- Triangulation.
- Stratifications.

b) Define the term: **[4]**

i) Static interval tree.

ii) Spatial decomposition for solid representation.

P.T.O.

Q4) Explain the following representation scheme. **[16]**

a) Pure primitive instancing.

b) Constructive schemes.

c) Decomposition schemes.

d) Hybrid schemes.

SECTION - II

Q5) a) Explain the edge identification with respect to **[10]**

i) Topological aspect.

ii) Edge orientation.

iii) Singularities on edges.

iv) Edge identification information.

b) Explain the terms affine and projective spaces. **[6]**

Q6) a) What property of raster displays makes the technique of the ray tracing possible? **[6]**

b) What do we mean by parametric and implicit forms for different representation of conics? Give the parametric form and implicit form of the circle, ellipse, parabola and hyperbola. **[10]**

Q7) a) For the knot set $t_1 = 1$, $t_2 = 2$ ....., ti = 1 calculate $B_{i,3}$ (5.5). **[8]**

b) Find the approximation equation for the plane $3.2x + 4.5y + 12.3z + 30 = 0$ When the coefficient x,y,z should be bounded by 3 and the constant term by 9. **[8]**

Q8) a) What is the curve and surfaces? Give the implicit and parametric representation of curves and surfaces. And give the conversion methods for implicit to parametric curves and surfaces. **[8]**

b) What is floating point arithmetic's? What is its significance for solid modeling? Explain the following errors with respect to floating point arithmetic **[10]**

i) Conversion errors.

ii) Round off errors.

iii) Digit cancellation errors.

Total No. of Questions : 8]

SEAT No. :

P2031

[Total No. of Pages : 2

[4165]-208
M.E. (Computer Engineering)
ADVANCED COMPUTER NETWORK
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain different switching modes for building a network. **[8]**

b) What are factors that can affect performance of LAN or WAN? Explain. **[8]**

Q2) Messages (independently) arrive to a system at the rate of 10 per minute. Their lengths are exponentially distributed with an average of 3600 characters. They are transmitted on a 9600 bps channel. A character is 8 bits long. What is the average service time, arrival rate, service rate, utilization of server, probability that there are 2 messages in the system, average no. of messages in queue, average no. of messages in system, average waiting time (time in the queue)? **[16]**

Q3) a) Compare horizontal and vertical approaches to network representation based on amount of effort required to add and delete nodes, links and properties. **[8]**

b) How to determine order of complexity of runtime (or storage). Explain with example. **[8]**

Q4) Write short notes on any THREE : **[18]**

a) Bin-packing algorithm.

b) M/M/1 queuing model.

c) Centralized network with concentrators.

d) Multipoint line layout heuristics.

P.T.O.

SECTION - II

Q5) a) Explain what is SIP? Explain different SIP messages. **[8]**

b) Explain different VoIP signaling protocols. **[8]**

Q6) a) Explain Storage area network components. **[8]**

b) Explain Fiber channel frame structure in detail. **[8]**

Q7) a) Explain Spread Spectrum Transmission techniques. **[8]**

b) Explain IEEE 802.11b wireless LAN standard in detail. **[8]**

Q8) Write short notes on any THREE : **[18]**

a) Lossless compression.

b) RAID.

c) CDMA Standards.

d) Lossy compression.

Total No. of Questions : 8]

SEAT No. :

P2032

[Total No. of Pages : 2

[4165] - 215
M.E. (Computer)
APPLIED ALGORITHMS
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is worst case, average case and best case time complexity of an algorithm? Write a Selection sort algorithm and Analyze the same to find out its worst case, average case and best case complexity. **[10]**

b) Suppose you have algorithms with the running time listed below (Assume these are exact running time) How much slower do each of these algorithms get when you

i) Double the input size.

ii) Increase the input size by one.

1) $100n^2$.
2) n log n.
3) 2^n. **[6]**

Q2) a) Discuss the recursive and non-recursive version of finding the maximum value in the array of 10 elements and compare the time space complexity requirement in the same. **[8]**

b) What is divide and conquer strategy for algorithmic design? Give an example which can be solved with and without divide and conquer strategy? And give the advantages and disadvantages of divide and conquer strategy. **[8]**

Q3) a) Solve the following problem of job sequencing with deadline using Greedy approach. Find out feasible and optimal solution. **[8]**

Let

N = 4, (p1,p2,p3,p4) = (55,15,20,35) and (d1,d2,d3,d4) = (2,1,2,1).

P.T.O.

b) Explain How Greedy strategy is applied in minimum spanning tree problem? Analyze the Kruskal's algorithm using greedy algorithm. **[8]**

Q4) a) By considering the complete graph with n vertices, show that the number of spanning trees in an n vertex graph can be greater than $2^{n-1} - 2$. **[8]**

b) Give an algorithm to detect whether a given undirected graph a cycle. If the graph contains a cycle, then your algorithm should output one. (it should not output all cycles in graph, just one of them) the running time of your algorithm should be O(m+n) for agraph with n node and m edged. **[10]**

SECTION - II

Q5) a) Consider the following instance of Knap sack problem : n = 6, (p1,p2,p3,p4,p5,p6) = (w1,w2,w3,w4,w5,w6) = (100,50,20,10,7,3) and M = 165. **[12]**

Solve the problem using Dynamic programming approach.

b) What is principle of optimality? Which algorithmic strategy use this principle? Explain with suitable example. **[6]**

Q6) a) Solve the sum of subset problem using backtracking algorithmic strategy for the following data **[8]**

N = 4 (w1,w2,w3,w4) = (11,13,24,7) and M = 31.

b) Discuss and analyze the problem of finding Hamiltonian cycle using backtracking. **[8]**

Q7) a) Show that both P and NP are closed under the operation union, intersection, concatenation and kleen closure (*). **[10]**

b) Show that an infinite recursively enumerable set has an infinite recursive subset. **[6]**

Q8) a) Write an algorithm for Depth First Search algorithm in Graph using suitable data structure. What is the complexity of the algorithm? If we have not use this data structure can still we implement the same algorithm, if yes what is its complexity? **[8]**

b) Explain the branch and bound algorithmic strategy for solving the problem, take an example of traveling salesman problem using branch and bound. **[8]**

Total No. of Questions : 7]

SEAT No. :

P2035

[Total No. of Pages : 4

[4165]-220
M.E. (Petroleum Engg.)
RESERVOIR CHARACTERIZATION AND MANAGEMENT
(2002 Course)

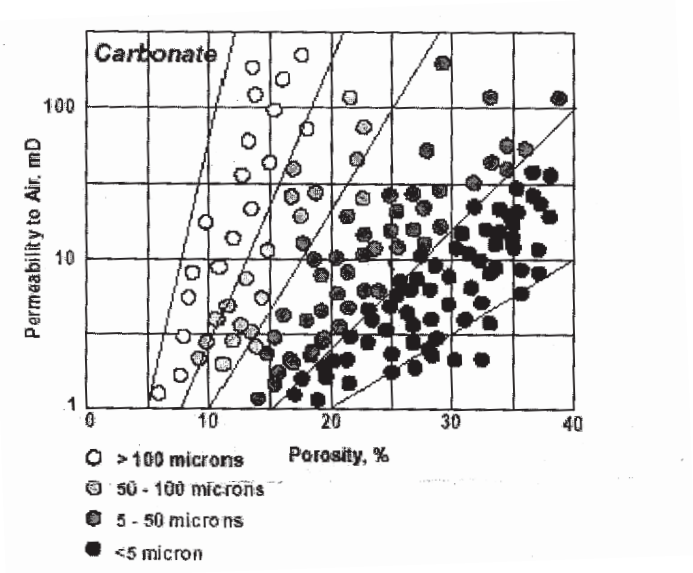
Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Attempt any two questions each from Section I and from Section II.***
3) ***Assume additional data if required.***
4) ***Use of graph paper is allowed.***

SECTION - I

Q1) a) Figure below shows porosity - permeability (k-ϕ) cross plot along with grain size variation for 150 samples representative of a carbonate reservoir. **[15]**



Answer the following :

i) What is the relationship between coarsening of grain size and porosity - permeability values

ii) What is the probability that k > 5

iii) What is the probability that ϕ > 10%

iv) What is the probability that k < 5 and ϕ > 10%

b) Discuss how shale porosity changes with depth? **[10]**

OR

P.T.O.

Q2) a) Why is it necessary to use different tools and techniques to understand porosity - permeability relationship? **[15]**

b) What are different components of a reservoir system? How is a reservoir classified on drive mechanisms? **[10]**

Q3) a) How understanding of the Structural model and Stratigraphic model is helps in the development of Integrated Geological model of the reservoir? **[15]**

b) Write notes on **any one** of the following : **[10]**

i) Borehole Environment.
ii) Reservoir Heterogeneity.
iii) Reserves classification system recommended by SPE.

OR

Q4) a) A prospect with two objectives A and B is under comparison to ascertain commercial chance of success. Which objective has greater risk involved? **Justify your answer with suitable arguments**. **[10]**

No.	Description	A	B
1.	Probability of occurrence of reservoir rock (h, k)	0.7	0.4
2.	Probability of occurrence of structure	0.6	0.5
3.	Probability of hydrocarbon charge	0.7	0.6
4.	Cap rock/seal	0.7	0.6

b) At 70% water saturation and 30% oil saturation, water and oil were flowed at rates of 2.86×10^{-2} m^3/d and 1.9×10^{-3} m^3/d respectively through a 30 mm × 15 mm diameter core plug at a pressure difference of 207 kPa. **Calculate relative permeability to oil and relative permeability to water**. **[15]**

SECTION - II

Q5) a) Semi-variogram drawn for vertical permeability on different scales in a complex reservoir is given below. **[10]**

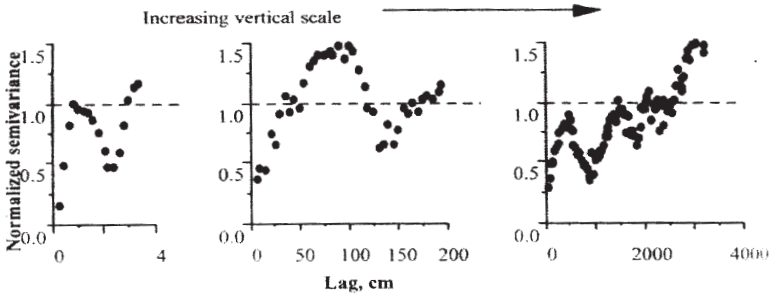


Figure for Q5.a.

Interpret the variograms taking into consideration nugget effect, sill, range and anisotropy.

What may be the reason for similar and repetitive patterns on different scales? How nugget effect is explained on different scales.

b) Write notes on **any two** of the following : **[15]**

i) Exponential and hyperbolic decline methods,
ii) Interwell mapping and autocorrelation,
iii) Upscaling of dynamic properties under single and multi flow system,
iv) Waterflooding.

OR

Q6) a) Following fine scale models generated below are prepared on 1 × 1m block, which needs Upscaling to 5 × 5m block size. **Calculate the effective properties for a coarse block representative of all five blocks**. **[15]**

Note : Calculate geometric, arithmetic and harmonic mean for Permeability.

Porosity (Ø)					Permeability (k)					Water Saturation (Sw)				
20	25	14	07	22	99	91	81	50	85	09	31	13	25	26
10	15	06	09	07	02	93	29	71	28	10	37	26	15	18
13	21	23	10	12	06	01	09	04	10	22	37	39	37	28
06	24	15	08	19	28	95	83	82	22	12	10	25	10	29
22	22	09	08	09	76	60	98	91	62	15	22	15	37	10

b) An oil and gas exploration and development company would have a collection of assets with an associated expected value and an uncertain level of risk. Consider the following investment opportunities that might be available to the company with a current interest in producing fields.**[10]**

Asset	Opportunity	Total Investment (M = 10^6 \$)
A	Wildcat well on exploration permit	\$ 40 M
B	Exploration project adjacent to producing field	\$ 20 M
C	Infill drilling prospect in producing field	\$ 25 M

If the current cash flow forecast indicates a budget of \$ 40 M available to reinvest next year, which is the best way to spend money acknowledging the factors of uncertainty and risk.

i) 100% opportunity in C and 75% opportunity in B.
ii) 100% opportunity in C, 25% opportunity in B and 25% opportunity in A.
iii) 80% opportunity in C, 50% opportunity in B and 25% opportunity in A.

Justify your decision with suitable arguments for each alternative.

Q7) a) A detailed account of production history along with cost incurred during the project span is given in the following table. Oil price is assumed to be $ 65/bbl throughout the tenure of the project. **[15]**

All values for costs are in million dollars, and Oil production in millions of barrels annually.

Year	Oil production MM bbl/year	Capital cost ($ MM)	Operation cost ($ MM)	Production cost ($ MM)
1	0	15.125	---	---
2	0	60.750	---	---
3	5.6	120.50	4.345	12.225
4	11.2	3.975	10.900	22.260
5	5.6	---	19.500	12.982
6	2.1		12.500	5.200
7	1.05	---	11.500	2.765
8	1.2	---	12.500	2.450
9	2.7	---	9.500	5.910
10	1.9	---	9.500	4.505
11	0.9	---	9.500	2.500
12	0.6	---	9.500	1.750
13	0.2	12.300	8.250	0.590

Using above data, prepare a detailed spreadsheet showing gross profit, royalty, net revenue, yearly total expenditure and net profit per year. Royalty is 10% per year on annual production, which has to be paid with the beginning of commercial production. Income tax is 30% of net profit.

b) Write a note on Petroleum Fiscal System in India. **[10]**

✷✷✷

Total No. of Questions : 8]

SEAT No.:

P2036

[Total No. of Pages : 3

[4165]-227
M.E. (Petroleum)
WELL CONTROL
(2002 Course) (Elective - I (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of cm scale graph paper is allowed.***
5) ***Figures to the righ indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe in detail blow out control equipments in brief. **[12]**

b) Explain water based drilling fluids in brief. **[6]**

Q2) a) Define fracture pressure gradient. **[4]**

b) Explain mud weight of drilling fluid. **[4]**

c) Surface casing is to be set in 16" hole. Length = 850 ft., And of size 9 5/8". The slurry yield is 1.2 cubic ft/sack and 29% excess is needed. The cement slurry weight is 13.6 ppg and requires 6.2 gal/sack of water. Cement is circulated to the surface.Capacity of the annulus to be cemented is 0.42805 cubic ft/ft. Capacity 13 3/8" Casing is 0.1497 bbl/ft.

Calculate :

i) No. of sacks.

ii) Volume of water in bbl and in liters. **[4]**

d) Write API types of Casing pipes. **[4]**

Q3) a) Write the types of drilling fluids and determine the height in feet of the influx in following case. **[8]**

Pit gain = 30 bbl.

Hole size = 8.5 in.

Drill collar OD = 6.5 in.

Drill collar length = 890 ft.

Drill pipe OD = 5.0 in.

P.T.O.

b) Explain well control procedure after kick in brief. **[8]**

Q4) Write short notes on : **[16]**

a) Well planning.

b) Well completion.

c) HPHT wells.

d) Drilling difficulties.

SECTION - II

Q5) Following data is available : **[18]**

SIDP = 570 psi. SICP = 430 psi

Hole size – 12.25" Hole depth 6600 ft TVD

Casing : 9 - 5/8" set at 5300 ft TVD Mud wt. : 13 ppg

Drill pipe : 5" Capacity 0.0178 bbls/ft

Drill collar : 8.3", 530 ft long, capacity 0.0088 bbls/ft

Capacities :

Drill collar in open hole : 0.0837 bbl/ft

Drill pipe in open hole : 0.1216 bbls/ft

Drill pipe in casing : 0.1353 bbls/ft

Mud pump output = 0.119 bbls/stroke

Slow circulation rate = 440 psi at 28 SPM

Calculate,

a) Kill mud density.

b) Initial circulating pressure.

c) Final circulation pressure.

d) Time for one complete circulation.

Q6) a) Determine the type of influx using following data. **[4]**

SICP = 1184 psi

SIDPP = 680 psi

Height of influx = 400 ft.

Mud weight = 13.00 ppg.

b) Explain in detail bit and drilling fluid hydraulics. **[12]**

Q7) a) Discuss in brief general offshore well control procedure and LMRP. **[12]**

b) Explain the oil well cement properties in brief. **[4]**

Q8) Write short notes on <u>any two</u> : **[16]**

a) Drill string design considerations.

b) Wait and weight method.

c) Applications of choke.

☒☒☒☒

Total No. of Questions : 8]

SEAT No. :

P2037

[Total No. of Pages : 2

[4165] - 233
M.E. (Petroleum)
OFFSHORE TECHNOLOGY
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write in detail various drilling, structural and environmental forces acting on a tension leg drilling platform. State and explain the mathematical equations to calculate these forces. Also explain in brief the merits, demerits and drilling difficulties in deep water drilling from this platform. **[18]**

Q2) Classify the different types of offshore structures according to their merits and demerits. Explain their working principle in brief. Draw the schematic sketch and indicate rotational forces and oscillating motions acting on a drill ship. **[16]**

Q3) Write and explain in brief offshore drilling, casing and cementing for conductor casing installation program. **[16]**

Q4) Write short notes on: **[16]**

a) Drill Stem testing.

b) Choke line and kill line.

c) Well control.

d) Fixed structures.

P.T.O

SECTION - II

Q5) a) Describe the general design considerations for deep water oil well cementation program. **[9]**

b) Write and discuss pipe line design considerations for the transportation of oil and natural gas. **[9]**

Q6) a) Draw neat schematic sketch and Discuss in brief typical subsea completion. **[12]**

b) What is drilling riser? Explain. **[4]**

Q7) Draw neat sketches and explain the basic principle, elements, merits and demerits of various methods of station keeping. **[16]**

Q8) Write short notes on: **[16]**

a) Types of oil well cements.

b) Safety in Diving.

c) Stage separation.

d) Storage of gas.

Total No. of Questions : 8]

SEAT No. :

P2044

[Total No. of Pages : 2

[4165]-270
M.E. CSE (IT)
ADVANCED INTERNET TECHNOLOGY
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Assume suitable data, if necessary.***
4) ***Draw sketches wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What do you mean by malicious code attack to be carried out on application layer? How these attacks can be prevented? **[8]**

b) How pervasive security mechanisms are implemented in X.800 model? **[8]**

Q2) a) How confidentiality using symmetric encryption is provided by TRANSEC protocol? **[8]**

b) Why is it important to study the Feistel cipher? **[8]**

Q3) a) Show that in DES the first 24-bits of each subkey come from the same subset of 28-bits of the initial key and that the second 24-bits of each subkey come from a disjoint subset of the 28 bits of the initial key. **[8]**

b) What requirements must a public key cryptosystems fulfill to be a secure algorithm? **[8]**

Q4) Write short notes on (Any 3) : **[18]**

a) Multilateral Security.

b) Privacy Regulations.

c) COMSEC.

d) Logical Access Control.

P.T.O.

SECTION - II

Q5) a) How SNMP protocol helps to provide the security? **[8]**

b) What role is played by key management protocols from security point of view? **[8]**

Q6) a) How session hijacking attack is carried out? Suggest the solution to prevent session hijacking. **[8]**

b) Explain the working of secure RSVP protocol. **[8]**

Q7) a) How ICMP protocol can be used to carry out the attacks? **[8]**

b) List and explain the security weakness in FTP service which are merely helpful to the hackers. Suggest a solution to secure it. **[8]**

Q8) Write short notes on (Any 3) : **[18]**

a) PEM.

b) ARP Explosion.

c) NTP.

d) IPv6 Header Security.

Total No. of Questions : 8]

SEAT No. :

P2045

[Total No. of Pages : 2

[4165] - 257
M.E. CSE (IT)
INTELLIGENT SYSTEMS
(2002 Course) (Elective - I (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written on separate answer books.***
3) ***Assume suitable data if necessary.***
4) ***Draw sketches wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Why would evolution tend to result in systems that act rationally? What goals are such systems designed to achieve? **[8]**

b) Define in your own words the following terms. **[10]**

i) Reflex Agent.
ii) Model Based Agent.
iii) Goal based Agent.
iv) Utility based Agent.
v) Learning Agent.

Q2) a) Solve 8-puzzle problem using hill climbing search method. (Choose proper heuristic function for the same). **[8]**

b) Explain with suitable example why problem formulation must follow goal formulation. **[8]**

Q3) a) What is memory bounded search? Explain SMA* with suitable example. **[8]**

b) Explain the properties of task environment. **[8]**

Q4) Write Short notes on any two: **[2 x 8 = 16]**

a) Minimax Algorithm.
b) Arc consistency.
c) Contingency Problems.
d) Backjumping.

P.T.O

SECTION - II

Q5) a) Explain four planning methods for handling indeterminacy. **[8]**

b) Describe the differences and similarities between problem solving and planning. **[8]**

Q6) a) Explain the constraints or axioms of utility theory. **[8]**

b) What do you mean by Partial Order planning? Explain with suitable example partial order plan vs. total order plan. **[8]**

Q7) a) Explain Conditional Planning in fully observable environments. **[8]**

b) Compare and contrast between simple replanning agent vs. Unbounded indeterminacy. **[8]**

Q8) Write short notes on any three: **[3 x 6 = 18]**

a) Uncertainty.

b) Decision - Theoretic Agents.

c) Bay's Theorem.

d) First order logic.

Total No. of Questions : 8]

SEAT No. :

P2046

[Total No. of Pages : 3

[4165] - 258
M.E. CSE (IT)
OBJECT ORIENTED SYSTEMS
(2002 Course) (Elective - I (c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Question 1 and 5 are compulsory. Answer any other two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw a class diagram for the following system : "PARKING LOT" for your college is multistoreyed with two wheeler parking on the floor one, visitor parking and VIP parking at ground floor. Cars parking is on upper floors. Employees can pay quarterly or yearly. Visitors pay on a daily basis. System has a GUI to show floorwise plan, show free slots, cars location. Members use swipe card to enter/exit the parking lot. System can help locate free slots, can reserve cars for VIP members, generate space utilization reports too. **[10]**

b) With examples of your choice illustrate the following concepts: **[8]**

i) Sequential substates.

ii) Object flow in an activity diagram.

Q2) a) Draw a sequence diagram for the usecase described below: **[8]**
Consider the usecase "Buy an insurance policy". Key steps of the use case could be to get customer details, get customer needs, offer policy list and detail of various policies available. Based on customer choice of the policy, he is made a policy member and first premium is paid by customer by credit card (validation needed). State whatever assumptions you make in this use case "Buy an insurance policy".

b) From the above insurance system example, with additional assumptions if needed, show the following concepts in context of a collaboration diagram. Concepts: Message nesting, link, iteration, guard condition, creation of object and actor. You could draw a collaboration diagram to show all concepts in the same diagram or show small collaboration diagram parts to show the above concepts. **[8]**

P.T.O

Q3) a) Consider a system for election management for a college. The election process involves many activities like candidate's application, validation of voter list, voting process at various booths, results declaration etc. Expand on the ideas given above and draw an activity diagram for the same exploiting all the available features in an activity diagram. **[10]**

b) Compare generalization, include, extends relations clearly. Which will you chose and when? Give examples for the three from a payroll system. Justify your choice of the relation. **[6]**

Q4) Write Short Notes on: **[16]**

a) Neat diagram showing CORBA client and server side blocks.

b) The 4 P's (People, Project, Product, Process) in software Development.

SECTION - II

Q5) a) A window in a window management system can be displayed in one of the three states : maximized, where it takes up the entire screen; normal, where it is displayed as a bordered window with a given size and position on the screen; and iconized, where it is displayed as a small icon. When a window is opened, it will be displayed as a normal window, unless minimize on use has been selected, in which case it will be displayed as an icon. A normal window and an icon can be maximized; a maximized window and a normal window can be minimized, or reduced to an icon. Maximized windows can be restored to their normal size, and icons can be restored to the size they had before they were minimized. Icons and normal windows can be moved, and normal windows can also be resized. No matter how it is displayed, a window can always be closed. Draw a state diagram expressing these facts about the display of windows. **[12]**

b) Explain the significance of stereotypes, tagged value and constraints and how they are represented in UML. **[6]**

Q6) An information system is to be designed for a car rental company. Potential customers phone up the company for advice and information. The booking clerks field all calls. Many interested parties remain anonymous, because their personal data is not registered. Customers reserve cars. Reservation and customer data are accepted by the booking clerks and entered into the reservation system. The customer is given a reservation number. Drivers collect reserved cars at the branch office. Some customers are companiers and therefore they will send a particular driver to pick up a car. The customer service clerk takes the agreement from the customer file, checks the details and amends the agreement if necessary. The vehicle documents and keys are hander over to the driver. On return the cars are parked in the return car park

and the keys and vehicle documents are received back from the driver. Before the driver is permitted to leave, the car is checked over for any damage.

a) Develop a use case model for this example.

b) Think about whether the actors you have identified are beneficiaries of the use cases. Think about including Uses and Extends relationships; are they necessary at this stage?

c) Model one of the interactions with either a collaboration diagram or a sequence diagram.

[16]

Q7) a) Suppose that an environmental monitoring station contains three sensors, namely a thermometer, a rain gauge and a humidity reader. In addition, there is an output device, known as a printer, on which the readings from these three sensors are shown. Readings are taken and transcribed onto the printer every five minutes. This process is known as 'taking a checkpoint'. Draw an object diagram showing a plausible configuration for these objects, and include on the diagram the messages that might be generated in the system every time a checkpoint is taken. Assume that a checkpoint is initiated by a message sent from a timer object to the monitoring station. Does you diagram clearly show the order in which messages are sent? If not, how this might be shown. **[10]**

b) Write a note on 'Analysis, Design and Implementation to realize Use Cases'. **[6]**

Q8) a) Consider the design of a software system for a ONLINE BOOK SHOPEE: Give scope of your software identifying key functional and non-functional requirements. Which UML diagrams are most relevant for this systems and why? In which order will you draw them. Draw a class diagram for the above system. **[10]**

b) Explain 'Life of Unified Process'. **[6]**

Total No. of Questions : 8]

SEAT No. :

P2050

[Total No. of Pages : 2

[4165]-294

M.E. (Chemical)

ADVANCED PROCESS DYNAMICS & CONTROL

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain steps followed in empirical modeling (process identification) of a process. **[16]**

Q2) Linearize the generalized non-linear process model $\frac{dx}{dt} = f(x,u)$, $y = h(x)$ **[16]**

using Taylor's series method.
Derive the linearized model in

i) State-space form.
ii) Transfer function form.

Q3) Find the eigen values and vectors for the multivariable system having state-space matrix $A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$.

Explain the node, saddle, focus and center behavior of given 2 × 2 system based on the nature of eigen values. **[16]**

P.T.O.

Q4) Write short notes on the following : **[18]**

a) Antireset windup systems.

b) Open-loop unstable systems.

c) Model-based control systems.

SECTION - II

Q5) a) What is RGA of a MIMO system? State the properties of RGA and its use in predicting input-output interactions.

b) Derive the expression for RGA of a 2 × 2 process having steady-state transfer function matrix $K = \begin{bmatrix} k_{11} & k_{12} \\ k_{21} & k_{22} \end{bmatrix}$. **[16]**

Q6) What is decoupler? Draw closed-loop block diagrams for a 2 × 2 system having decouplers D_1 & D_2. Also derive the expressions for D_1 & D_2 if the 2 × 2 process is modeled as

$$\bar{y}_1 = H_{11}\bar{m}_1 + H_{12}\bar{m}_2$$
$$\bar{y}_2 = H_{21}\bar{m}_1 + H_{22}\bar{m}_2$$

[16]

Q7) a) Draw and explain block diagram of a computer-based feedback control system.

b) Derive pulse transfer function of a ZoH element.

[16]

Q8) Write short notes on the following : **[18]**

a) Plant-wide control systems.

b) Distillation column control system.

Total No. of Questions : 8]

SEAT No. :

P2051

[Total No. of Pages : 2

[4165]-295
M.E. (Chemical Engg.)
NOVEL SEPARATION TECHNIQUES
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Classify membrane separation processes based on : **[16]**

a) Transport mechanism.

b) Material of membrane.

Q2) Explain construction of the following membrane modules : **[16]**

a) Spiral wound.

b) Hollow fibre.

c) Tubular.

d) Plate and frame type.

Q3) Explain pervaporation process with the help of following points. **[16]**

a) Transport mechanism.

b) Modes of separation - vacuum driven, temperature gradient driven, carrier gas aided, with fractional permeate condensation.

Q4) Write short notes on the following : **[18]**

a) Membrane reactors.

b) LEM.

c) Membrane Fouling.

P.T.O.

SECTION - II

Q5) Explain use of physical adsorption as separation process. **[16]**

Q6) Explain reactive distillation and extraction processes used as separation processes. **[16]**

Q7) Explain ion-exchange chromatographic separation processes. **[16]**

Q8) Write short notes on the following : **[18]**

a) Supercritical fluid extraction.

b) Bioseparation processes.

Total No. of Questions : 6] **SEAT No. :**

P2052 **[Total No. of Pages : 2**

[4165] - 473

M.E. (Civil) (Structures)

THEORY OF PLASTICITY

(2008 Course) (Elective - IV(c)) (Sem. - II)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the differential equations of equilibrium for three-dimensional problems and show that shear stresses are complimentary. **[10]**

b) Show that $\phi = \frac{q}{8c^3}\left[x^2\left(y^3 - 3c^2y + 2c^3\right) - \frac{1}{5}y^3\left(y^2 - 2c^2\right)\right]$ is a stress function, and find what problem it solves when applied to the region included is $y = \pm c$, $x = 0$, on the side x positive. **[15]**

Q2) a) Explain in brief Drucker's stability postulates. **[10]**

b) Describe geometrical representation of the yield surface in the principle stress space. **[10]**

c) State and explain uniqueness theorem. **[5]**

Q3) a) The state of stress at a point is given by, σ_x = 70 MPa; σ_y = 120 MPa; τ_{xy} = 35 MPa. If the yield strength of the material is 125 MPa, determined in a uniaxial tensile test, whether yielding will occur according to Tresca's and Von-Mises yield condition or not. **[10]**

b) Write short note on plastic stress-strain relations. **[10]**

c) Explain factors affecting plastic deformation of metals. **[5]**

P.T.O.

SECTION - II

Q4) a) Write short note on: **[15]**

i) Isotropic hardening model.

ii) Kinematic hardening model.

b) Explain initial and subsequent yield surfaces in tension. **[10]**

Q5) a) State and prove the upper and lower bound theorems of limit analysis. **[10]**

b) A rectangular beam 8 *cm* wide and 10 *cm* deep is 2 *m* long and is simply supported at the ends. The yield strength for the beam material is 250 MPa. Determine the value of concentrated load applied at the beam midspan if **[15]**

i) The outermost fibre of the beam just starts yielding.

ii) The outer shell upto 3 *cm* depth yields.

iii) Whole of the beam yields.

Assume linear stress strain idealized curve for the beam material.

Q6) a) Explain the finite element models for plasticity problems. **[15]**

b) Explain incremental methods of determining limit load. **[10]**

Total No. of Questions : 6]

SEAT No.:

P2056

[Total No. of Pages : 2

[4165]-31
M.E. (Civil-Structures)
NUMERICAL METHODS AND FINITE ELEMENT METHODS
(2002 Course)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***All questions carry equal marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Given $\frac{dy}{dx}=1+y^2$, where $y = 0$, when $x = 0$. Find y (0.2), y (0.4), y (0.6), using Runge-Kutta fourth-order method. **[15]**

b) Determine the highest eigen value for the matrix. **[10]**

$$\begin{bmatrix} 0.42 & 0.28 & 0.14 \\ 0.28 & 0.56 & 0.28 \\ 0.14 & 0.28 & 0.42 \end{bmatrix}$$

Q2) a) Solve the equation $\nabla^2 f = 2x^2y^2$, over the square domain $0 \le x \le 2$, $0 \le y \le 2$, with $f = 0$ on the boundary (choose mesh length as unity). **[15]**

b) Solve the equation $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$, subject to the boundary conditions u (0, t) = u (1, t) = 0, u (x, 0) = $x - x^2$. Take h = 1/4 k = 0.025. **[10]**

Q3) a) Solve the boundary value problem using Rayleigh-Ritz method.

$\frac{d^2y}{dx^2}+2x=0$, y (0) = 0, y (1) = 0. **[10]**

P.T.O.

b) Apply Galerkin's technique to solve boundary value problem $y'' - x = 0$,

$y(0) = 0, y'(1) = \frac{-1}{2}$. **[15]**

SECTION - II

Q4) a) Derive shape function using natural co-ordinates for 2D, 3 noded triangular element. **[8]**

b) A square plate of 1m × 1m is supported by all edges. A hole of 50m diameter is punched at centre of plate. The in plane pressure is acting on circular hole of 5Mpa intensity. Discretise the model into FEM model show boundary condition and loading at suitable nodes. **[10]**

c) State utility of F.E.M over other methods of analysis. **[7]**

Q5) a) Explain with suitable example plain stress, plain strain, axisymmetric type of problem. **[6]**

b) Write stress-strain relation for plain strain and axisymmetric problem. **[7]**

c) Write a note on how reduction of band width of matrix is carried out. **[6]**

d) Distinguish between CST and LST element used to solve 2D problem. **[6]**

Q6) a) Explain displacement function using polynomial equation. **[6]**

b) Explain Direct and variational method of deriving stiffness matrix. **[7]**

c) What are the requirements of convergence. **[6]**

d) Explain isoparametric element. **[6]**

Total No. of Questions : 6]

SEAT No. :

P2058

[Total No. of Pages : 2

[4165]-33
M.E. (Civil) (Structures)
ADVANCED STRUCTURAL MECHANICS
(2002 Course)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Obtain the differential equation of equilibrium to be satisfied by rectangular stress components acting on element in a stressed body. **[7]**

b) What is compatibility of strains? Obtain strain compatibility equation for 2D problem in elasticity? **[8]**

c) Find stress and strain components of a cantilever beam loaded with a point load at its free end using Airy's Stress Function? **[10]**

Q2) a) What is Airy's stress function? Show that the Airy's stress function for 2D problem satisfies the bi-harmonic equation? **[10]**

b) Obtain the expressions for stresses for 3^{rd} degree polynomial for 2D elasticity problem. **[15]**

Q3) a) What are different types of Elastic foundations? Give examples. **[5]**

b) Using polar co-ordinates, obtain the solution for stress distribution for radial and transverse stresses in a hollow cylinder subjected to uniform external pressure only. **[10]**

c) Derive differential equation for the elastic line of a beam resting on an elastic foundation. **[10]**

P.T.O.

SECTION - II

Q4) a) Explain the methods of combining various mechanisms for plastic collapse of multi-bay, multi-storey rectangular frames? Illustrate each by simple example. **[10]**

b) Based on static concept, explain the following analytical approaches of stability analysis – **[15]**

i) Equilibrium Approach.
ii) Imperfection Approach.
iii) Energy Approach.

Q5) A three span girder is simply supported at the ends. The height of the girder is 4 m and panel width 3 m. The girder is subjected to a point load 400 kN at each interior panel. Construct B.M. and S.F. diagram for this girder. **[25]**

Q6) A simply supported beam ABC of length 'L' m supports a uniformly distributed load 'w' kN/m over middle third span. l (AB) = l (BC) = l (CD) = L/3 m. Assume $2I_{AB} = I_{BC} = I_{CD}$. Estimate the maximum deflection in the beam by Finite Difference Method. **[25]**

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Total No. of Questions : 6]

SEAT No. :

P2059

[Total No. of Pages : 2

[4165] - 37

M.E. (Civil)(Structures)

STRUCTURAL DYNAMICS

(2002 Course)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicates full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the difference between response of structure to static loading and dynamic loading. **[7]**

b) What is the necessity of modeling a structure? Explain with suitable examples the various type analytical of modeling. **[8]**

c) A vibrating system of SDOF consists of mass of 5 kg and a spring constant 25 kN/cm. The system is viscously damped such that the ratio of any consecutive amplitudes is 1.00: 0.85. Determine **[10]**

i) Natural frequency ii) Logarithmic Decrement

iii) Damping Factor iv) Damping Coefficient

Q2) a) Derive the expression for logarithmic decrement 'δ' in terms of damping ratio 'ζ'. **[7]**

b) What are types of vibrations? Obtain general solution for Un-damped Forced SDOF system? Hence derive the equation for Dynamic Amplification Factor? **[8]**

c) Determine natural frequency and natural period of system consisting of a mass of 100 kg attached to center of a horizontal simply supported beam through a linear spring of constant 10kg/cm. The beam has thickness of 0.80 cm and width 1.2 cm. Take $E = 2.1 \times 10^6$ kg/cm^2 and length of 70 cm. **[10]**

P.T.O.

Q3) a) Using Duhamal's Integral, determine response of an un-damped system to a rectangular pulse force of magnitude 'Fo' and time 'T'. **[7]**

b) Explain non-linear analysis by Linear Variation Method for response of SDOF. **[8]**

c) Elaborate the concept of transmissibility and vibration isolation. Also obtain transmissibility and force transmitted for a mass of 100 kg supported on springs of constant 7.84×10^5 N/m and subjected to disturbing force of 392 N due to unbalanced element rotating at frequency 314 rad/s. Assume damping ratio = 0.20. **[10]**

SECTION - II

Q4) a) Explain the concept of normal mode and mode shapes? **[5]**

b) Calculate normal frequency and mode shapes of a three storey building having masses 2000kg for 1^{st} and 2^{nd} floor and 1000 kg of 3^{rd} floor. The building consists of one bay only and EI for each column is 4.5×10^6 N/m^2. **[20]**

Q5) a) Explain the concept of Shear Building. **[5]**

b) Explain Rayleigh's Method to determine frequency in fundamental mode of vibrations? **[10]**

c) Explain Linear Acceleration Method for non-linear analysis by step by step method? **[10]**

Q6) Write notes on:- **[25]**

a) Stodola Method of Analysis.

b) Wilson Theta Method.

c) Finite Element Techniques in Vibration Problems.

d) Rayleigh Method for Frequency in Fundamental Mode.

e) Coupled and Un-coupled MDOF system.

Total No. of Questions : 8]

SEAT No. :

P2062

[Total No. of Pages : 3

[4165] - 52

M.E. (Mechanical) (Heat Power)

ADVANCED HEAT TRANSFER

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive general heat conduction equation in cartesian coordinates. State the assumptions made. **[10]**

b) Heat is generated in a slab of 120mm thickness with a conductivity of 200 W/mk at a rate of 10^6 W/m^3. Determine the temperature at the midpoint plane if the surface temperature of the solid on both sides is 150ºC. Show the temperature distribution with a suitable sketch. **[6]**

Q2) a) Explain the followings:- **[6]**

i) Fin efficiency ii) Fin effectiveness

iii) Biot number

b) A thermometer well of 10 mm OD and 8mm ID is of material with thermal conductivity of 25 W/mk. It is exposed to gases at 2ºC and the temperature of the wall in which the well is fixed is 12ºC. If an error of not more than 0.6ºC is to be involved, determine the length of the well. Take h = 50 w/m^2k. **[10]**

Q3) a) Write a note on Heisler Grober charts with suitable diagrams. **[8]**

b) An aluminium sphere weighing 5.5 kg and initially at temperature of 290ºC is suddenly immersed in a fluid at 15ºC. Estimate the time required to cool the sphere to 95ºC. Use lumped capacity method. Given h = 58W/m^2k. For aluminium, ρ =2700 kg/m^3; C_p = 900 J/kg K, K = 205 W/mk. **[8]**

P.T.O.

Q4) Write short notes on (any three): **[18]**

a) Reynold and Colburn analogy.

b) Implicit and Explicit methods.

c) Stanton number and Rayleigh number.

d) Prandtl number and its effect on velocity & thermal boundary layers.

SECTION - II

Q5) a) Determine the distance from the leading edge of a flat plate at which transition will occur for each of the following fluids when $u_\infty = 2$ m/s: **[6]**

i) Water at 20ºC ($\upsilon = 1 \times 10^{-6}$ m^2/s).

ii) Engine oil at 20ºC ($\upsilon = 900 \times 10^{-6}$ m^2/s).

iii) Mercury at 20ºC ($\upsilon = 0.11 \times 10^{-6}$ m^2/s).

iv) Air at 20ºC ($\upsilon = 15 \times 10^{-6}$ m^2/s).

Take. $Re_{cr} = (5 \times 10^5)$.

b) Show that the average heat transfer coefficient for a configuration is, $\bar{h}_x = 1.11\ (h_x)$, where the local heat transfer coefficient is given by $h_x = c(x)^{-0.1}$

Show the variation of h_x and $\bar{h}_x$ with a suitable diagram. **[10]**

Q6) a) Explain:

i) Nusselt theory of condensation.

ii) Pool boiling curve. **[10]**

b) How is the Reynolds number defined in condensation? Discuss. What is its critical value? **[6]**

Q7) a) Distinguish between: **[6]**

i) Black body and grey body.

ii) Specular and diffuse surface.

iii) Absorptivity and emissivity of a surface.

b) Two large parallel plates having emissivities of 0.3 and 0.5 are maintained at 800ºC and 300ºC respectively. Find the percentage reduction in heat transfer rate when a polished aluminium radiation shield having emissivity of 0.05 is placed between them. Also find the temperature of the shield. **[10]**

Q8) Write short notes on (any three): **[18]**

a) Heat pipe and its applications.

b) Hottel's cross string method.

c) Radiation from gases and vapours.

d) Rayleigh Jean's lane.

Total No. of Questions : 8]

SEAT No. :

P2064

[Total No. of Pages : 2

[4165]-66

M.E. (Mechanical) (Design Engineering)

ANALYSIS AND SYNTHESIS OF MECHANISMS

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) For the function $y = x^2 - x$ in the range $1 \le x \le 2$, locate 4 accuracy points with Chebyshev spacing and find the values of y at these accuracy points. Discuss briefly the relation between accuracy point spacing and the structural error of a synthesized mechanism. **[10]**

b) State and prove Robert Chebyshev theorem. **[6]**

Q2) a) A function $y = x + \sqrt{x}$ is to be generated using a four bar in the range $0 \le x \le 1$.. three accuracy points with uniform spacing is to be used. The total rotations of the input and output links are to be 60º and 90º respectively. Synthesize a four bar for this purpose using a graphical method and draw it in one position. **[10]**

b) Discuss the principles underlying the method of normal acceleration. **[6]**

Q3) a) Define the term 'Dyad' and derive the 'standard form equation' of dyad. Explain 4-bar synthesis for 'Rigid body guidance' and 'Path Generation' using the dyad method. Also obtain the correlation between the number of prescribed positions and the number of solutions for both the above cases and tabulate this correlation. **[10]**

b) State and prove the condition to be satisfied by a four bar, so that the coupler curve is symmetric. **[6]**

P.T.O.

Q4) Write a note on following (any three) : **[18]**

a) Branch and order defects.

b) Ball point.

c) Eulerian Angle.

d) Matrix Method of position analysis of spatial mechanisms.

SECTION - II

Q5) a) Synthesize a 4-bar to coordinate the input and output link positions as specified below. **[8]**

Input link positions	Φ	0°	30°	60°
Output link positions	ψ	35°	55°	75°

Use the Frudenstein's equation.

b) Explain the terms Function Generation. 'Path Generation' and 'Rigid body guidance'. **[9]**

Q6) a) Using the complex vector approach, derive the expressions for the link lengths of a 4-bar mechanism in terms of specified angular velocities and accelerations of its moving links. **[8]**

b) Explain with neat sketch the Bobillier's construction for drawing the inflection circle, if two points A and B on the moving link are given together with their centers of curvature A' and B'. Then explain how this construction can be used for drawing the inflection circle of a slider crank mechanism. **[9]**

Q7) a) Explain with neat sketch the D-H parameters for a pair of links of a spatial mechanisms. **[8]**

b) Explain the velocity analysis of a typical ternary link of a complex mechanism by the auxiliary point method. Clearly state the quantities that must be known. **[8]**

Q8) a) Write short notes on (any two) : **[10]**

i) Hartman construction.

ii) Mechanical Errors of a mechanism.

iii) Cubic of stationary curve.

b) Explain and prove Euler's savary equation. **[6]**

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Total No. of Questions : 10]

SEAT No. : ____

P2065

[Total No. of Pages : 2

[4165] - 70

M.E. (Mechanical) (Design Engineering)

ROBOTICS

(2002 Course) (Elective - I (c))

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non programmable calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the terms Work volume, Spatial and control resolution related to the robots. **[8]**

b) Classify the robots according to physical configuration and explain any one in detail. **[8]**

Q2) a) In a robot, a twisting joint wrist assembly can rotate through 10 full revolutions and is required to have a resolution of 0.3 degree. Find out the required bit storage capacity for achieving desired resolution. **[8]**

b) Explain role of robots in automation. **[8]**

Q3) a) A 2 DOF planar manipulator is as shown in figure 1 choose analytically whether end B can be located at (90, 50). If 'yes' state the angles, the link will have with positive X - Axis. If 'no' state the proper reason.**[10]**

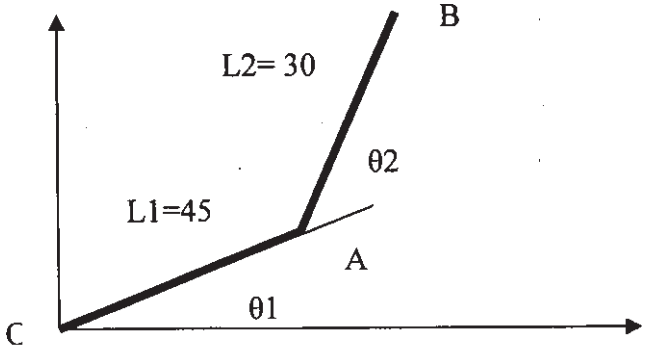


Figure 1

b) Explain the procedure used to establish the Jacobian matrix for wrist positioning. **[6]**

P.T.O.

Q4) a) Derive an equation to determine the joint torque and the components of forces applied at the wrist or tool are useful for controlling the robot arm. **[10]**

b) Compare Algebraic and Geometric approach to the solution of a simple planar three-link manipulator. **[6]**

Q5) a) Difference between inverse and forward kinematics. **[6]**

b) Difference between PTP and Continuous path robots. **[6]**

c) Applications of robots. **[6]**

SECTION - II

Q6) a) It is desired to have the first joint of a six axis robot go from initial angle of 30º to a final angle of 60º in 4 seconds. Use third order polynomial to calculate joint angles at 1, 2 and 3 seconds. **[8]**

b) Sketch and explain the terms path points, via points and pseudo via points with suitable example. **[8]**

Q7) a) Describe briefly the general considerations used for robot path description and generation. **[8]**

b) Explain different factors to be considered while selecting the sensors for robot applications. **[8]**

Q8) a) Explain briefly the components of machine vision system used in robots. **[8]**

b) Explain the following MOVE, OPEN and SIGNAL commands used in robot programming. **[8]**

Q9) a) Differentiate between lead through and teach pendent programming methods. **[8]**

b) Explain Artificial Intelligence system used in robots. **[8]**

Q10)a) Adaptive control. **[6]**

b) Difference between proximity and touch Sensors. **[6]**

c) Redundent and closed chain structures. **[6]**

Total No. of Questions : 10]

SEAT No. :

P2066

[Total No. of Pages : 2

[4165] - 69

M.E. (Mechanical) (Design Engineering)

PROCESS EQUIPMENT DESIGN

(2002 Course) (Elective - I(b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain significance of the following preliminaries in PED. **[8]**

i) Design stress ii) Weld joint efficiency

iii) Corrosion Allowance iv) Factor of safety

b) Explain various types of roofs used for storage vessels. **[6]**

c) What are causes for loss of liquid in Fixed volume tanks. **[2]**

Q2) a) Estimate the thickness of a conical head having half apex angle 38°. The diameter of the vessel is 1.5 m. permissible stress of the material is 1020 kg/cm^2, welded joint efficiency is 85%. **[8]**

b) What are the various methods used to fix the closures to high pressure vessels. **[6]**

c) Name two materials used for high pressure vessels. **[2]**

Q3) a) A high pressure vessel is to be operated at 150 N/mm^2, the inside diameter of vessel is 30 cm; vessel is fabricated from high tensile steel having permissible tensile stress 5 kN/mm^2. Determine wall thickness on the basis of maximum tangential stress at inner surface. **[8]**

b) Explain various methods of providing reinforcement for nozzles. **[6]**

c) Explain any one of the following theories of failure. **[2]**

i) Guest Theory ii) Saint venanat's Theory

P.T.O.

Q4) a) Explain bracket supports and design aspects related to them. **[6]**

b) Explain the working and construction of the following: **[8]**

i) Cyclone separator ii) Coil type crystalliser.

c) Name various standards used in process equipment design. **[2]**

Q5) Write short notes on the following: **[18]**

a) Design of saddle support.

b) Autofrettage and shrink fit.

c) Different types of heads for pressure vessels.

d) Expansion joints used in process piping systems.

e) protective coatings and their applications.

f) Hortonsphers in high pressure vessels.

SECTION - II

Q6) a) Explain the important features of plate columns or packed columns. **[8]**

b) Explain in detail the design considerations for storage vessels. **[8]**

Q7) a) What is the role of process flow dig. in plant design & errection? Explain. **[8]**

b) What are the thermal considerations in the design of heat exchangers. **[8]**

Q8) a) Discuss the sources of Hazards in process industries & suggest suitable measures. **[8]**

b) Explain the construction & working of Jacketed through crystallizer. **[8]**

Q9) a) Explain the effect of seismic load & wind load on Tall Vessels. **[8]**

b) Explain types of vacuum pumps with sketch. **[8]**

Q10) Write short note on [Any two]. **[18]**

a) Optimization Techniques.

b) Spiral Heat exchanger.

c) Cyclone separators.

Total No. of Questions : 10]

SEAT No. :

P2067

[Total No. of Pages : 2

[4165]-124
M.E. (E & TC) (Microwave)
RF WAVE & MICROWAVE CIRCUIT DESIGN
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Assume suitable data, if necessary.***

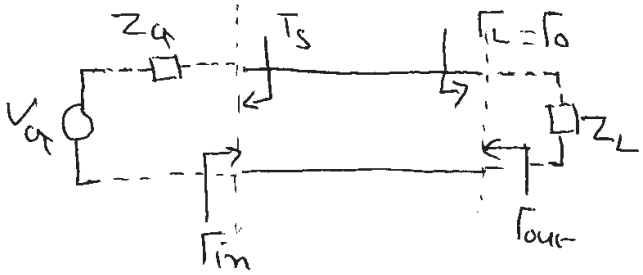
SECTION - I

Q1) a) Explain and draw equivalent circuit and frequency response of capacitor at high frequency. **[5]**

b) Compute the skin depths for (upper $\sigma_{Cu} = 64.516 \times 10^6$ s/m), Aluminum $\sigma_{AL} = 40 \times 10^6$ s/m and gold $\sigma_{Au} = 48.544 \times 10^6$ s/m at 1GHz and 10GHz and find the resistance of 10 cm wire with diameter as 1 mm.**[5]**

Q2) Derive parallel plate transmission line equation. **[10]**

Q3) For the circuit shown, assume a lossless line with $Z_O = 75\,\Omega$, $Z_S = 50\,\Omega$, $Z_L = 40\,\Omega$. Compute the input power and power delivered to load, give your answer in watts & dBm. Assume the length of line to be $\lambda/2$ with source voltage $V_S = 5V$. **[10]**



Q4) a) Explain step by step procedure for mapping normalized R and imaginary × components into complex Γ plane. **[5]**

b) For four different load impedances a) $Z_L = 50\,\Omega$ b) $Z_L = 48.5\,\Omega$ c) $Z_L = (75 + j25)\,\Omega$ and $Z_L = (10–5j)\,\Omega$ all sequentially connected to $50\,\Omega$ transmission line. Find the reflection coefficient and the SWR circles and determine return loss in dB. **[5]**

P.T.O.

Q5) Derive relation between parallel connection of two port network with the help of admittance matrix Y' & Y''. **[10]**

SECTION - II

Q6) What are microwave filters? Explain filter design by the image parameter method. **[10]**

Q7) Explain the working with characteristic waveform of TRAPATT and BARRITT diode. **[10]**

Q8) Explain matching and biasing network for maximum power transfer. Explain microstrip line matching network design from discrete components. **[10]**

Q9) Draw generic amplifier system, explain its characteristic, and discuss the concept transducer power gain, available power gain and operating power gain. **[10]**

Q10) For a 200 MHz oscillation frequency, a culpitts BJT oscillator in C-E configuration has to be designed. For the bias point of V_{CE} = 3V & I_C = 3mA, following are the circuit parameters at room temperature. C_{BC} = 0.1 pF, $r_{BE} = 2k\Omega$, $r_{CE} = 10k\Omega$, CBE = 10pF. If the inductance should not exceed $L_3 = L = 50nH$, find the values for the capacitance in the feedback loop. **[10]**

Total No. of Questions : 6]

SEAT No. :

P2068

[Total No. of Pages : 2

[4165]-141

M.E. (E & TC) (VLSI & Embedded Systems)

CASE STUDIES IN EMBEDDED SYSTEMS

(2002 Course) (Elective - II (b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate answer papers.***
2) ***Answer any two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Design an access and authentication system using RFID and Biometrics. Justify your selection criteria of the components for the same. **[15]**

b) What is an embedded system? What are different parameters to be considered while designing embedded system? **[10]**

Q2) a) Explain architectural overview of smart camera application of smart camera in object detection. **[15]**

b) Explain the functioning of an RFID system. What are different frequency bands used for RFID? Explain the RFID tag & RFID reader. **[10]**

Q3) With respect to block diagram, processor, memory, inter processor communication and algorithms explain design of digital camera. **[25]**

SECTION - II

Q4) a) Explain intelligent remote positioner. How it can be used in robotics application? **[15]**

b) Explain DSP architectures for next generation wireless communications and how this DSP architecture is used in digital cellular phones. **[10]**

Q5) a) What is a smart card? What are different types of smart cards? How smart card can be used in firewalls? **[15]**

b) What are functional and nonfunctional requirements during development of embedded system? **[10]**

P.T.O.

Q6) a) Explain how automatic number plate recognition system can be designed using embedded system. **[15]**

b) Write short notes on : **[10]**

i) Design of automatic washing machine.

ii) Wireless telemedicine.

Total No. of Questions : 8]

SEAT No. :

P2071

[Total No. of Pages : 2

[4165] - 159

M.E. (Electronics) (Computer)

SYSTEMS ON CHIP

(2002 Course)

Time :3 Hours] ***[Max. Marks :100***

Instructions to candidates:-

1) ***Answer three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of non-programmable electronic calculator is allowed.***

SECTION - I

Q1) Write 16-bit ripple counter with asynchronous reset in VHDL. Also write test bench for the same. **[18]**

Q2) Write a model for digital integrator with following specifications. **[16]**

- Clock input of type bit.
- Data input of type real.
- Data output of real.
- Integrator maintains the sum of successive data input values.
- For the clock input change from '1' to '0' the integrator should add the current data input to sum and provide the new sum on the output.

a) Draw neat block diagram of the function.

b) List all ports and internal signals required.

c) Write VHDL code for the same.

Q3) Explain various components of SOC with neat diagram. What are design constraints for SOC design? What different methods are used to reduce the power dissipation, explain? **[16]**

P.T.O.

Q4) a) Explain the following attributes with the help of example **[8]**

i) 'delayed ii) 'event

iii) 'transaction iv) 'stable

b) 'A' is declared as a BIT_VECTOR and its value is 10101101 give value of 'A' after execution of following statements: **[8]**

i) A sla 2; ii) A srl 2;

iii) A sra 3; iv) A rol 3;

SECTION - II

Q5) Explain with suitable example **[18]**

- Operator overloading
- Resolved signal
- Inertial, Transport delay
- Configuration

Q6) What makes VHDL a testing language? Illustrate various approaches for writing test bench. Discuss Delta delay. **[16]**

Q7) Draw and explain the architecture of FPGA suitable for SOC. **[16]**

Q8) Describe serial adder using block diagram. Write VHDL code for serial adder. **[16]**

Total No. of Questions : 10]

SEAT No.:

P2072

[Total No. of Pages : 3

[4165]-193
M.E. (Production)
ADVANCED MACHINE TOOL DESIGN
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Show that in' twin gear block' or 'triple gear block' the difference between the consecutive numbering teeth should be greater than or equal to 4. **[6]**

b) Make a compact speed ray diagram for compromise gear box having 15 number of spindle speeds between 90 rpm and 2100 rpm. Make a layout of a gear box and draw the structure diagram. Discuss the method of determining the dimensional size of the spindle. **[10]**

Q2) a) Develop a generalized empirical relationship for the thrust and torque in drilling and compare the same with turning to validate Opitz's hypothesis that the principles of cutting mechanism fall in to the same category. **[8]**

b) How can you make a variator using internal cone and conical roller, with a positive self locking unit? **[8]**

Q3) a) Show with neat sketches at least two methods of preloading a ball lead screw. Also deduce an expression that the magnitude of preload is normally equal to 1/3 of the total load. **[8]**

b) In a surface grinding machine it is necessary to design table guides having straight flat configuration so as to obtain hydrodynamic lubrication. If the viscosity of the film is 0.07 N-s/m^2 and minimum oil film thickness is 15 micron, find the width of the guide. Table moves with a feed velocity of 0.4 mm/sec and the uplifting hydrodynamic force balances half of the

P.T.O.

vertical load acting on the table. Weight of the table and vertical component of cutting force together comes to be 25 kN and the specific pressure on guide on each side is 1.5 N/cm^2. Design a guide. **[8]**

Q4) a) In designing the bed of a machine tool, it is often found that the hollow rectangular cross-section is the most suitable one. Make a comprehensive evaluation of the various types of cross sections commonly used in machine tool on the basis of stress and deflection in both bending and torsion. **[8]**

b) Show the variation of coefficient of friction of a hydrostatic slideway against external pressure to which the oil is raised. Is it possible to get a condition when the coefficient of friction becomes zero? If so, determine the value of oil film thickness. **[8]**

Q5) Write short notes (any three) : **[18]**

a) Composite guideways.

b) Dependence of process capability of machine tool on its rigidity.

c) Dynamic analysis of stick-slip vibration in machine tools.

d) PIV drive.

SECTION - II

Q6) a) Analyze the load taken by the balls in a ball bearing used as a spindle support and show that due to contact deformation not more than 80% of the balls take the entire thrust. **[8]**

b) Discuss the systematic steps for selecting the lubrication oil to be used in machine tool operations and what are their influences on overall design of the machine tools. **[8]**

Q7) a) What is meant by regenerative chatter? Explain it with reference to any one type of machine tool. **[8]**

b) Analyze the forces acting on a radial drilling machine during drilling operation and explain the design procedure of radial arm. **[8]**

Q8) a) 'Stick-slip' error can be reduced by using hydraulic relieving of the table of a vertical boring machine. Prove that in such a case the oil film thickness is given 1.47 h_0, where h_0 is the minimum oil film thickness, mainly due to surface asperities. **[8]**

b) Draw a circuit diagram for hydrostatic power pack and flow line for a high speed spindle. Explain the function of important units of the system. Find out an expression for load that can be supported by it. **[8]**

Q9) a) Compare the following systems : **[8]**

i) Stepper motor and DC servomotors.

ii) DNC and Stand-alone NC machine.

b) Explain the functioning of a shaft encoder and why gray code rather than binary is used in shaft encoder. **[8]**

Q10) Write short notes (any three) : **[18]**

a) Retrofitting.

b) Preselective control systems.

c) Design considerations for CNC machine tools.

d) Dynamic characteristic of the cutting process.

Total No. of Questions : 8]

SEAT No. :

P2073

[Total No. of Pages : 2

[4165] - 197
M.E. (Production)
HUMAN FACTORS IN DESIGN AND MANUFACTURING
(2002 Course) (Elective - I (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain Analytical Hierarchy Process (AHP) in detail with suitable illustration. **[16]**

Q2) Explain Material Requirement Planning (MRP) with proper flow chart. **[16]**

Q3) Explain Product life cycle with suitable illustration. **[16]**

Q4) Write short note on: **[18]**

a) Job allocation.

b) Uses of Diagraph.

c) Life cycle cost.

SECTION - II

Q5) a) Explain different types of fatigue. **[8]**

b) Explain and state the difference between static and dynamic displays. **[8]**

Q6) a) Explain and apply ergonomics criterias to design a kitchen. **[8]**

b) Explain various types of controls. **[8]**

P.T.O.

Q7) Explain in detail various pillars of Lean Manufacturing. **[16]**

Q8) Write short note on: **[18]**

a) World class manufacturing.

b) Principles of motion economy.

c) Biomechanics.

Total No. of Questions : 8]

SEAT No. :

P2074

[Total No. of Pages : 2

[4165]-198
M.E. (Production)
PRECISION ENGINEERING
(2002 Course) (Elective - II (a))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt any Three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the errors in relative location of surfaces with neat sketches. **[8]**

b) Elaborate the significance of spindle rotation error for machine tools. **[8]**

Q2) a) Enumerate the concept of selective assembly in manufacturing with a suitable example and state its importance. **[8]**

b) Explain with neat sketch, procedure of calculating the clearance in journal bearings. **[8]**

Q3) a) Explain the steps in calculations of tolerances on coaxiality or non-coincidence of axes with typical example. **[8]**

b) Describe with suitable sketches the influence of machining parameters on surface roughness. **[8]**

Q4) Write short notes on (any Three) : **[18]**

a) Significance of traceability.

b) Precision angle measurement.

c) Errors due to numerical interpolation.

d) Role of amplification in measurement.

P.T.O.

SECTION - II

Q5) a) Explain the method of calculating the tolerances on distance between centers of holes with a suitable example. **[8]**

b) State reasons why coordinate measuring machines (CMM's) have not potentially shared by individual measuring instruments. **[8]**

Q6) a) Explain the general concept of accuracy of machine tool in the context of precision engineering. **[8]**

b) Enumerate your thoughts on the merits and limitations of analog vs. digital measuring equipment. Give specific examples. **[8]**

Q7) a) What is sampling? Explain the different sampling methods used in the industries. **[8]**

b) Explain the need of microfinishing processes in the machining of metals. **[8]**

Q8) a) Explain with a suitable example the inaccuracies due to thermal effects in precision machining. **[10]**

b) Discuss the principle of incomplete location for prismatic components. **[8]**

Total No. of Questions : 6]

SEAT No. :

P2075

[Total No. of Pages : 1

[4165] - 222

M.E. (Petroleum)

ADVANCED NATURAL GAS ENGINEERING AND TECHNOLOGY

(2002 Course) (Elective - II (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer two questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) Explain flash and differential liberation process, K values and its application. **[25]**

Q2) Derive the pipe line flow equation for series and parallel flow. **[25]**

Q3) Explain the design of centrifugal compressors. **[25]**

SECTION - II

Q4) Explain phase behavior of a gas reservoir. **[25]**

Q5) Draw a process flow diagram to show two methods how H2S is removed from a natural gas stream. **[25]**

Q6) Derive the equation used to calculate flow rate in a orifice meter. Explain all the constants. **[25]**

Total No. of Questions : 6]

SEAT No. :

P2076

[Total No. of Pages : 1

[4165]-228
M.E. (Petroleum Engineering)
WELL TESTING AND ANALYSIS
(2002 Course) (Elective - I (b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator, log-log semi-log paper is allowed.***
6) ***Assume suitable data, if necessary and clearly state it.***

SECTION - I

Q1) Derive the diffusivity equation in cylindrical coordinate system. **[25]**

Q2) Write an essay on DST and its interpretation. **[25]**

Q3) Derive the Laplace solution to the diffusivity equation. **[25]**

SECTION - II

Q4) State the complete methodology in analysis of a gas well. **[25]**

Q5) State the complete methodology in analysis of horizontal wells. **[25]**

Q6) Define and explain the Derivative plot. **[25]**

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Total No. of Questions : 8]

SEAT No.:

P2077

[Total No. of Pages : 2

[4165]-238
M.E. (Instrumentation) (Process & Biomedical)
TRANSDUCER DESIGN
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Design a pressure transducer having a diameter of 14mm, employ stainless steel with. Young's modulus = 209GPa. Specific gravity 7.83×10^{-3} kg/cm^3. and having Poisson's ratio = 0.286. Find out maximum strain and deflection developed for a pressure of 50MPa. **[18]**

a) Plot a graph for deflection versus pressure in steps of 5MPa. Starting with zero pressure.

b) Excitation given to strain gauges installed inside the diaphragm is 15V DC. Hence find electrical output of the bridge for every step of 5MPa pressure upto maximum of 50MPa.

c) Find out a natural resonant frequency of this transducer when maximum pressure is 50MPa.

- Quote assumptions made at every step of above three situation.
- Would it be better to employ diaphragm gauge or discrete strain gauge for this type of transducer.
- Note diaphragm has to be integral to the structure of transducer body.
- Corrossive elements are likely to affect the material hence choose appropriate material.

P.T.O.

Q2) Displacement of drilling machine is to be monitored during drilling operation. Use any contact type transducer and discuss its operation alongwith suitable signal conditioner and digital display. The range of variation is 0 to 25mm. **[16]**

Q3) Measurement of pH of urine is to be monitored. Suggest suitable set up. Also suggest temperature measuring device and compare merits of monitoring temperature and pH. So accuracy is improved. **[16]**

Q4) Discuss servo accelerometer for measuring acceleration in two axes for a moving platform installed in main oil basin. This platform is used as part of oil rig. The acceleration expected is 0 to 0.29 for a frequency range of $\frac{1}{20}$ Hz to 1Hz. **[16]**

SECTION - II

Q5) Measurement of flow in a closed pipe line drawing water from dam to municipal storage tanks. Discuss an electromagnetic flow meter to monitor flow and discharge. What accuracy one should consider when a dischange of 10cusecs is desired. What time would be required to fill up total of 10 lakh litre of storage tanks. **[16]**

Q6) Design a force transducer to monitor a force due to large vehicle on the weigh bridge. Design for maximum capacity of 80 Tons and accuracy less than 0.5% with a resolution of 0.5%. Discuss complete signal conditioning system with. Display of weight. What type of transducer is selected in this case? Justify choice. **[16]**

Q7) a) Discuss optical fiber transducer to measure : **[12]**

i) Temperature.

ii) Force.

b) Design a vibrating wire transducer based system to measure strain from 0 to 1000 microstrain. **[6]**

Q8) Discuss LASER based transducer for measuring : **[16]**

1) Gyration of earth. &

2) Displacement measurement using Michelson interferometer.

OR

3) LASER doppler velocity meter.

(Note - can attempt only 3 or should attempt 1 & 2 together)

Total No. of Questions : 8]

SEAT No.:

P2079

[Total No. of Pages : 1

[4165]-293
M.E. (Chemical)
PROCESS MODELING AND SIMULATION
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is a process model? How to form the model?
b) Discuss the classification of model. What is the difference between linear and non linear model? Explain with examples. **[16]**

Q2) a) Draw a flow chart of a systematic approach to process modeling. Enlist the points to form the key issues for each major modeling task. **[9]**
b) Discuss the classification of the categories of equations in process model. **[9]**

Q3) Derive the model for Batch reactor with heating and cooling phase. **[16]**

Q4) Develop the model for Batch distillation column. **[16]**

SECTION - II

Q5) Derive the model for Inverted Distillation column. **[18]**

Q6) Discuss the model for Bioreactor. **[16]**

Q7) What is process simulation? Explain in detail. **[16]**

Q8) a) Classify the optimization process.
b) Write steps involved in formulation of optimization problems. **[16]**

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Total No. of Questions : 8]

SEAT No. :

P2080

[Total No. of Pages : 2

[4165] - 296
M.E. (Chemical)
CATALYSIS AND SURFACE PHENOMENA
(2002 Course) (Elective - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Define catalysis & give its classification and discuss the preparation of Catalysis using industrial method. **[16]**

Q2) Define BET theory and derive the equation for surface area determination using BET method. **[16]**

Q3) Discuss the characterization of catalysis using

a) XRD method. **[8]**

b) NMR method. **[8]**

Q4) Write short notes on: **[18]**

a) Chemisorption.

b) Thermal stability of catalyst.

c) Zeolites.

SECTION - II

Q5) What are the various adsorption isotherms? Discuss the chemistry & thermodynamics of adsorption. **[16]**

P.T.O.

Q6) Discuss the catalytic deactivation prevention methods. **[16]**

Q7) Derive the equation for Effectiveness factor & Thiele modulus in catalysis. **[16]**

Q8) Write short notes on: **[18]**

a) Catalyst Regeneration.

b) FBR.

c) Heat & Mass Transfer in catalysis.

Total No. of Questions : 8]

SEAT No. :

P2081

[Total No. of Pages : 2

[4165]-297
M.E. (Chemical Engg.)
FLUIDIZATION ENGINEERING
(2002 Course) (Elective - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define fluidized state and discuss the hydrodynamics of fluidization system. **[8]**

b) Discuss the industrial applications of fluidization. **[8]**

Q2) a) Discuss the operating model for fluidization system. **[8]**

b) Mechanism of bubble formation. **[8]**

Q3) Explain the Davidson model for gas flow and write all corresponding equations needed for the model. **[16]**

Q4) Explain the following in detail : **[18]**

a) Incipient fluidization.

b) Pressure fluidization.

SECTION - II

Q5) a) Derive the equation for minimum fluidization velocity. **[9]**

b) Two phase and three phase inverse fluidized bed. **[9]**

P.T.O.

Q6) Explain in detail about : **[16]**

a) Modeling by bed collapsing.

b) Semi-fluidized bed system.

Q7) Derive the kinetic model for conversion of shrinking and growing particle in fluidization. **[16]**

Q8) Write short notes on : **[16]**

a) Conical fluidized bed.

b) Geldart's classification for power assessment.

Total No. of Questions : 8]

SEAT No.:

P2083

[Total No. of Pages : 2

[4165]-403
M.E. (Civil) (Construction and Management)
CONSTRUCTION TECHNOLOGY
(2008 Course) (Sem. - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) Explain the method of construction and discuss advantages and limitations for any two of the following methods of construction of caissons. **[16]**

a) Open caissons.

b) Precast concrete Well caissons.

c) Pneumatic caissons.

Q2) Explain with sketches sequence of construction of a" Interlocking circular 900 mm dia. Steel Pile Cofferdam" for a Bridge pier foundation in a river having with the following data : **[18]**

a) Size of the Footing 2.00 × 5.00 × 1.5 m. depth.

b) Founding level 3.0 m. below bed level.

c) Type of piles used '900 mm dia. Steel pile welded with half cut steel pile'.

d) Standing water level of 3.00 meters.

For the above data workout the following,

a) Size of the cofferdam required.

b) Size and length of the interlocking circular piles.

c) Number of piles required to complete the cofferdam.

P.T.O.

Q3) Explain the method of construction of casting and sinking of 'Pneumatic Sinking of cofferdam for a bridge pier in a creek with the use of 'Submersible Barge' and 'Floating Concrete Batching Plant'. **[16]**

Q4) Write short notes on <u>any three</u> of the following : **[16]**

a) Properties of grout mixes used for structural and geotechnical works.

b) Tunnel formwork and Mivan formwork.

c) Advantages and disadvantages of 'Well point system' of dewatering.

d) Slip form shuttering in 'High rise buildings'.

e) Jet grouting.

SECTION - II

Q5) a) Explain with sketches the method of construction and discuss advantages and Limitations of 'Micro Piles'. **[8]**

b) Explain method of construction of "Jet Grouting" with neat sketches and its application in soft soil tunneling. **[8]**

Q6) a) Precast segmental construction was adopted in a 'Flyover Bridge' construction having 10 segments per span. List out and explain in short various activities involved, from 'Clearance of the site' till completion of the work. **[9]**

b) Explain with sketches 'Method of launching' adopted to complete one span of 10 segments in 7 days. **[9]**

Q7) a) Explain sequence and construction of cast in situ Reinforced Concrete Diaphragm Wall used as a basement wall. **[8]**

b) Explain with a labeled sketch what is a "Primary panel" and a "Secondary Panel". What are the precautions taken in construction of a joint between such Panels. **[8]**

Q8) Write short notes on <u>any three</u> of the following : **[16]**

a) Merits and demerits of R.M.C. (Ready Mix Concrete) in high-rise buildings.

b) Factors to be considered in design of Machine Foundations.

c) Slip form technique used in high-rise buildings.

d) Accelerated curing methods used in high-rise buildings.

e) Chemical grouting and its applications.

Total No. of Questions : 8]

SEAT No. :

P2085

[Total No. of Pages : 3

[4165]-424

M.E. (Civil - Hydraulic Engineering)

WATER RESOURCES PLANNING & MANAGEMENT

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the various objectives of water resource planning? Explain them in brief. **[6]**

b) Discuss the engineering & management aspect in irrigation projects. **[6]**

c) What information or study is needed for carrying out the investigations in water resource project planning? **[6]**

Q2) a) What is the underlying principle in planning of multipurpose projects? For a water resources project which of the uses are most compatible & which are least compatible? How these are accounted in planning the reservoir storage? **[8]**

b) Why the projection of future is necessary in planning of water resources projects? What are the factors that are kept in view for project formulation? **[8]**

Q3) a) What are the various multi objective planning models that can be used in economic planning of water resources? Explain the same in detail. **[8]**

b) Write short notes on : **[8]**

i) Irrigation management policy.

ii) Economic aspect of water resource planning.

P.T.O.

Q4) a) Write short notes on : **[8]**

i) Water user's co-operative societies.

ii) Physical features of India-influencing water resource utilisation.

b) The details of various alternative proposals in a water resource development scheme are given as below.

Sr. No.	Proposal	Capital cost in crore	Annual Maintenance & operation cost in lac	Life in year	Rate of Interest %
1.	Large storage reservoir	8	4	75	8
2.	Storage reservoir together with pick up weir	6.5	6	70	8
3.	Lift irrigation scheme	5	7	40	8

Annual benefits from each reservoir is the same. Suggest the best alternative with justification. **[8]**

SECTION - II

Q5) a) What are the different bodies associated with water resource planning? Explain the working & importance of these bodies in water resource planning? **[9]**

b) Explain the necessity of integrated water resource management in water resource planning. **[9]**

Q6) a) Discuss the 'state water disputes' with giving examples. **[8]**

b) Explain the importance of global water partnership. **[8]**

Q7) a) Write short notes on : **[8]**

i) ICOLD.

ii) ICID.

b) How can you justify the feasibility of any irrigation project? Explain it by giving suitable examples. **[8]**

Q8) It is required to prepare the feasibility report for a multi-purpose water resource project by considering the following points – **[16]**

a) Investigations into resources.

b) Site conditions.

c) Legal issues.

d) Socio-economic aspect.

e) Other factors bearing upon the design of engineering works.

How will you proceed further in order to prepare a feasibility report for the project.

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Total No. of Questions : 8]

SEAT No. :

P2086

[Total No. of Pages : 2

[4165] - 427

M.E. (Civil - Hydraulics)

DAM ENGINEERING

(2008 Course) (Sem. - I) (Elective - I(b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer booklet.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A vertical gravity dam retains water up to a depth of 110 metres on the upstream side and the inclined surface retains water up to a height of 11 metres in the downstream side. The dam has a total base width of 60 metres. Determine the total uplift pressure when the centre line of the drainage gallery is at a distance of 10 metres from the upstream face. **[9]**

b) The elementary profile of a Gravity Dam is triangular in shape. The height of the Water in the upstream side is 76 metres and the height of the water in the downstream side is 6 metres. No drainage gallery is provided. The base width of the dam is 52 metres. The uplift coefficient is 0.8. Find the total uplift force acting over the dam. **[9]**

Q2) a) Prove that the best central angle for an arch dam is 133°34'. Give all the mathematical details with all the steps. **[8]**

b) What are major forces that act on a gravity dam? Write in brief about the Earthquake force acting on a gravity dam. **[8]**

Q3) a) Write in detail about Swedish Slip Circle method. **[8]**

b) A zoned type earthen dam of height of 50 m is proposed at a location where hard rock is available at 8 m depth below the river bed.

i) Draw a sketch of the cross section showing all the dimensions of different components.

Show at least two components and state the function of each of them. **[8]**

P.T.O.

Q4) a) Draw the neat sketch of a side channel spillway and show the important parts of it. **[8]**

b) With the help of neat sketch, explain the type of stilling basin that is preferred for Froude number more than 4.5 and less than 9.0 with the velocity of flow less than 15m/s. **[8]**

SECTION - II

Q5) a) Determine the crest level and shape of crest of an ogee spillway by USWES profile for the following data: **[9]**

i) Length of Spillway = 180m.

ii) Discharge capacity = $1600 m^3/s$.

iii) Upstream face is vertical.

iv) Downstream slop 0.75 H: 1.0V

v) R.B.L. = 120m.

vi) M.W.L. = 160m

$C_d = 2.275$.

b) Draw the neat sketch of an Energy Dissipator and show all the parts. **[9]**

Q6) a) What do you mean by Drainage Gallery? How the uplift pressure is reduced by providing Drainage Gallery? Explain it with the help of Sketch. Assume that water height in the upstream side is 'H_1' and in the down stream side is 'H_2'. Assume the base width of the dam as 'B' and the coefficient of uplift is 0.9. **[8]**

b) Draw the neat sketch of a Morning Glory Spillway and show all the parts of it. **[8]**

Q7) a) Discuss about the construction methods of Rockfill dam. What are the challenges to be faced while constructing a Rockfill Dam? **[8]**

b) Discuss in brief about the Tainter Gate and explain it with a neat sketch. **[8]**

Q8) a) What is ogee spillway? What are the other types of spillways? Write in brief about the design criteria of an ogee spillway with all the required formulae. **[8]**

b) State any three types of Energy Dissipation devices below a Spillway. **[4]**

c) Write in detail about the Hydraulic failures of Earthen Dams. **[4]**

Total No. of Questions : 8]

SEAT No. :

P2087

[Total No. of Pages : 2

[4165] - 428

M.E. (Civil) (Hydraulic Engg.)

SYSTEMS TECHNIQUES IN WATER RESOURCES ENGG.

(2008 Course) (Sem. - I) (Elective - I (c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the concept of system, its characteristics and hierarchy of system with the help of an example from water resources engineering. **[8]**

b) Discuss the characteristics and manageable resources of ground water system. How can the conjunctive use of surface and ground water be effectively achieved by applying systems concepts? **[8]**

Q2) a) Explain in brief the theory of duality. What are primal-dual relationships? Discuss the concept of sensitivity analysis and its use. **[8]**

b) Solve the following linear programming problem. **[8]**

Maximize $Z = 2X_1 + X_2$

Subject to $3X_1 + X_2 \leq 300$

$4X_1 + 2X_2 \leq 500$

Also write it's dual and solve.

Q3) a) Classify the types of non-linear programming problems and explain the method of solution by Lagrange Multipliers. **[8]**

b) Find the minimum of $f = x(x - 1.5)$ in the interval (0, 1) to within 10% of the exact value by dichotomous search method. **[10]**

Q4) a) Explain the 'curse of dimensionality' for dynamic programming. **[4]**

b) Explain the Bellman's principle of optimality and state the requirements of dynamic programming problem. **[8]**

c) State the composition of Hessian Matrix. How do you decide it's nature? **[4]**

P.T.O

SECTION - II

Q5) a) Explain Transportation array and discuss it's noteworthy features. **[6]**

b) Total available supply at each of the three origins namely: A, B and C is 10, 25 and 25 respectively. The total demand at each of the four destinations is given as 10, 15, 20 and 15 respectively. Obtain initial feasible solution using North West Corner Rule. **[10]**

Q6) a) State whether each of the following functions is a polynomial, posynomial or both. **[6]**

i) $f = 4 - x_1^2 + 6x_1 x_2 + 3x_2^2$

ii) $f = 4 + 2 x_1^2 + 5x_1 x_2 + x_2^2$

iii) $f = 4 + 2x_1^2 x_2^{-1} + 3x_2^{-4} + 5x_1^{-1} x_2^3$.

b) Explain the following: **[8]**

i) Arithmetic - geometric inequality.

ii) Unconstrained minimization problem.

c) Define Saddle point and fair game. **[2]**

Q7) a) List the main components of a queing system. Explain their characteristics. **[2]**

b) Explain the following terms: **[8]**

i) Net Present value.

ii) Internal rate of return.

iii) Capital recovery factor and sinking fund factor.

iv) Benefit cost ratio.

c) What is an annuity? Write in briefly on 'present value of an annuity' and 'amount of an annuity'. **[8]**

Q8) a) Explain the procedure of solving sequencing problem of 3 stations and n-jobs. **[6]**

b) What is Simulation? Explain Monte Carlo simulation technique in water resources engineering. **[6]**

c) Describe briefly 'Markov process' and Markov chain. **[4]**

Total No. of Questions : 6]

SEAT No. :

P2089

[Total No. of Pages : 3

[4165]-433
M.E. (Civil) Structure
ADVANCED SOLID MECHANICS
(2008 Course) (Sem. - I)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Obtain the differential equation of equilibrium to be satisfied by rectangular stress components acting on element in a stressed body. **[7]**

b) What is compatibility of strains? Obtain strain compatibility equation for 2D problem in elasticity? **[8]**

c) A plane passing through point (x, y, z) in a stressed elastic body has its normal 'n' with direction cosines cos(n,x), cos(n,y), cos(n,z). Obtain expressions for the stress resultants (Tn) and its direction in terms of six independent components at that point. **[10]**

Q2) a) Explain the concept of 'Stress Invariants' and hence discuss the state of Pure Shear and Hydrostatic State of Stress? **[7]**

b) If $\Phi = a.x^4/12 + b.x^3y/6 + c.x^2.y^2 + d.x.y^3/6 + e.y^4/12$, obtain the stress distribution on the sides of rectangular plate of size L × 2C. Neglect body forces. Also check for static equilibrium of the plate under this stress distribution. **[8]**

c) Find stress and strain components of a cantilever beam loaded with a point load at its free end using Airy's Stress Function? **[10]**

P.T.O.

Q3) a) Define the plane strain problem. Write the basic equations of equilibrium, strain-displacement and stress-strain relations for a plain strain 2D problem in Polar Co-ordinates. **[8]**

b) Define an axi-symmetric problem in elasticity giving two examples. Write the basic equations for stress equilibrium, compatibility and stress components in an axi-symmetric problem. **[7]**

c) A curved bar with constant narrow c/s and circular axis is bent in the plane of curvature by a moment "M" applied at the ends. Obtain the necessary equation to find stress distribution σ_r and $\sigma\theta$. **[10]**

SECTION - II

Q4) a) A thick cylinder with open ends has internal and external radii 'a' and 'b' respectively. It is subjected to a uniform external pressure 'P_0'. Treating this as an axially symmetrical problem obtain relations for radial and tangential stresses in terms of radial co-ordinate 'r'.

Hence obtain the relations for the circumferential and radial strains at the outer radius 'b' in the cylinder. **[15]**

b) A thick walled open ended cylinder is made of RCC with E = 20 GPa and Poisson's ratio 0.17. It has an inside diameter of 600 mm and outside diameter 750 mm. The cylinder is subjected to external pressure of 15 kN/m^2.

Compute :

i) principal stresses at inner and outer radii of the cylinder.
ii) the maximum shear stress in the cylinder.
iii) the change in the external diameter of the cylinder. **[10]**

Q5) A uniform bar of elliptical cross section has semi-major and semi-minor axes of length '*a*' and '*b*' respectively. The bar carries an axial twisting moment 'M_t applied at each end. Using Prandalt's Stress Function in the form.

$\Phi = m(x^2/a^2 + y^2/b^2 - 1)$, where 'm' is constant, obtain the solution for shear stress in cross section satisfying the boundary conditions. **[25]**

Q6) a) State the assumptions in the analysis of beams on elastic foundations. Give your comments thereon. **[5]**

b) Indian Railway use steel rails with I-section having following data-

Width of top flange = 40 mm, width of bottom flange = 120 mm
Depth of section = 185 mm, distance of x-x axis from bottom = 85 mm
$I_{xx} = 38.5 \times 10^6$ mm^4, E = 2×10^5 MPa.

The rail is supported on an elastic foundation with foundation constant K = 15 MPa. A diesel locomotive with their wheels spaced at 1.7 m passes over the rail. Assuming the rail as Infinite Beam on elastic foundation, obtain maximum values of deflection, B.M. and flexural stress if the load on each wheel is 180 kN. **[20]**

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Total No. of Questions : 6]

SEAT No. :

P2090

[Total No. of Pages : 3

[4165]-441

M.E. (Civil - Structures)

PLASTIC METHOD FOR ANALYSIS AND DESIGN OF STEEL STRUCTURES

(2008 Course) (Elective - II (c)) (Sem. - I)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non programmable calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Determine the shape function of unequal-section having following dimensions. **[10]**

Top flange = 250 mm × 50 mm
Bottom flange = 400 mm × 50 mm
Web = 50 mm × 200 mm (excluding flanges).

b) A simply supported beam of T section is subjected to sagging bending moment. Find the shape factor if permissible yield stress in compression and tension is 200 MPa and 250 MPa respectively. The T section has following dimensions : **[15]**

Top flange = 120 mm × 12 mm
Web = 12 mm × 168 mm (excluding top flange).

Q2) a) A continuous beam ABCD is as shown in fig. 1. Find the plastic moment and draw BMD at collapse. **[12]**

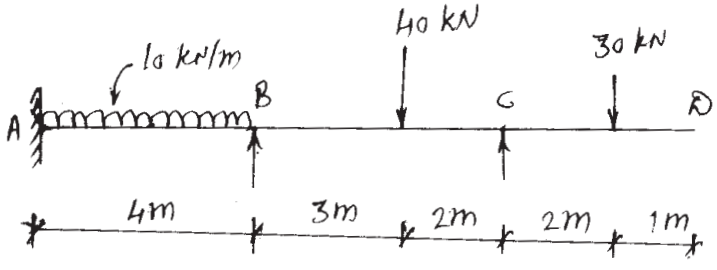

Fig. 1 (Q 2a)

P.T.O.

b) Determine the plastic moment capacity of the frame for the loading shown in Fig. 2. The loads shown are the working loads. Take load factor = 1.75. Sketch all possible mechanism. **[13]**

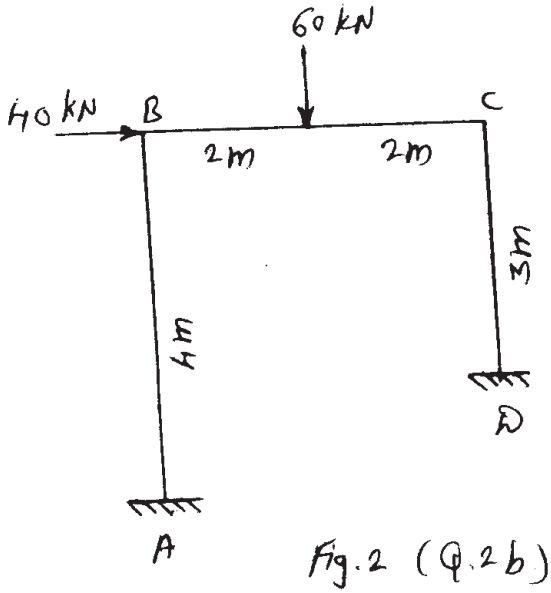

Fig. 2 (Q.2b)

Q3) A symmetrical gable portal frame ABCDE has bases A & E fixed, 14 m apart. Vertical columns AB and ED, each 6 m in height and apex C is 8 m above base. It is subjected to horizontal load of 40 kN at B and vertical load of 80 kN at center of each gable beam. Mp is uniform. **[25]**

a) Draw all basic mechanisms and obtain Mp in each case.

b) Draw combined-sway + gable mechanism and obtain Mp.

SECTION - II

Q4) a) How the cross sections are classified in limit state theory? What is its significance? **[5]**

b) Explain in brief, philosophy of limit state design. **[5]**

c) A simply supported beam of 7 m effective span carrying factored load of 80 kN/m on entire span and a point load of 40 kN at 3 m from left end. The compression flange is laterally supported. Design the section as per IS 800-2007 and check for shear and deflection. **[15]**

Q5) Design a column of a non sway frame subjected to factored axial load of 250 kN and factored bending moments of 60 kNm and 30 kNm at its top hinged end and bottom fixed end respectively. Both bending moments produce identical curvature about zz axis. Height of column is 5 m and it is braced at its midheight to provide local lateral restraint for buckling about yy axis. Design the section as per IS 800-2007. **[25]**

Q6) Design symmetrical gable portal frame for workshop shed of span 20 m. Height of columns is 8 m and apex is at 12 m from the base. Columns are fixed at bottom. AC sheets are used over purlins. Using DL + LL combination, design the frame for bending as per IS 800-2007. **[25]**

Total No. of Questions : 8]

SEAT No. :

P2094

[Total No. of Pages : 2

[4165] - 462

M.E. (Civil) (Hydraulic Engineering)

WATER MANAGEMENT & CONVEYANCE SYSTEMS

(2008 Course) (Elective - III (c)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the nature of waste inputs to water system. Why point source pollution reduction is easier & cheaper than non-point source pollution? **[9]**

b) Explain the following: **[9]**

i) Micro-organism survival models.

ii) Dissolved oxygen models.

iii) Toxic substance & heat management.

Q2) a) Discuss the water issues or problems from a global, national & local perspective. **[8]**

b) What are the various technologies used for water conservation & also explain the impact of water conservation systems. **[8]**

Q3) a) Explain the design elements of water distribution system. Why system modeling is necessary in water distribution system? **[8]**

b) What do you mean by water tariff? Give the criteria on which water tariffs are set & also explain the different water tariff structures. **[8]**

P.T.O

Q4) Write short notes on the following: **[16]**

a) Applications of computer based models for water quality & contaminant transport.

b) Quantity estimation of water.

c) Diffusion & dispersion regime theory for river flow.

d) Measurement techniques of water distribution.

SECTION - II

Q5) a) What are the methods of runoff control in the innovative design of urban drainage. Also explain on-site detention method of runoff control giving its advantages & disadvantages. **[9]**

b) Write short notes on the following: **[9]**

i) Meteorological data analysis.

ii) Use of deterministic & stochastic modeling.

Q6) a) Discuss the structural & non-structural alternatives for accomodating large floods at dams. **[8]**

b) Enlist the various hydraulic structures for river bank protection & formation of deep navigation channel. What are the effects of these structures on river surface profile & sediment transport. **[8]**

Q7) a) Discuss on the relative economics of hydel plant & thermal power plant for power generation. **[8]**

b) How do you make the assessment of water power potential of a hydro-electric scheme? **[8]**

Q8) Write short notes on the following (any four): **[16]**

a) Effect of levees on river stages.

b) Flood ways.

c) Channel improvement.

d) Early warning or dam failure warning system for structural modification.

e) Components of hydroelectric development.

f) Alternative structures to avoid erosion & deposition around the structure.

Total No. of Questions : 6]

SEAT No. :

P2097

[Total No. of Pages : 2

[4165]-466
M.E. (Civil) (Structure)
MANAGEMENT IN STRUCTURAL ENGINEERING
(2008 Course) (Sem. - II)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the time management? Explain the parameters of time management. **[6]**

b) What do you mean by logistic management? **[7]**

c) Explain the principles of material management. **[6]**

d) Define the terms : **[6]**

i) Asset.
ii) Accounting.
iii) Liability.
iv) Capital.
v) Revenue.
vi) Profit.

Q2) a) Explain the concept of T.Q.M. **[5]**

b) Differentiate strength and durability of concrete. **[5]**

c) Explain ultrasonic pulse velocity method. **[7]**

d) Explain the various parameters affecting durability of concrete. **[8]**

Q3) a) What is structural audit? Explain the steps in structural audit. **[10]**

b) State and explain different methods of NDT. **[8]**

c) Explain carbonation depth measurement test. **[7]**

P.T.O.

SECTION - II

Q4) a) Differentiate between retrofitting, restoration and rehabilitation. **[6]**

b) What are the requirements of structural detailing? Also explain structural detailing for restoration. **[10]**

c) Explain with sketches : **[9]**

i) Base isolation techniques.
ii) Shear wall.
iii) Jacketing to the structural members.

Q5) a) What are the objectives of construction safety? Explain different methods adopted for construction safety. **[10]**

b) What are the factors governing the selection of type of formwork. **[5]**

c) Explain design of formwork with respect to load on formwork, design criterion and design procedure. **[10]**

Q6) a) What are the various factors influencing on reuse of demolished material. **[6]**

b) Explain method of implosion. **[6]**

c) Explain the sequence of detonation. **[6]**

d) Explain step by step method of demolition by explosives. **[7]**

Total No. of Questions : 6]

SEAT No. :

P2098

[Total No. of Pages : 3

[4165] - 467

M.E. (Civil) (Structure)

EARTH QUAKE RESISTANT DESIGN OF STRUCTURES

(Sem. - II) (2008 Course) (Elective - III (a))

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***
7) ***Use of IS 1893 (Part I) 2002 is permitted.***

SECTION - I

Q1) a) What are the causes of earthquakes? Explain with neat sketches the 'Elastic Rebound Theory'. **[6]**

b) What is lique faction of soil? Explain the causes and various measurement to be taken to reduce it. **[7]**

c) Write notes on: **[12]**

i) Convergent, Divergent and transform boundries.

ii) Types of faults.

iii) Reservoir Induced Earthquakes.

iv) Past Earthquakes in India.

Q2) a) Explain with sketches the vertical and plan irregularities in buildings. How the structure should be planned to have substantial torsional rigidity? **[6]**

b) What are the lessons learnt from past earthquakes. **[7]**

c) Write notes on: **[12]**

i) Strong ground motion.

ii) Strength and stiffness.

iii) Soft and Weak storey.

iv) Earthquake Measuring devices.

P.T.O.

Q3) a) Explain the different techniques of Seismic Design. **[6]**

b) Explain the following: **[7]**

i) Importance and Response Reduction factor.

ii) Time History Method.

c) A three storeyed symmetrical RC school building situated at Bhuj with following data: **[12]**

i) Plan Dimensions at plinth level: 7m.

ii) Storey height : 3.5m.

iii) Total weight of beam in a storey = 130 kN.

iv) Total weight of column in a storey = 250 kN.

v) Total weight of walls in a storey = 530 kN.

vi) Live Load / Storey = 130 kN.

vii) Wt. of terrace floor = 655 kN.

The structure is resting on hard rock. Determine total base shear and lateral loads at each floor levels for 5% damping using seismic Coefficient Method.

SECTION - II

Q4) a) Define shear wall and its classification. **[4]**

b) A RC shear wall has following details **[8]**

i) Height of wall = 12m.

ii) Thickness of wall = 150 mm.

iii) Size of RC column connecting shear wall = 400 mm x 400 mm.

iv) Width of shear wall = 4.2m.

Calculate lateral stiffness of wall for an inplane point load at the top assuming that the wall is rigidly held at base. Assume M25 grade for RC shear wall.

c) What are the requirements of ductility? Explain their types and factors affecting ductility. **[13]**

Q5) a) Describe the concept of base isolation. Explain types of base isolation techniques. **[7]**

b) What is Seismic Evaluation? What are different retrofitting techniques? Explain non conventional technique of retrofitting. **[9]**

c) Describe the procedure to be adopted to ascertain the requirement and level of retrofitting. **[9]**

Q6) a) Explain structural behavior of reinforced masonry walls and infill walls. **[7]**

b) Write notes on: **[18]**

i) Winkler's Model.

ii) Seismic Design of RC elevated water tank.

iii) Retrofitting of Masonry Low Rise structures.

iv) Flexural and Shear behavior of RC shear wall.

Total No. of Questions : 6]

SEAT No. :

P2099

[Total No. of Pages : 2

[4165] - 470
M.E. (Civil) (Structures)
NON-LINEAR ANALYSIS OF STRUCTURES
(2008 Course) (Elective - III (d)) (Sem. - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non programmable calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find approximate solution for a moment - slope non linear analysis of a cantilever beam with point load at the free end. Plot load-deflection curves. **[13]**

b) State and explain types of nonlinearities, with examples, in the analysis of structure. **[6]**

c) State and explain techniques of non-linear analysis. **[6]**

Q2) a) Derive Material Nonlinearity of plates using Ramberg-Osgood relation. **[8]**

b) Write the strain energies due to stretching, bending and kinetic energy of an orthotropic plate. Use Hamilton's principle and stress function approach to derive governing equations. **[17]**

Q3) a) Obtain the governing equations for an orthotropic rectangular plate with immovable in plane boundary conditions. Use Berger Approach. **[15]**

b) State and explain different boundary conditions for the nonlinear analysis of plates obtained from variational technique. **[10]**

SECTION - II

Q4) Obtain approximate solutions for the tip deflection components of cantilever column at post-buckling stage due non linear behaviour considering moment curvature relationship. **[25]**

P.T.O

Q5) a) For a two-node truss element, develop the tangent stiffness matrix and force vector corresponding to the configuration at time t. Consider large displacement and large strain conditions. **[12]**

b) Derive Tangent Stiffness matrix of a member of plane frame. **[13]**

Q6) a) Write steps involved in elastic plastic analysis of frames. **[13]**

b) Obtain statics matrices by Elastic-Plastic Analysis for a member with **[12]**

i) A plastic hinge at end1.

ii) A plastic hinge at end2.

iii) Hinges at both the ends.

Total No. of Questions : 8]

SEAT No. :

P2101

[Total No. of Pages : 3

[4165]-476

M.E. (Civil) (Environmental Engineering)

AIR POLLUTION AND CONTROL

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Question Nos.1 and 5 are compulsory. Out of the remaining attempt 2 questions from Section I and 2 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe various sources of air pollution with suitable examples. **[6]**

b) What are the causes and consequences of acid rains? Explain the mechanism of formation of acid rain in the atmosphere. **[6]**

c) State the classification of air pollutants with reference to origin, state of matter and chemical composition mentioning suitable example in each case. **[6]**

Q2) a) Explain with relevant chemical reactions the process of formation of photochemical smog in atmosphere. What are the effects of photo chemical smog on the environment? **[8]**

b) What is atmospheric stability? State how the atmospheric stability is determined using environmental lapse rate and dry adiabetic lapse rate.**[8]**

Q3) a) What is temperature inversion? Explain the radiation and subsidence inversion in brief. **[8]**

b) Explain the effect of surface topography on wind velocity profile and turbulance in the atmosphere. Give the significance with reference to dispersion of pollutants. **[8]**

P.T.O.

Q4) a) State the Gaussian Plume model for determination of pollutant concentration at a point (x, y, z) on the down wind direction. State the assumptions made during formulation and explain the terminology used in the model. **[10]**

b) Explain the wind rose diagram and its importance in the dispersion of air pollutants. **[6]**

SECTION - II

Q5) a) Explain the procedure used for determination of Suspended Particulate Matter (SPM) during ambient air sampling.

High volume sampler is used for ambient air sampling for particulate matter at a road intersection. Determine the SPM in $\mu g/m^3$ present in the air at standard temperature and pressure conditions. Use following data.

i) Average temperature and pressure of the sampling day = 28ºC and 740 mm of Hg.

ii) Flow rate for air sampling
Initial = 105 m^3/min, when filter was clean.
Final = 1.2 m^3/min at the end of sampling time.

iii) Sampling period = 8 hours.

iv) Weight of clean & dry filter = 3.25 g.
Final weight of filter paper at the end of sampling = 3.46 g. **[10]**

b) Write short note on any two : **[8]**

i) Bag house filter.

ii) Electrostatic precipitator.

iii) Venturi scruber.

iv) Cyclone separator.

Q6) a) Explain the principles used for construction of control equipments for removal of particulate matter from flue gas. **[8]**

b) List out various control equipments used for controlling gases emissions from flue gas. Explain any two in detail. **[8]**

Q7) a) What are the major gases pollutants normally present in flue gas? Explain the principles used in construction of control equipments for removal of gases pollutants from flue gas. **[8]**

b) Enumerate the different sources of air pollution in urban areas. What preventive measures should be adapted to maintain better quality of air in urban areas? **[8]**

Q8) a) What are the circumstances favoring use of combustion process as method of controlling the pollutants? Explain in brief the working of catalytic converter. **[8]**

b) State and explain the important provisions made under Air (Prevention and Control) Act. State the role and responsibilities of Central Pollution Control Board. **[8]**

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Total No. of Questions : 10]

SEAT No.:

P2102

[Total No. of Pages : 2

[4165]-477
M.E. (Civil) (Environmental Engg.)
PHYSICO-CHEMICAL PROCESS FOR WATER AND WASTEWATER TREATMENT
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from section-I and 3 questions from section-II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are physical, chemical and biological characteristics of wastewater? **[8]**

b) Define treatability index and what is the significance of treatability index? **[8]**

Q2) a) Give difference between unit operations and unit processes. **[8]**

b) Explain the different treatment units in the preliminary and primary treatment of wastewater. **[8]**

Q3) a) Explain the phenomenon of aeration and gas transfer. **[8]**

b) Explain theory of coagulation. Give equations of coagulation by alum. **[8]**

Q4) a) Explain in detail, the working of a circular clariflocculator. Draw the typical cross section of a circular clariflocculator, showing various components. **[10]**

b) Define mean velocity gradient. How it is calculated in the design of clariflocculator. **[8]**

Q5) Write short note on : **[4 × 4]**

a) Potable water standards.

b) Wastewater effluent standards.

c) Tertiary treatment.

d) Types of aeration.

P.T.O.

SECTION - II

Q6) a) Design a set of rapid sand filters for treating water required for a population of 80,000. Rate of water supply = 200 lit/hr/day. The filters are rated to work at 5000 lit/hr/m^2. Show the arrangement of filter units. **[10]**

b) Give the classification of filters on various bases. **[8]**

Q7) a) Enlist the various components of rapid sand filter and explain it. **[8]**

b) What are wash water troughs? Give various layouts and cross-sections of troughs. **[8]**

Q8) a) What are the different disinfecting agents? Explain. **[8]**

b) Explain disinfection with chlorine dioxide and chloramines. **[8]**

Q9) a) Give applications of Reverse Osmosis and Micro-filtration. **[8]**

b) What are the different methods of Desalination? Explain. **[8]**

Q10) Write short note on : **[4 × 4]**

a) Important guidelines for design of slow sand filter.

b) Working and operation of filter.

c) Ozonation.

d) Electrodyalisis.

Total No. of Questions : 12]

SEAT No.:

P2104

[Total No. of Pages : 4

[4165]-494
M.E. (Mechanical Engineering)
(Common to Design, Heat Power, Mechatronics and Automotive Engg.)
TECHNOLOGY AND FINANCIAL MANAGEMENT
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any one question from each unit.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I
Unit - I

Q1) a) Write short notes on the following : **[10]**

i) Types for capital.

ii) Sources of long term finance.

b) Foster company has gathered the following information for the month of July, 2001 : **[6]**

Sales :	Rs.2,00,000
Sales commissions :	10% of sales
Advertising expenses :	Rs.5,000 + 2% of sales
Miscellaneous selling expenses :	Rs.1,000 + 1% of sales
Office salaries :	Rs.7,000
Office supplies :	0.5% of sales
Travel and entertainment :	Rs.4,000
Miscellaneous administrative expenses :	Rs.1,750

Prepare a selling and administrative budget

OR

Q2) a) What do you understand by fixed and flexible budgets? Explain. **[6]**

P.T.O.

b) Paints Private Ltd. Company, manufacturing a single product, is facing servere competition in selling it at Rs.50 per unit. The company is operating at 60% level of capacity at which level the sales are Rs.1200000 and variable costs are Rs.30 per unit. Semi-variable costs may be considered as fixed at Rs.90000 when output is nil and the variable costs is Rs.250 for each additional 1% level of activity. Fixed costs are Rs.150000 at the present level of activity. But at 80% level of activity or above, these costs are expected to increase by Rs.50000.

To cope up with the competition, the management of the company is considering a proposal to reduce the selling price by 5%. Prepare a flexible budget statement showing the operating profit at levels of activity of 60%, 70%, 80%, 90% assuming that :

i) The selling price remains at Rs.50.
ii) The selling price is reduced by 5%. **[10]**

Unit - II

Q3) a) Discuss the nature and characteristics of process costing system? **[6]**

b) From the following figures, prepare process accounts indicating the cost of process and the total cost. The production was 480 articles per week.

	Process I	Process II	Process III
Materials	Rs.3000	Rs.1000	Rs.400
Labor	1600	4000	1200
Factory overheads	520	1440	500

Office overheads amounting to Rs.1700 should be apportioned on the basis of wages. Ignore stock in hand and work-in-progress at the beginning and end of the week. **[8]**

c) What are the special features of contract costing? **[4]**

OR

Q4) a) What is Activity Based Costing? How activities are classified in Activity Based Costing? **[5]**

b) What do you mean by marginal costing? Discuss its usefulness and limitations? **[5]**

c) A factory is engaged in manufacturing plastic buckets is working to 40% capacity and produces 10000 buckets per annum. The selling price is Rs.20 per bucket. The present cost break-up for one bucket is as under :

Material	Rs.10
Labor cost	3
Overheads	5 (60% fixed)

If it is decided to work the factory at 50% capacity the selling price falls by 3%. At 90% capacity, the selling price falls by 5% accompanied by similar fall in the prices of material. Calculate the profit at 50% and 90% capacities and also calculate the break-even points for the same capacity productions. **[8]**

Unit - III

Q5) a) State and explain the Law of Demand. Examine the role of price, income, prices of related goods and advertising as factors determining demand. **[10]**

b) Discuss briefly on different types of competition. **[6]**

OR

Q6) a) Discuss the role of costs in pricing. How does the consumer behavior affect pricing policies? **[10]**

b) Distinguish between Balance of Trade and Balance of Payments. **[6]**

SECTION - II

Unit - IV

Q7) a) Distinguish between quality planning, quality control and quality improvement. Explain in brief Juran's spiral of progress in quality. **[8]**

b) Explain in brief different work elements normally performed by quality specialists. **[8]**

OR

Q8) a) Distinguish between *push* and *pull* system? Explain the role of Kanban cards in JIT cycle with the help of a neat line diagram? **[10]**

b) Explain the different quality management principles defined in ISO 9001-2000 series. **[6]**

Unit - V

Q9) a) Explain in brief different types of concession contracts used in BOT policy of project management? **[8]**

b) What do you mean by a critical path in a network? What are its characteristics? **[6]**

c) Define 'Slack Time' of an event and 'Float' of an activity? **[4]**

OR

Q10) a) Distinguish between PERT and CPM? **[6]**

b) Define 'Normal Time' and 'Crash Time' of an activity. **[4]**

c) Draw a network with the following data and find out the critical path. What is the minimum time required for completion of the project as indicated by the critical path. **[8]**

Activity	Time (Days)	Preceding Activities
A	10	-
B	12	-
C	8	-
D	13	A
E	14	A
F	18	B,D
G	14	C
H	12	C
I	12	F,G

Unit - VI

Q11) a) What do you understand by Human Resource Planning. Explain the various steps in the Human Resource Planning? **[8]**

b) Why is it important for organizations to do an effective job of recruiting? What are the advantages and disadvantages of various external recruitment sources? **[8]**

OR

Q12) a) Define the term 'Training and Development'. Bring out the importance of Training and Development? **[8]**

b) What is performance appraisal? What are its objectives? How do the results of performance appraisal affect other HR activities? **[8]**

Total No. of Questions : 8]

P2105

SEAT No.:

[Total No. of Pages : 7

[4165]-503
M.E. (Mech. - Heat Power)
ADVANCED HEAT TRANSFER
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write the general differential equation of heat conduction in cylindrical (r, θ, z) and spherical coordinates (r, θ, ϕ). Also draw the schematic of control volume for the two cases. **[6]**

b) Heat is conducted through a uniformly tapered rod of square cross-section and length 50cm. as shown in fig - (I). At the left end, the side face is 3cm and the temperature is 600ºC. At the right end, the corresponding values are 8cm and 150ºC. Determine :

i) The rate of heat conduction.

ii) The temperature at a point 30cm from the hot end.

It may be presumed that thermal conductivity of the rod is 60 w/mk. and heat is conducted only along the length of the rod. **[10]**

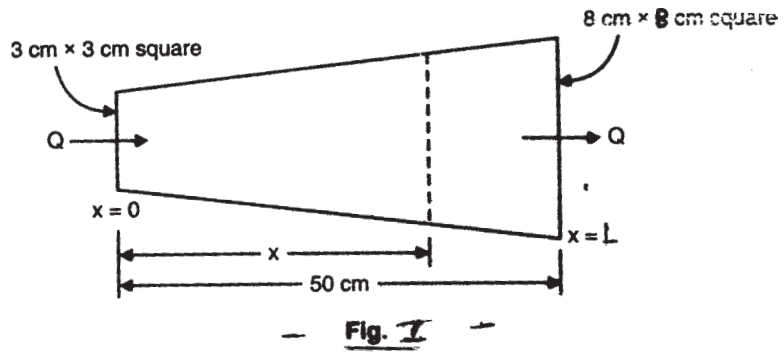

Fig. I

P.T.O.

Q2) a) Describe different types of boundary conditions applied to heat conduction problems. **[8]**

b) An electrical conductor of copper with a diameter of 1mm is covered with a plastic insulation of thickness 1mm. The temperature of the surroundings is 20ºC. Find the maximum current carried by the conductor so that no part of the plastic is above 80ºC. (eighty deg. C). The following data can be used :

Thermal conductivity of copper and plastic are 400w/mk and 0.5w/mk, respectively. Heat transfer coefficient, h = 8w/m^{2}k and specific electric resistance of copper = (3×10^{-8}) ohm-m. Discuss the effect of increase of insulation on the current carrying capacity of the conductor. **[8]**

Q3) a) Write a note on efficiency of fin and effectiveness of fin. **[5]**

b) To determine thermal conductivity of a long solid rod of 20mm diameter, one end was inserted into a furnace while the other end was projecting into the air at 28ºC. After steady state has been reached, the temperatures at two points 100mm apart were measured and found to be 125ºC and 91ºC, respectively. The heat transfer coefficient over the surface of the rod was estimated to be 17.5w/m^{2}k. Estimate the thermal conductivity of the rod. **[7]**

c) Explain Navier-stokes equations in brief. **[4]**

Q4) a) A large plate of aluminium 5cm thick and initially at 200ºC is suddenly exposed to the convection environment at 70ºC. Find the centre temperature of the plate 1 minute after the plate has been exposed to the environment. Take, for aluminium, k = 215w/mk, $\alpha = 8.4 \times 10^{-5}$ m^2/s. Heat transfer coefficient, h = 525w/m^{2}k. Is it a case of lumped system? You may use Heisler chart. **[6]**

b) Explain : **[6]**

i) Time constant of a thermocouple.

ii) Biot and Fourier numbers.

c) At a certain instant of time, the temperature distribution in a long cylindrical five tube can be represented by the relation,

T = ($c_1 + c_2 r - c_3 r^2$) where, c_1 = 650, c_2 = 800 and c_3 = 4250 and temperature is in ºC and radius r is in meter. The tube has 50cm ID and 80cm O.D. For tube material K = 5.5w/mk, α = 0.004m^2/hr. Find the rate of change of temperature at the inside & outside surface of the tube. **[6]**

SECTION - II

Q5) a) Determine the value of heat transfer coefficient for the following temperature profile given by the relation;

$$\frac{\theta}{\theta_s} = \sin\left(\frac{\pi y}{k_1}\right)$$ where, $k_1 = 0.015$ and $\theta = (T_s - T)$ and $\theta_s = (T_s - T_\infty)$.

Thermal conductivity $k = 0.026$w/mk. Sketch the temperature profile for the surface of the plate. **[7]**

b) Explain Reynolds and Colburn analogy. **[5]**

c) The local heat transfer coefficient h_x for the flow over a flat plate is given by, $h_x = a\,(x)^{-0.1}$. Where x is the distance from the leading edge. Develop an expression for the average and local heat transfer coefficient. **[4]**

Q6) a) Air at a pressure of 8 kpa (0.08 bar) and a temperature of 240ºC flows over a flat plate 30cm wide & 100cm long at a velocity of 45kmph. If the plate is to be maintained at a temperature of 80ºC, estimate the rate of heat to be removed continuously from the plate. You may use the property table for air given at the end. Properties are given at a pressure of 1 atm.

Use the following relations :

$\overline{Nu}_L = 0.662\,(Re_L)^{0.5}\,(P_r)^{0.33}$, for Laminar flow.

$\overline{Nu}_L = 0.037\,(Re_L)^{0.8}\,(P_r)^{0.33}$, for turbulent flow. **[6]**

b) Write a note on various heat transfer enhancement techniques. **[4]**

c) The velocity and temperature profiles for a fully developed flow at a particular axial location in a 20cm diameter pipeline may be approximated by the followings :

$u = 96\,(r) - 190\,(r^2)$ m/s

$T = 100\,(1 - 2r)$ ºC

where r is the distance measured from inside surface. Calculate the average or cupmixing temperature of the fluid. **[6]**

Q7) a) Atmospheric air passes through a 25mm diameter horizontal tube at an average velocity of 35cm/sec. The tube is maintained at 140ºC and the bulk temperature of air is 30ºC. State whether the flow is mixed; natural or forced convection. Also find the Graetz no. (GZ). **[7]**

b) One - hundred tubes of 12.7mm diameter are arranged in a square array

and exposed to atmospheric steam. Calculate the heat transfer rate per unit length of tubes for a tube wall temperature of 98ºC. **[6]**

c) Explain : **[5]**

i) Film wise and drop wise condensation.

ii) Radiation shape factors.

Q8) a) Write short notes (any two) : **[6]**

i) Pool Boiling.

ii) Electronic cooling.

iii) Ablative cooling.

b) Consider a very long isocelles triangular duct shown below. For the given dimensions : $ab = ac = x$ and $bc = x/2$. Find the shape factor F_{12}. **[6]**

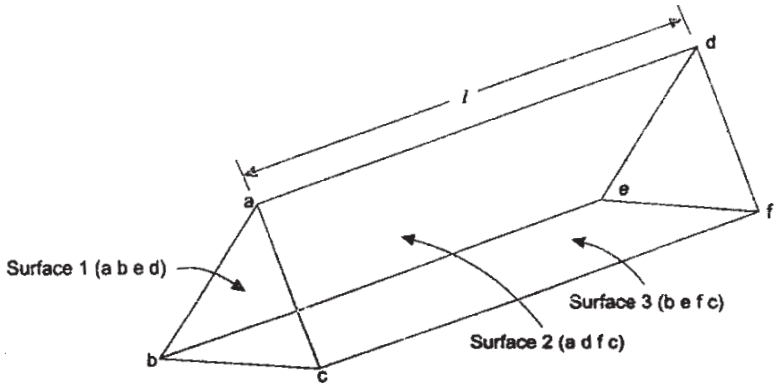

Fig. II

OR

A black body of 1500cm^2 has an effective temperature of 700ºC. Calculate :

i) Intensity of normal radiation.

ii) Intensity of radiation along a direction 45º to the normal.

iii) The wavelength of maximum monochromatic emissive power. **[6]**

c) Explain (any one) : **[4]**

i) Solid angle and intensity of radiation.

ii) Monochromatic and total emissive power.

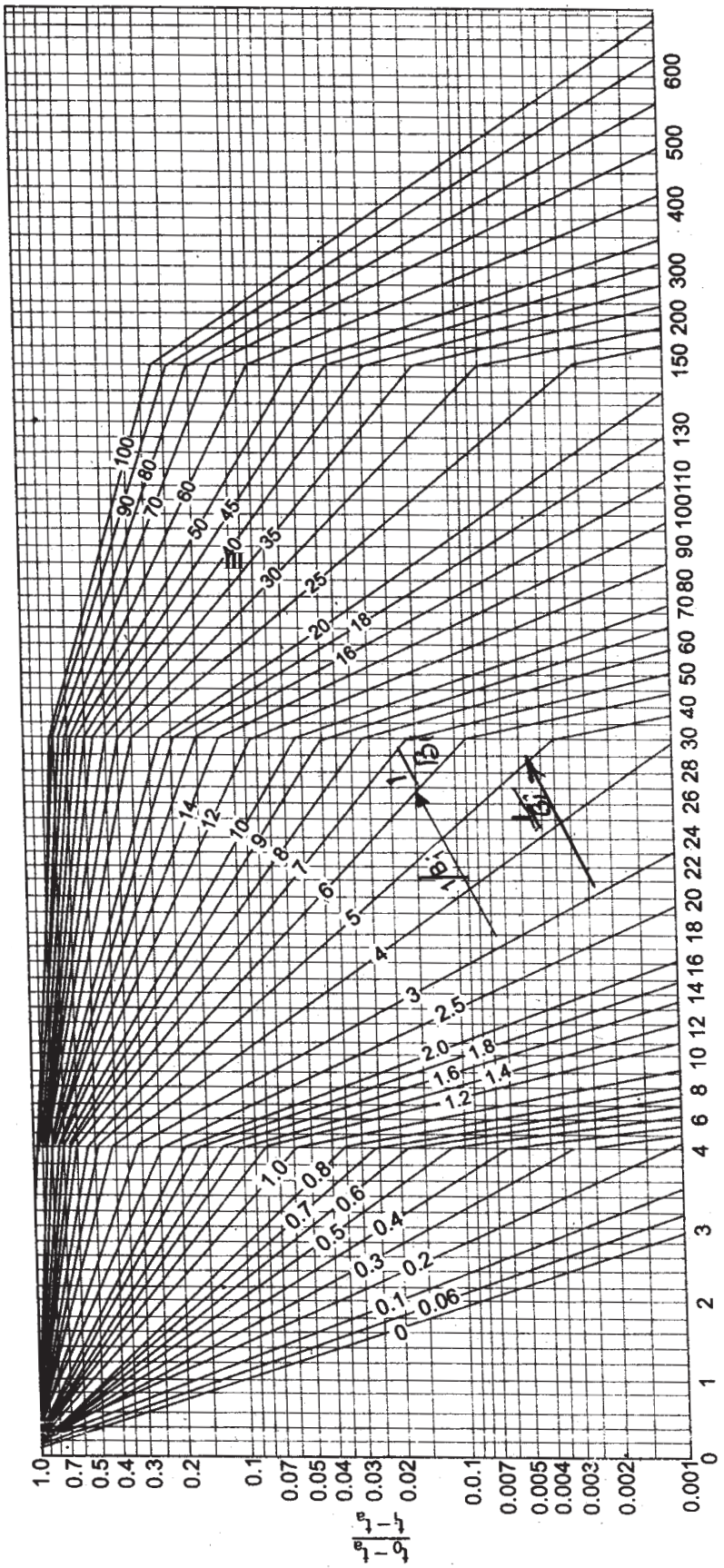

Fig. III Heisler chart for temperature history at the centre of a plane

Appendix-B

Table B.1. Physical Properties of Water (Liquid)

t °C	ρ kg/m^3	c_p kJ/kgK	$k \times 10^2$ W/mK	$\alpha \times 10^4$ m^2/hr	$\mu \times 10^2$ kg/hr-m	$\nu \times 10^6$ m^2/s	Pr –
0	999.9	4.212	55.093	4.71	644.093	1.789	13.67
10	999.7	4.191	57.418	4.94	469.818	1.306	9.54
20	998.2	4.183	59.859	5.16	361.892	1.006	7.02
30	995.7	4.174	61.718	5.35	288.668	0.805	5.42
40	992.2	4.174	63.345	5.51	235.602	0.659	4.31
50	988.1	4.178	64.740	5.65	197.771	0.556	3.54
60	983.2	4.178	65.902	5.78	169.305	0.478	2.98
70	977.8	4.187	66.716	5.87	146.370	0.415	2.55
80	971.8	4.195	67.413	5.96	127.924	0.365	2.21
90	965.3	4.208	67.995	6.03	113.507	0.326	1.95
100	958.4	4.220	68.227	6.09	101.910	0.295	1.75
110	951.0	4.233	68.460	6.13	92.215	0.272	1.60
120	943.2	4.250	68.576	6.16	85.448	0.252	1.47
130	934.8	4.266	68.576	6.29	78.744	0.233	1.36
140	926.1	4.287	68.460	6.21	72.475	0.217	1.26
150	917.0	4.312	68.343	6.22	66.792	0.203	1.17
160	907.0	4.346	68.227	6.23	62.206	0.191	1.10
170	897.3	4.379	67.878	6.22	58.623	0.181	1.05
180	886.9	4.417	63.413	6.20	54.976	0.173	1.00
190	876.0	4.459	66.949	6.17	51.921	0.165	0.96
200	863.0	4.505	66.251	6.14	49.266	0.158	0.93
220	840.3	4.614	64.508	5.99	44.823	0.148	0.89
240	813.6	4.756	62.764	5.84	41.356	0.141	0.87
260	784.3	4.949	60.440	5.61	38.274	0.135	0.87
280	750.7	5.229	57.418	5.27	35.596	0.131	0.90
300	712.5	5.736	53.931	4.75	32.835	0.129	0.97

Table B.2. Physical Properties of Air (At 1 atm)

t °C	ρ kg/m^3	c_p kJ/kgK	$k \times 10^2$ W/mK	$\alpha \times 10^4$ m^2/hr	$\mu \times 10^2$ kg/hr-m	$v \times 10^6$ m^2/s	Pr –
– 50	1.584	1.013	2.036	4.57	5.264	9.22	0.728
– 40	1.515	1.013	2.115	4.96	5.475	10.04	0.728
– 30	1.453	1.013	2.197	5.37	5.645	10.80	0.723
– 20	1.395	1.009	2.278	5.38	5.822	12.09	0.716
– 10	1.342	1.009	2.360	6.28	5.996	12.43	0.712
0	1.293	1.005	2.441	6.77	6.188	13.28	0.707
10	1.247	1.005	2.511	7.22	6.346	14.16	0.705
20	1.205	1.005	2.592	7.71	6.533	15.06	0.703
30	1.165	1.005	2.673	8.23	6.717	16.00	0.701
40	1.128	1.005	2.755	8.75	6.904	16.96	0.699
50	1.093	1.005	2.824	9.29	7.067	17.95	0.698
60	1.060	1.005	2.894	9.79	7.221	18.97	0.696
70	1.029	1.009	3.045	10.28	7.523	21.09	0.692
80	1.000	1.009	3.045	10.87	7.523	21.09	0.692
90	0.972	1.009	3.127	11.48	7.701	22.10	0.690
100	0.946	1.009	3.208	12.11	7.880	23.13	0.688
120	0.898	1.009	3.336	13.26	8.170	25.45	0.686
140	0.854	1.013	3.487	14.52	8.479	27.80	0.684
160	0.815	1.017	3.638	15.80	8.786	30.08	0.682
180	0.779	1.022	3.778	17.10	9.070	32.49	0.681
200	0.746	1.026	3.929	18.49	9.380	34.85	0680
250	0.674	1.038	4.266	21.49	10.020	40.61	0.677

☒☒☒☒

Total No. of Questions : 10]

P2106

SEAT No. : [ ]

[Total No. of Pages : 2

[4165] - 511

M.E. (Mechanical) (Heat Power)

COMPUTER AIDED ENGINEERING (DESIGN)

(2008 Course) (Elective - IV (a)) (Open Study) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Discuss steps used for simulation model building with suitable example. **[8]**

b) Explain the role of CAE in system design. **[8]**

Q2) a) Explain feature based modeling features available in commercial modeling software and explain any one in detail. **[8]**

b) Explain how to reduce ideal time of modeling and analysis of a system using CAD/CAM/CAE software. **[8]**

Q3) a) Classify solid modeling techniques and explain in detail hybrid solid modeling technique. **[8]**

b) Discuss the set of issues that need to be addressed during development of conceptual model for analysis. **[8]**

Q4) a) Explain briefly effect of mesh density and biasing in critical regions of meshing. **[8]**

b) Explain typical issues in contact analysis used in FEA. **[8]**

P.T.O.

Q5) Write short notes on :

a) Numerical methods used in FEA. **[6]**

b) Bottom up Assembly modeling approaches. **[6]**

c) Analytical techniques for structural systems. **[6]**

SECTION - II

Q6) a) Define CFD and describe briefly its need and motivation. **[8]**

b) Explain role of simulation in CAE. **[8]**

Q7) a) Discuss briefly general considerations used during mesh generation related to discretization and generation of finite element data. **[8]**

b) Classify 3D meshing techniques of FEA and explain any one in detail. **[8]**

Q8) a) Enlist different ways to apply force and moment in FEA and explain any one in detail with suitable example. **[8]**

b) Explain with suitable example, how to apply constraint for the solid elements used in FEA. **[8]**

Q9) a) Explain finite difference method used in CFD and how it is different from FEM. **[8]**

b) Explain different types of grids in CFD. **[8]**

Q10)Write short notes on :

a) Describe the stages of CFD analysis. **[6]**

b) Methods to improve quality of poor elements in FEA. **[6]**

c) Difference between static and dynamic analysis. **[6]**

❖❖❖❖

Total No. of Questions : 8]

SEAT No. :

P2107

[Total No. of Pages : 3

[4165] - 517

M.E. (Mechanical) (Design Engineering)

OPTIMIZATION TECHNIQUES

(Sem. - I) (2008 Course) (Elective - I (c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Three grades of coal A, B and C contain phosphorus and ash as impurities. In a particular industrial process fuel up to 100 ton (maximum) is required which should contain ash not more than 3% and phosphorus not more than 0.03%. It is desired to maximize the profit while satisfying these conditions. There is an unlimited supply of each grade. The percentage of impurities and the profits of grades are given below: **[10]**

Coal	Phosphorus(%)	Ash(%)	Profit in rupees per ton
A	0.02	3.0	12
B	0.04	2.0	15
C	0.03	5.0	14

Find the proportions in which the three grades be used.

b) What is difference between linear and nonlinear programming problems? **[6]**

Q2) a) A beam of uniform rectangular cross section is to be cut from a log having a circular cross section of diameter 2a. The beam has to be used as a cantilever beam (the length is fixed) to carry a concentrated load at the free end. Find the dimensions of the beam that correspond to the maximum tensile (bending) stress carrying capacity. **[10]**

b) Explain convex programming problems. **[6]**

P.T.O.

Q3) a) An Air Force is experimenting with three types of bombs P, Q and R in which three kinds of explosions viz. A, B and C will be used. Taking the various factors into account, it has been decided to use the maximum 600 kg of explosive A, at least 480 kg of explosive B and exactly 540 kg of explosive C. Bomb P requires 3,2,2 kg, Q requires 1,4,3 kg and R requires 4,2,3 kg of explosives A, B and C respectively. Bomb P is estimated to give the equivalent of a 2 ton explosion, bomb Q a 3 ton explosion and bomb R a 4 ton explosion respectively. Under what production schedule can the Air Force make the biggest bang? **[10]**

b) Classification of optimization problems. **[6]**

Q4) Write short notes on (any three): **[18]**

a) Engineering applications of optimization.

b) Theorem of necessary condition and sufficient condition.

c) Pivotal reduction method.

d) Equality constraint.

SECTION - II

Q5) a) Minimize $f(x_1,x_2) = x_1 - x_1 + 2x_1^2 + 2x_1x_2 + x_2^2$ from the starting point $X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ using Powell's method. **[10]**

b) What is the difference between the simplex algorithm and the simplex method? **[6]**

Q6) a) Determine minimum of the following function using the golden section search $f = 2 - 4x + e$ Compute the minimum with $x = 0$, step size of 0.5 and tolerance = 0.01. **[10]**

b) Explain Direct search method. **[6]**

Q7) a) Minimize $f(x_1,x_2) = x_1 - x_1 + 2x_1^2 + 2x_1x_2 + x_2^2$ from the starting point $X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ using Conjugate gradient method. **[10]**

b) How do you identify the presence of multiple optima in the simplex method. **[6]**

Q8) Write short notes on (any three): **[18]**

a) Random Search methods to solve a constrained optimization problem.

b) Geometric interpretation of Sequential Linear Programming.

c) Penalty function method.

d) Conjugate gradient method.

Total No. of Questions : 10]

SEAT No. :

P2108

[Total No. of Pages : 2

[4165]-519

M.E. (Mechanical) (Design Engineering)

PROCESS EQUIPMENT DESIGN

(2008 Course) (Elective - II (b)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the method for calculating thickness of torispherical head subjected to internal and external pressure. **[6]**

b) Explain importance of design pressure, factor of safety, weld joint efficiency in relation to P.E.D. **[4]**

c) A pressure vessel is to be designed for an internal pressure of 0.4 N/mm^2. The vessel has nominal diameter of 1.2 m. The vessel is made up of S.S. with permissible stress of 120 N/mm^2. No corrosion allowance is necessary. If the weight of vessel and content is 3000 kg and torque due to offset piping is 500 N-m. Find stresses due combined loading. **[6]**

Q2) a) What are different types of storage vessels used for storage of liquid and gases. **[6]**

b) List the theories of failure and explain any one of them. **[4]**

c) A tall vessel of 1.5 m in diameter and 13 m in height is to be provided with skirt support. The weight of vessel attachments is 90,000 kg. Skirt diameter is equal to diameter of vessel and height is 2.2 m, wind pressure on the vessel is 110 kg/m^3. Seismic coefficient is 0.08; permissible stress in skirt material is 900 kg/cm^2 and permissible compressive stress is 800 kg/cm^2. Estimate thickness of support. **[6]**

P.T.O.

Q3) a) Discuss step by step design procedure for tall vessels including skirt design. **[6]**

b) What is gasket factor? Explain gasket selection and classification. **[4]**

c) What are entrainment separators? Explain their applications, Advantages and disadvantages. **[6]**

Q4) a) What are integral, fabricated and formed nozzles. **[6]**

b) What are the various types of losses in case of storage of volatile fluids. **[4]**

c) A storage tank is to store 25,000 kgs, of benzene having density 800 kg/m^3. Due to space limitations the maximum tank diameter is 2.4 m, Estimate height of tank if liquid is to be filled up to 90% capacity of storage tank. **[6]**

Q5) Write short notes on the following (Any three) : **[18]**

a) Nozzle reinforcement.

b) Theories of failure.

c) Optimum techniques in P.E.D.

d) Hortonsphers - Design, Advantage & Disadvantage and Applications.

SECTION - II

Q6) a) Explain with neat sketches various expansion provision arrangements in Heat exchanger. **[8]**

b) Give classification of filters. Explain any one in detail. **[8]**

Q7) a) Explain the importance of piping design in process equipment design. **[8]**

b) Explain with neat sketches valves used on pipe line. **[8]**

Q8) a) What are agitators? Explain design consideration of an agitator. **[8]**

b) Explain testing & inspection of pressure vessels. **[8]**

Q9) a) Explain the fundamentals of process measurements & control. **[8]**

b) Explain with neat sketch - storage vessels. **[8]**

Q10) Write short note (Any Three) : **[18]**

a) Protective usings for process equipments.

b) Process flow diagrams.

c) Centrifuges.

d) CAD in process equipment design.

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Total No. of Questions : 10]

P2109

SEAT No.:

[Total No. of Pages : 4

[4165]-521
M.E. (Mechanical) (Design Engineering)
VIBRATION AND NOISE CONTROL
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic table and electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Derive the equations of motion for the two degree of freedom system as shown in Fig. No.1, obtain the natural frequencies and natural modes. Also write the general solution to the free vibration. **[16]**

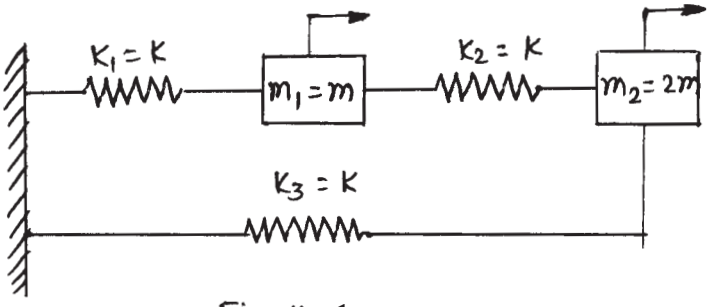

Fig. No. 1

Q2) A uniform bar of length 'l', cross sectional area 'A' density 'ρ' and young's modulus 'E' is free at x = 0 and attached to a spring of stiffness 'K' at x = l, as shown in Fig. No.2. Determine the natural frequencies and the mode shapes of longitudinal vibration of the bar. **[16]**

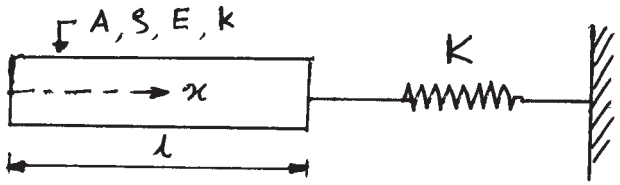

Fig. No. 2

P.T.O.

Q3) Derive expressions for dimensionless displacements in undamped dynamic vibration absorber in terms of the parameters of the system. For the tuned absorber, show : **[16]**

a) The relationship between response speed and mass ratio.

b) Frequency response curves for main system and absorber.

Q4) A building frame is modeled as an undamped single degree of freedom system. Find the response of the frame if it is subjected to blast loading represented by the triangular pulse. Refer Fig. No. 3. **[16]**

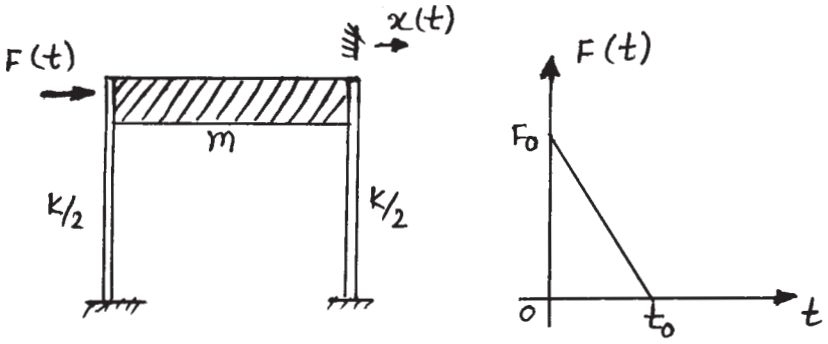

Fig. No. 3

Q5) Write the short notes of the following (any two) : **[18]**

a) Vibration isolation with practical examples.

b) Influence coefficients.

c) Rayleigh's Method.

SECTION - II

Q6) a) Explain Mechine conditioning and Monitoring. **[8]**

b) When an undamped vibration absorber, having a mass 30kg and a stiffness 'k', is added to a spring mass system of mass 40kg and stiffness 0.1MN/m, the main mass (40kg mass) is found to have zero amplitude during its steady state operation under a harmonic force of amplitude 300N. Determine the steady state amplitude of the absorber mass. **[8]**

Q7) a) Derive an expression for the spectral density of a derived process. **[6]**

b) Give three examples of random input. How will you proceed to find their Power Spectral Density?

Calculate the Autocorrelation function corresponding to the ideal white noise and to the unit step function. **[10]**

Q8) The motion of mechanical system with nonlinear restoring force is given by the equation $\ddot{x} + w_n^2 x + \beta x^3 = 0$ with initial conditions $x(0) = A$ and $\dot{x}(0) = 0$ where w_n is the natural frequency of linear system. Using Perturbation method show that $w^2 = w_n^2 + 3/4\ \beta A^2$ upto first order correction. **[16]**

Q9) a) Explain the need of Octave band analysis in noise control. **[5]**

b) Explain Noise measurement using a suitable example. **[5]**

c) A machine operator in a factory is surrounded by five machines. The machines produce sound pressure levels of 95 dB, 87 dB, 90 dB, 93dB 88dB respectively at the operator's position, when there is no back ground noise. When the machines are 'off', the SPL at this position 88dB, determine the total sound pressure level at this position due to both the machines and ambient sound. **[6]**

Q10) Write the short notes of the following (any two) : **[18]**

a) Experimental Modal Analysis.

b) Ambient emission noise standards in India.

c) Jump Phenomenon.

Laplace Transform Pairs

	$f(t)$	$L[f(t)]$
1.	$f(t)$	$\int_0^\infty f(t)e^{-st}dt = F(s)$
2.	$x(t)+y(t)$	$X(s)+Y(s)$
3.	$K f(t)$	$K F(s)$
4.	$u(t)$ *or* 1	$\frac{1}{s}$
5.	$\partial(i)$	1
6.	t	$\frac{1}{s^2}$
7.	t^n	$\frac{n!}{s^{n+1}}$
8.	Sin ωt	$\frac{\omega}{s^2+\omega^2}$
9.	Cos t	$\frac{s}{s^2+\omega^2}$
10.	e^{-at}	$\frac{1}{s+a}$
11.	e^{-at} Sin ωt	$\frac{\omega}{(s+a)^2+\omega^2}$
12.	e^{-at} Cos ωt	$\frac{s+a}{(s+a)^2+\omega^2}$
13.	$e^{-at} f(t)$	$F(s+a)$
14.	$u(t-a)$	$\frac{e^{-as}}{s}$
15.	$\partial(t-a)$	e^{-as}
16.	$\begin{bmatrix}0 \text{ when } t<a \\ f(t-a) \text{ when } t>a\end{bmatrix} = f(t-a)u(t-a)$	$e^{-as}F(s)$
17.	$\frac{df(t)}{dt}$	$sF(s)-f(0)$
18	$\frac{d^2f(t)}{dt}$	$s^2F(s)-sf(0)-\frac{df(0)}{dt}$
19.	$\int_0^t f(t)dt$	$\frac{F(s)}{s}$

Total No. of Questions : 10]

SEAT No. :

P2111

[Total No. of Pages : 2

[4165] - 526

M.E. (Mech. - Design Engineering)

COMPUTER AIDED ENGINEERING

(Sem. - II) (2008 Course) (Elective - III(c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any THREE questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain generalized procedure for modeling and simulation of Electromechanical systems. **[8]**

b) Enlist the data exchange issues related to the analysis and simulation. **[8]**

Q2) a) Discuss the analytical techniques used for thermo-fluid systems. **[8]**

b) Explain the role of assembly modeling in simulation. **[8]**

Q3) a) Differentiate between parametric and constrained based solid modeling techniques. **[8]**

b) Explain coupled thermo mechanical stress analysis with the help of suitable example. **[8]**

Q4) a) Explain stress tensors and their invariants in contest to von-misses stress. **[8]**

b) Differentiate between dynamic and fatigue analysis. **[8]**

Q5) Write short notes on:

a) Topology optimization in FEA Software. **[6]**

b) Top down assembly modeling approaches. **[6]**

c) Material models in FEA software. **[6]**

P.T.O.

SECTION - II

Q6) a) Enlist different types of elements used in FEA and explain how to decide element type. **[10]**

b) Classify and explain 3D meshing techniques of FEA. **[6]**

Q7) a) Explain some of the quality checks used to check 2D meshing in FEA. **[8]**

b) What is mesh refinement, Explain mesh refinement methods with suitable examples. **[8]**

Q8) a) Explain the general procedure used for static analysis of any engineering systems. **[8]**

b) Explain finite volume method used in CFD analysis and how it is different from FEM. **[8]**

Q9) a) State and explain in detail the fundamental physical principals of CFD. **[10]**

b) Explain problems of an airfoil shape descritized with rectangular grid. **[6]**

Q10) Write short notes on:

a) Uniform and compressed grids used in CFD. **[6]**

b) Methods to improve quality of poor elements in FEA. **[6]**

c) Thermal analysis in CAE. **[6]**

Total No. of Questions : 8]

SEAT No.:

P2113

[Total No. of Pages : 2

[4165]-539
M.E. (Mechanical) (Mechatronics)
MICROCONTROLLERS
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Explain the features and architecture of 8051 with detailed block diagram. **[10]**

b) Explain the software tools used in microcontroller systems. **[6]**

Q2) a) Interface 4Kbytes × 8 RAM and 2Kbytes × 8 ROM with 8051 and give details of memory mapping. **[8]**

b) Explain serial communication in 8051 with all required special function registers and other details. **[8]**

Q3) a) Explain the following instructions : **[8]**

i) DJNZ Rn, Label.
ii) ADDC A, <Source>.
iii) ACALL Addr.
iv) CJNE <Dest>; <Src>.

b) Explain the Addressing Modes in 8051 with suitable examples. **[8]**

Q4) Write short note on : **[18]**

a) Logic Analyzer.
b) Internal Memory Map of 8051.
c) Power saving modes in 8051.

P.T.O.

SECTION - II

Q5) a) Draw the interfacing diagram of Stepper motor with 8051 and explain the algorithm for rotating the stepper motor in clockwise and anticlockwise direction. **[10]**

b) Write an assembly language program to generate square wave of 50% duty cycle on the pin P0.5 using Timer 0. (Assume XTAL = 12MHz). **[8]**

Q6) a) Explain the Interrupt Structure of 8051 and write interrupt priority on reset. **[8]**

b) Draw interfacing diagram of ADC with 8051 and explain the algorithm to display this converted data on to port 0. **[8]**

Q7) a) Explain the architecture of PIC microcontroller of the series 16XX. **[8]**

b) Explain the features of ARM7TDMI family Microcontroller. **[8]**

Q8) a) Explain the register model of ARM7TDMI architecture and different operating modes. **[8]**

b) Write short note on : **[8]**

i) RS232.

ii) I^2C Bus.

Total No. of Questions : 8]

SEAT No.:

P2114

[Total No. of Pages : 2

[4165]-557
M.E. Mechanical (Automotive Engineering)
AUTOMOTIVE FUELS AND EMISSIONS
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if required, but state the assumptions clearly.***

SECTION - I

Q1) a) Discuss the octane rating and cetane rating. **[6]**

b) What are the various additives used in conventional fuels? **[6]**

c) Discuss the various stages of combustion in SI engines. **[6]**

Q2) a) Discuss the importance of alternative fuels in the Indian context. **[6]**

b) Explain in brief the drawbacks of using straight vegetable oils (SVO) in IC engines. **[4]**

c) Describe at least three methods to produce hydrogen. **[6]**

Q3) a) Explain the concepts of enthalpy of formation and combustion. **[4]**

b) What do you mean by stoichiometric combustion? What is the definition of adiabatic flame temperature? **[6]**

c) Describe the criterion of chemical equilibrium and define the equilibrium constant. **[6]**

Q4) Write short notes on : **[16]**

a) LPG composition and storage.

b) Biodiesel Production.

c) Detonation in SI Engine.

d) Simultaneous Relations.

P.T.O.

SECTION - II

Q5) a) Discuss in brief the various design and operating parameters responsible for formation of : **[8]**

i) Carbon monoxide.
ii) Hydrocarbons.
iii) Oxides of nitrogen in petrol and diesel engine.

b) Discuss briefly the following with regard to S.I. Engines : **[8]**

i) Crank case emission.
ii) Evaporative emission.
iii) Exhaust emission.

Q6) a) What is smoke? What are the bad effects of smoke on human health and how smoke in diesel engine can be controlled? **[8]**

b) Explain the ambient air quality standards. **[8]**

Q7) a) Explain with neat sketch positive crankcase ventilation system. **[8]**

b) Explain and compare electronic catalytic converter and conventional exhaust catalytic converter. **[8]**

Q8) Write notes on : **[18]**

a) Euro III and Bharat norms.
b) E.G.R.
c) Greenhouse gas emissions.

Total No. of Questions : 6]

SEAT No. :

P2117

[Total No. of Pages : 3

[4165] - 601

M.E. (Electrical) (Power Electronics & Drives)

DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS IN ELECTRICAL DRIVES

(2008 Course) (Elective - I (a)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Solve any TWO questions from Section - I and any TWO questions from Section - II***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Few discrete time systems are given below: **[10]**

i) $y(n) = x^2(n)$.

ii) $y(n) = x(2n)$.

Check whether systems are

1) Static or dynamic.

2) Linear or Non-linear.

3) Shift variant or invariant.

b) Explain classification of Discrete Time Signal. **[7]**

c) Find linear convolution of following sequences using matrix or tabular method. **[8]**

i) $x(n) = 2$ *for* $n = -2,0,1$

$= 1$ *for* $n = -1$

$= 0$ *otherwise*

$$h(n)=\delta(n)+2\delta(n-1)+\delta(n-2)-\delta(n-3).$$

P.T.O

ii) $x(n) = \{1,1,0,1,1\}$ *for* $-3 \leq n \leq 0$

$h(n) = \{1,-2,-3,4\}$ *for* $-3 \leq n \leq 0$

OR

Q2) a) State and prove following properties of z-transform **[9]**

i) Linearity.

ii) Time shifting.

iii) Initial Value Theorem.

b) Find the inverse z-transform using partial fraction method. **[8]**

$$x(z)=\frac{1+3z^{-1}}{1+5z^{-1}+4z^{-2}}$$

For

i) $\text{ROC}|z|>4$.

ii) $\text{ROC}|z|<1$.

c) Determine the z-transform and the ROC of the signal. **[8]**

i) $x(n)=\left[3.\left(\frac{1}{4}\right)^n-4.\left(\frac{1}{2}\right)^n\right]u(n)$.

ii) $x(n)=\{1,-2,1,3,4\}$ for $-4 \leq n \leq 0$.

Q3) a) State and explain following properties of DFT. **[12]**

i) Periodicity.

ii) Linearity.

iii) Circular convolution.

b) Explain 8-point Radix-2 DIF-FFT algorithm. **[7]**

c) Compute 4-point DFT of the sequence $x(n) = \{0,1,2,3\}$. **[6]**

SECTION - II

Q4) a) Give difference between analog and digital filters. **[6]**

b) Design the band-pass filter whose frequency response is given by **[10]**

$$H(e^{jw})=1 \quad for \frac{\pi}{6} \leq |\omega| \leq \frac{\pi}{3}$$

$$= 0 \quad otherwise$$

using rectangular window for length M = 5.

c) The system function of the analog filter is given by **[9]**

$$H(s)=\frac{s+0.1}{(s+0.1)^2+16}$$

Obtain system function of the digital filter using bilinear transformation which is resonant at $\omega_r = \frac{\pi}{2}$.

Q5) a) Explain applications of multi-rate signal processing. **[10]**

b) Explain decimation by factor D and interpolation by factor I. **[8]**

c) Explain DAC in compact hi-fi system. **[7]**

Q6) Write short note on: **[25]**

a) Barrel Shifter.

b) Harmonic analysis using DSP.

c) Power factor correction using DSP.

Total No. of Questions : 6]

SEAT No. :

P2118

[Total No. of Pages : 2

[4165]-615
M.E. (E & TC) (Microwave)
ELECTROMAGNETICS AND ANTENNA THEORY
(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the different methods of computation electromagnetics, how do they help in solving electromagnetics problem. Give qualitative comparison of all the methods. **[15]**

b) Explain the Finite Difference method by taking a suitable example. **[10]**

Q2) a) Find the potentials at points *a* and *b* for the system shown in Fig. 2(a) using Finite Difference method. **[18]**

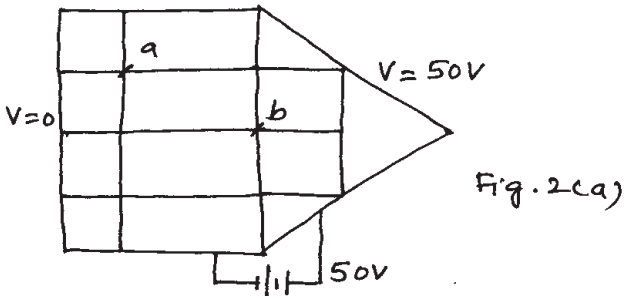

Fig. 2(a)

b) Define the Green's function, explain its significance and application by taking suitable example. **[7]**

Q3) a) Explain the Yee's FD algorithm in detail by giving mathematical expressions and flow chart also its application in solving electro magnetic problem. **[15]**

b) Write a detailed note on applications of FDTD to wave guide and planar Antenna. **[10]**

P.T.O.

SECTION - II

Q4) a) Draw the structural details of Microstrip Antenna showing all dimensions. What are the advantages and disadvantages of Microstrip Antenna. **[8]**

b) Explain the following feeding techniques of microstrip antenna and compare them with relevant figures. **[10]**

i) Microstrip line.
ii) Aperture coupling.

c) Design the microstrip antenna given Duroid substrate $\epsilon_r = 2.4$, h = 0.0625", fr = 10GHz. **[7]**

Q5) a) Define the following antenna parameters with relevant mathematical expressions and illustrative diagrams. **[10]**

i) Radiation Pattern.
ii) Directivity.
iii) Antenna Gain.
iv) Radiation Resistance.
v) Radiated Power.

b) Sketch the radiation pattern of linear Antenna array of 12 elements of broad side array. **[15]**

Q6) a) Design a broad side Dolph-Tsehebhyscheff's array of 7 elements with spacing *d* between elements with a major to minor lobe ratio of 35*d*B. Derive the array factor you use. **[10]**

b) Write short notes on following antennas giving expressions for directivity, radiation, power resistance, impedance, radiation pattern of each. **[15]**

i) Hertzion Dipole.
ii) Half wave Dipole.
iii) Loop Antenna.
iv) Helix Antenna.

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Total No. of Questions : 8]

SEAT No. :

P2119

[Total No. of Pages : 3

[4165] - 620

M.E. (E & TC) (Microwave)

COMMUNICATION NETWORKS

(2008 Course) (Elective - I(c)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer 3 questions from section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain different Network devices briefly. **[4]**

b) Explain Network functions briefly. **[4]**

c) Explain centralized data networks. **[4]**

d) Explain distributed data networks. **[4]**

Q2) a) A Messages independently arrive to a system at the rate of 10 per minute. Their lengths are exponentially distributed with an average of 3600 characters. They are transmitted on a 9600bps channel. A character is 8 bits long. **[4]**

Calculate:

i) average service time Ts

ii) What is arrival rate A

iii) What is Service rate D

iv) What is utilization of server U

b) Explain POISSON function. **[4]**

c) Explain network design issues briefly. **[4]**

d) Explain the structure of Network design tool. **[4]**

P.T.O.

Q3) a) Compare Frame Relay with ATM technology. **[4]**

b) What is concept of CELL in ATM networks? **[4]**

c) Compare virtual circuit packet switching with respect to Frame relay. **[4]**

d) Compare packet switching and Virtual circuit packet switching. **[4]**

Q4) Write short note on any three **[18]**

a) B-ISDN.

b) Erlang-B function.

c) Physical layer of IEEE-802.11 standard.

d) IPV-4 header.

SECTION - II

Q5) a) Explain the TCP/IP four layer model. **[4]**

b) Explain TCP Header in detail. **[4]**

c) Dijkstra's Algorithm. **[4]**

d) Explain real time Interactive Audio/Video communication characteristics. **[4]**

Q6) a) What are different RTCP message types? **[4]**

b) 24 terminals share a 9600 bps line. Each terminal sends an average of 10 msg/min over the line. The message lengths are exponentially distributed with an average length of 2000 bits. **[4]**

Calculate:

i) Average time that a message spends in system Ts.

ii) What is arrival rate A.

iii) Total time in the system T.

iv) What is utilization of server U.

c) Write a short note on SIP for VoIP communication. **[4]**

d) Write a short note on H.323 architecture. **[4]**

Q7) a) Explain AES algorithm briefly. **[4]**

b) We are given three system. All have 50% utilizations. All have average message lengths of 1400 bits. The first has exponentially distributed message lengths. The second has constant 1400 bits message length. In the third, half the messages are 400 bits long and the other half are 2400 bits long. **[4]**

Calculate:

i) What is arrival rate A.

ii) The mean service time E(S).

iii) The waiting time Tw for first case.

iv) The waiting time Tw for second case.

c) Explain the following Networks briefly. **[8]**

i) LAN ii) WAN

iii) MAN iv) Internet

Q8) Write short note on any three **[18]**

a) Bluetooth protocol stack.

b) Network monitoring & Protocol Analyzer.

c) PGP and S/MIME.

d) Digital Library Network Architecture requirements.

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Total No. of Questions : 6]

SEAT No. :

P2120

[Total No. of Pages : 2

[4165] - 621

M.E. (E & TC) (Microwave)

SMART ANTENNAS

(2008 Course) (Elective - II(a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw the block diagram of narrow band adaptive antenna system and explain the following terminology with reference to adaptive antenna system with relevant diagrams. **[20]**

i) Beam steering ii) Steering vector

iii) Null beam ferming iv) Diversity combining

b) Write a short note on how does antenna array improve spectrum efficiency and capacity. **[5]**

Q2) Explain how do you achieve adaptive Beam forming by using following adaptive algorithms by giving relevant mathematical details, and also discuss their applications limitations. **[25]**

a) SMI Algorithm b) LMS Algorithm

c) RLS Algorithm d) CMA Algorithm

Q3) a) What are the key benefits of smart antenna technology? Discuss. **[10]**

b) Draw the structure of a base band complex envelope model of a linear equally spaced array oriented along X-axis. Develop its array factor. $f(\theta, \phi)$: **[15]**

P.T.O.

SECTION - II

Q4) a) Draw a general smart Antenna system and discuss Fixed beam forming switched beam systems and Discuss. **[15]**

b) Write short notes on Spatial Diversity, Diversity combining and sectoring. **[10]**

Q5) a) How do you classify the CDMA base station spatial filtering approaches. Draw the structure of implementation of Coherent and Non coherent combining array receiver for CDMA system. Compare two in terms of complexity, limitations applications, advantages. **[20]**

b) Draw the illustrative antenna patterns that can be obtained using three finger filtering rake receiver receiving four components. **[5]**

Q6) a) How do you achieve Range extension in CDMA. Explain with supporting mathematical derivation. What is the possible SNR improvement for M-element array. **[10]**

b) Discuss the capacity improvement in CDMA using smart antenna system for following approaches. **[15]**

i) WLL subseriber unit

ii) Vector based approach

iii) Multi cell systems

Total No. of Questions : 10]

SEAT No.:

P2122

[Total No. of Pages : 2

[4165]-637
M.E. (E & TC) (VLSI and Embedded Systems)
EMBEDDED SYSTEM DESIGN
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Describe the steps for hardware and software architecture design of Embedded system. **[8]**

b) Explain why PLD based design is more flexible than ASIC during development of Embedded System. Explain typical architecture of FPGA. **[8]**

Q2) a) Draw architectural diagram of any ARM processor and explain it. **[8]**

b) Draw and explain interrupt structure for ARM processor. Explain how Interrupts are processed. **[8]**

Q3) a) Explain the Processor selection criteria required for embedded system. Also give the processor specifications and performance measures for any three Embedded System applications. **[10]**

b) What is the IDE and what are the software support tools required for the embedded system design process? **[8]**

Q4) a) What is IEEE 802.11 protocol? Explain the data transfer using this protocol? **[8]**

b) Explain the various cache mapping techniques with their merits and demerits. **[8]**

Q5) a) Explain the steps involved in development of Embedded System. **[8]**

b) Why selection of memory is critical in Embedded System? Explain the steps involved in designing Embedded System from memory selection point of view. **[8]**

P.T.O.

SECTION - II

Q6) a) Explain the architecture of ARM9 and explain how 5 stage pipeline is better than Arm 7 pipeline. **[10]**

b) List various Exception vectors of the ARM processor as per the priority. Explain the exception handling process in the ARM processor. **[8]**

Q7) a) Explain the role of Advanced Microprocessor Bus Architecture (AMBA) in ARM processors. Also explain the significance of timers in ARM processors. **[8]**

b) Explain the function of different registers in ARM processor. **[8]**

Q8) a) What are the three basic steps involved in physical design? Also explain the factors those influence the physical design. **[8]**

b) Explain Functional and Physical verification. **[8]**

Q9) a) What are the performance parameters which need to be optimized in Embedded Systems? What are the techniques used to achieve them? **[8]**

b) Draw and explain following fields of standard format of CAN protocol. **[8]**

Q10) a) What is JTAG? Explain hardware design on FPGA using Xilinx. **[8]**

b) Explain design for testability and its role in Embedded System Design. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2123

[Total No. of Pages : 2

[4165] - 641

M.E. (E & TC) (VLSI Embedded Systems)

RECONFIGURABLE COMPUTING

(2008 Course) (Elective - II(a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Question Nos. 1 and 8 are compulsory. Out of the remaining attempt 2 questions from Section I and 2 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Compare ASIC, GPP, FPGA and RD with respect to design efforts, power consumption, throughput and NRE? **[8]**

b) Define **[10]**

i) Granularity
ii) Coarse Grain
iii) Contexts
iv) Functional Capacity
v) Functional Density

Q2) Draw detailed block diagram of TSFGA. Explore each block. State the applications. Discuss their merits and demerits. **[16]**

Q3) a) What is need of instruction compression? Suggest suitable method of RD? **[8]**

b) What is the pitch of the wire? How to compute the area of crossbar? Give design strategy for crossbar? **[8]**

Q4) a) What are conventional interconnect? What are their limitations? Which scheme of interconnect is most suitable for RD? **[12]**

b) What is computational density? Explain with example? **[4]**

P.T.O.

SECTION - II

Q5) a) What is single context and multi context FPGA? Discuss these issues pertaining to present FPGA architecture? **[8]**

b) Give Rents Rule based hierarchical model for interconnect? **[8]**

Q6) a) What is network utilization efficiency? How to achieve it? Give mathematical model for it? **[8]**

b) With suitable example explain the difference between reconfigurable machines and conventional processors? **[8]**

Q7) a) What are research challenges in RC? **[8]**

b) What is partial reconfigurability? Is it supported in any present device? How do you decide that the task needs partially or fully reconfigurable device? **[8]**

Q8) Write short note on any three of the following: **[18]**

a) RP Space model

b) Overheads in network design

c) Bisection BW

d) Static interconnect

Total No. of Questions : 6]

SEAT No. :

P2125

[Total No. of Pages : 3

[4165] - 711

M.E. (Production) (Manufacturing Engineering & Automation)

ADVANCED MECHATRONICS

(2008 Course) (Elective - I(a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Draw figures wherever required.***
3) ***Assume suitable data wherever necessary and state them clearly.***

SECTION - I

Q1) What is mechatronics? Explain with suitable example different types of measurement and control systems used in Mechatronics? **[16]**

OR

a) Compare and contrast the control system for the domestic central heating system involving a bimetallic thermostat and that involving a microprocessor? **[12]**

b) State the steps that might be present in the sequential control of a dishwasher. **[4]**

Q2) A rotary variable differential transformer has a specification which includes the following information: **[16]**

Ranges : $\pm$ 30º, Linearity error $\pm$ 0.5º full range

$\pm$ 60º, Linearity error $\pm$ 2.0º full range

Sensitivity: 1.1 (mV/V input)/ degree

Impedance: Primary 750 Ω , Secondary 2000 Ω

What will be the

1) Error in a reading of 40º due to non-linearity when the RDVT is used on the $\pm$ 60º range

2) The output voltage change that occurs per degree if there is an input voltage of 3V?

OR

P.T.O.

a) Suggest a sensor that could be used as part of system to control the thickness of rolled sheet by monitoring its thickness of rolled sheet by monitoring its thickness as it emerges from rollers. The sheet metal is in continuous motion and the measurement needs to be made quickly to enable corrective action to made quickly. The measurement system has to supply an electrical signal. Explain the logical steps involved in the process and justify suggested sensor in mechatronic way. **[10]**

b) A copper-constant an thermocouple is to be used to measure temperatures between 0 to 200ºC. The e.m.f at 0ºC is 0 mV, at 100ºC it is 4.277 mV and at 200ºC it is 9.286 mV. What will be the non-linearity error at 100ºC as a percentage of the full range output if a linear relationship is assumed between e.m.f. and temperature over the full range? **[6]**

Q3) Explain following for microprocessor. **[18]**

a) Accumulator

b) Status

c) Memory Address

d) Program counter registers

OR

a) Explain in detail General internal architecture of a microprocessor with neat sketch. **[12]**

b) Explain programming of microprocessor using 8085 instructions. **[6]**

SECTION - II

Q4) a) Simplify following Boolean equations **[8]**

i) Q = A.C + A.C.D + C.D

ii) Q = A.B.C + C.D. + C.D.E.

b) Use De Morgan's laws to show that a NOR gate with inverted inputs is equivalent to an AND Gate. **[8]**

OR

Explain following for Process Control Computer Systems (Any Two): **[16]**

a) Instructions Set

b) Input/Output arrangements

c) Addressing Techniques

Q5) a) Devise a system, using a PLC which can be used to control the movement of a piston in a cylinder using a 4/2 solenoid operated pilot valve. The piston is to move in one direction when a proximity sensor at one end of the stroke closes contacts and in the other direction when a proximity sensor at the other end of the stroke indicates its arrival. **[10]**

b) Explain the criteria for selection of PLC for a particular task. **[6]**

OR

a) Explain various selection criteria of PLC in detail. **[10]**

b) Explain following for PLC. **[6]**

i) Shift Registers ii) Master and Jump Controls

Q6) Design a coin counter that includes an electromechanical device to accept a handful of mixed denominations of Indian rupee coins that will align and present the coins in serial order to a sensor array capable of acquiring data to determine its individual and group values of coin. The system should be useful for Indian Railways for platform ticket transaction machine. **[18]**

OR

Explain the mechatronic design of CCD camera inspections in an IC manufacturing operations. Specify the required electronics, sensors and other elements with selected control architecture. **[18]**

Total No. of Questions : 12]

SEAT No. :

P2126

[Total No. of Pages : 3

[4165] - 714

M.E. (Production)

ADVANCED MACHINE TOOL DESIGN

(2008 Course) (Elective - I(d)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Attempt any one question from each unit of Section I and Section II respectively.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable electronic pocket calculator and statistical tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Show that in 'twin gear block' or 'triple gear block' the difference between the consecutive numbering teeth should be greater than or equal to 4. **[8]**

b) Develop a generalized empirical relationship for the thrust and torque in drilling and compare the same with turning to validate Optiz's hypothesis that the principles of cutting mechanism fall into the same category. **[10]**

OR

Q2) a) Find out the method of differentiating a special purpose machine from a general purpose machine based on the kinematic structure. **[6]**

b) Draw the speed ray diagram (compromise gear box) having 6 speeds in the upper range and 8 speeds in the lower range. The spindle speed ranges from 2600 to 180 rpm. What are the advantages and limitations of such compromise gear box? **[12]**

Unit - II

Q3) a) Explain the method of evaluating the stiffness and natural frequency of vibration of a machine tool bed having two-tier cross-section with stiffeners, using Krylov's function. State the final expression for frequency of vibration. **[8]**

b) Discuss the method of designing a horizontal circular table of a vertical boring machine, where the cylindrical workpiece is clamped. Average diameter of the guide is *d* and the width of the guide is b. **[8]**

P.T.O.

OR

Q4) a) Make a sketch of at least two different types of spindle ends and make a comparative evaluation of their characteristics. **[8]**

b) Analyze the load taken by the balls in a ball bearing used as a spindle support and show that due to contact deformation not more than 80% of the balls take the entire thrust. **[8]**

Unit - III

Q5) a) What is meant by regenerative chatter? Explain it with reference to any one type of machine tool. **[8]**

b) Discuss with neat sketch the feed gearbox, operated by Tumbler gears. Show three positions forward, neutral, and reverse. **[8]**

OR

Q6) a) Draw the entire hydraulic circuit for obtaining forward as well as quick return motion of a shaping machine. Indicate all the parts and elements and describe briefly their characteristic functions. **[8]**

b) Show the circuit diagram for effecting 'push button' control system in a machine tool. **[8]**

SECTION - II

Unit - IV

Q7) a) Explain with a neat sketch the functioning of various elements of auto-inspection system used on machine tools. **[8]**

b) What procedure is used by the operator to determine the tool length offsets? **[8]**

OR

Q8) a) What are the various types of transducers commonly used in a CNC machine? Explain the functioning of linear transducer and angular transducer. **[8]**

b) Compare stepper motors with DC servo motors, in regard to their uses in NC, CNC machines. **[8]**

Unit - V

Q9) a) 'It is necessary to have high damping coefficient and large stiffness of the tool to reduce such vibration' - Discuss the statement giving specific example of a turning operation. **[8]**

b) Explain with suitable example, dynamic characteristic of the cutting process. **[10]**

OR

Q10)a) Enumerate the various methods, used in practice to reduce the positional displacement error due to 'Stick Slip'. **[8]**

b) 'Stick Slip' error can be reduced by using hydraulic relieving of the table of a vertical boring machine. Prove that in such a case the oil film thickness is given as 1.47 h_o, where h_o is the minimum oil thickness, mainly due to surface asperities. **[10]**

Unit - VI

Q11)a) Discuss the aims and trends of future development in design of machine tools. **[8]**

b) Explain with a suitable example the use of FEM for analysis of machine tool structures. **[8]**

OR

Q12)a) Explain with a suitable example the importance of aesthetics in machine tool design. **[8]**

b) Discuss the role of ergonomics in manufacturing of machine tools. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2127

[Total No. of Pages : 2

[4165] - 715

M.E. (Production Engg.)

ADVANCE ROBOTICS

(2008 Course) (Elective - II(a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define and explain the meaning of the following terms. **[8]**

i) Spatial Resolution ii) Control Resolution

iii) Accuracy iv) Repeatability

b) Explain the basic differences amongst. **[10]**

i) Teach Pendant Robot and

ii) Intelligent Robot, bringing out the salient features of each.

Q2) a) A five axis articulated robot has following kinematic parameters based on D-H algorithm. **[12]**

Axis	θ	d	a	α
1	θ_1	L_1	0	–90°
2	θ_2	0	L_2	0°
3	θ_3	0	L_3	0°
4	θ_4	0	0	–90°
5	θ_5	L_5	0	0°

Find out the position and orientation of the end effector w.r.t. origin if the joint variable vector is [45° –135° 180° 45° 180°] & the link parameters are $L_1 = 50$, $L_2 = L_3 = 140$ & $L_5 = 20$.

b) Explain Direct Kinematics. **[4]**

P.T.O.

Q3) a) Classify various types of grippers used in robots. Describe Magnetic gripper in detail. **[8]**

b) Assuming that a contour path of an end-effector of a robot can be defined by a cubic fit in the form:

$\theta(t) = a_0 + a_1t + a_2t^2 + a_3t^3$, plot the joint angle $\theta(t)$, with initial angle = 20°, final angle = 80° & the time to attain final angular position of the joint is 4 seconds. **[8]**

Q4) a) Explain with neat sketches PID controller and control stability. **[8]**

b) What are the major differences between open-loop and closed-loop servo systems? **[8]**

SECTION - II

Q5) a) Explain the generations of Robot programming Languages and discuss robot language elements. **[10]**

b) What is a 'Robot program'? State various steps in program writing. **[8]**

Q6) a) Describe how touch sensors operate. **[8]**

b) Describe various image processing steps in Robotic vision system. **[8]**

Q7) a) Explain the role of Jacobian matrix in the path control strategy. **[8]**

b) Explain the grasp planning considerations with example. **[8]**

Q8) a) Compare Newton-Euler and Lagrange - Euler formulations and situations when you will prefer N.E. formulations / L.E. formulations. **[8]**

b) Using a neat block diagram, describe a position control system of robotics. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2129

[Total No. of Pages : 3

[4165]-721

M.E. (Production) (Manufacturing and automation)

INDUSTRIAL AUTOMATION

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) A 16 station automatic transfer line has cycle time of 0.75 min., downtime of 3.0 min, and probability of breakdown 0.01 for all workstations. What is current efficiency? What will be the efficiency if the storage buffer of capacity 10 parts is placed between the stations 8 and 9. **[8]**

b) The following list defines the precedence relationship and element times for manufacturing of certain part : **[8]**

Element	1	2	3	4	5	6	7	8	9	10
Element time (min)	0.5	0.3	0.8	0.2	0.1	0.6	0.4	0.5	0.3	0.6
Immediate predecessors	–	1	1	2	2	3	4,5	3,5	7,8	6,9

If the ideal cycle time is 1.0 min, what is theoretical minimum number of stations required to minimize the balance delay. Also compute the balance delay.

Q2) a) A hydraulic system using accumulator has to operate with the following cycle : extends in 8 seconds at 30 bar, flow rate 20 1 /min; remain extended for 25 seconds at 150 bar, no flow; retract in 5 seconds at 30 bar, flow

P.T.O.

rate 12 1/min; remain retracted for 26 seconds, at 150 bar, no flow. Determine the size of accumulator and pump. Assume isothermal expansion and compression of gas. **[8]**

b) What are the functions of the fluid reservoir in hydraulic system? Explain the steps to design the reservoir considering heat dissipation. **[8]**

Q3) a) Draw a pneumatic circuit using cascade system to actuate three cylinders in following sequence : **[10]**

i) Cylinder 1 extends
ii) Cylinder 2 extends
iii) Cylinder 2 retracts
iv) Cylinder 3 extends
v) Cylinder 1 retracts
vi) Cylinder 3 retracts

b) Explain with suitable example the working of twin pressure valve. **[6]**

Q4) Write short notes on : **[18]**

a) Deceleration valves.
b) Electro-hydraulic valves.
c) Low cost automation.

SECTION - II

Q5) a) Draw and explain ladder diagram for a motor with the following: Normally open start button, normally closed stop button, thermal overload switch opens at high temperature, green light when running, red light for thermal overload. **[8]**

b) Write a subroutine to convert a 4 digit decimal number to 16 bit binary number. **[8]**

Q6) a) A part feeder has a feed rate of 15 components/min. The probability of passing the components through the selector is 25%. The cycle time for assembly is 0.35 min. The feeder stops when there are 20 parts in feed track and will start while 8 parts in feed track. Determine how long will it take for the feeder to turn on once it is turned off and how long it will take to turn off once it is turned on? **[8]**

b) Explain various types of conveyors. **[8]**

Q7) a) Explain the interlock and sensor commands for robots. **[8]**

b) What do you mean by redundant manipulator? What are its industrial applications? **[8]**

Q8) Write short notes on : **[18]**

a) Types of escapements.

b) Use of oscillating disks for automated orientation of workpiece.

c) Tactile sensor used in robots.

Total No. of Questions : 8]

SEAT No. :

P2130

[Total No. of Pages : 2

[4165] - 723

M.E. (Production) (Manufacturing and Automation)

PRODUCT LIFE CYCLE MANAGEMENT

(Sem. - II) (2008 Course) (Elective - III(b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from Section I and 3 questions from Section II.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is necessity of PLM feasibility study? What should be the contents of the feasibility study? **[8]**

b) Which benefits PLM would offer in the area of financial performance, time reduction, quality improvement, and business improvement? **[8]**

Q2) a) Why a well defined PLM strategy is important? **[6]**

b) Discuss the various steps to develop and implement PLM strategy? **[10]**

Q3) a) Explain with any suitable example following functions of product database management: **[8]**

- Product structure management.
- Classification management.
- Program and project management.
- Workflow and process management.

b) How product data management is useful for data access? **[8]**

Q4) Write short notes on: **[18]**

a) PLM visioning.

b) Change management for PLM.

c) Barriers to PDM implementations.

P.T.O.

SECTION - II

Q5) a) What do you understand by design for robustness? Explain Taguchi's method for robust design. **[8]**

b) How will you deal with the end of life phase of electronic products? **[8]**

Q6) a) How will you evaluate the market entry decision of a new product based on its process characteristics and market characteristics? **[8]**

b) Explain the components of decision support system for launching of a new product. **[8]**

Q7) a) Explain briefly the techniques of forecasting the changes in market and in competitive conditions as a result of technological innovations. **[8]**

b) Discuss how you will measure the technological changes using: **[8]**

- Productivity index
- Solow method
- Salter method

Q8) Write short notes on: **[18]**

a) Modeling and simulation in product design.

b) Redesign of product.

c) Mission flow diagram.

Total No. of Questions : 8]

SEAT No. : ____

P2132

[Total No. of Pages : 3

[4165] - 730-A
M.E. (Prod.) CAD/CAM
COMPUTER AIDED MANUFACTURING
(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculators is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the working of a typical adaptive control system used in CNC machines. **[6]**

b) Briefly describe the type of electric drives used in CNC machine. **[5]**

c) Describe the features of Vertical Turning Center. **[5]**

Q2) a) For the component shown in Figure 1, make part program for machining on a CNC machining center. **[10]**

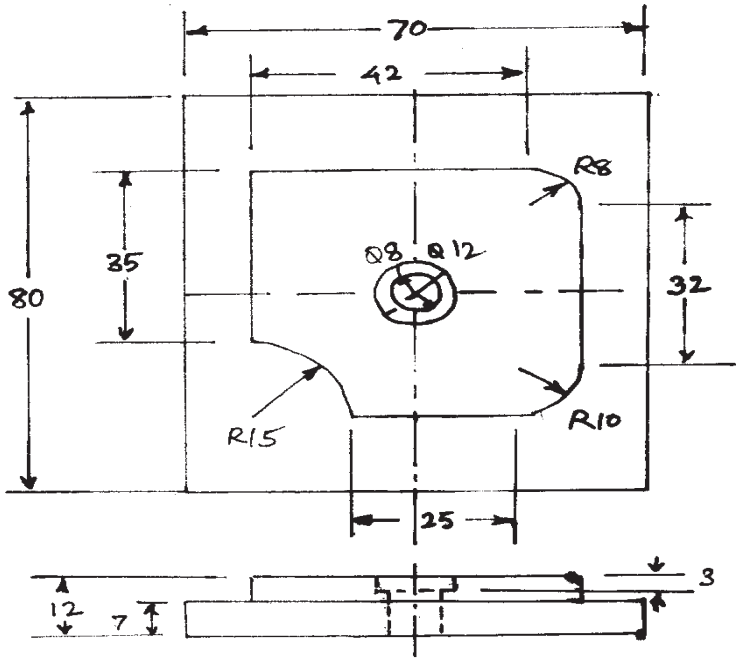

Figure 1

P.T.O.

b) How does proving of NC program on machine tool take place? **[6]**

Q3) a) Using APT language, generate the CL-files (part program) for the part shown in Figure 2. The part material is low carbon steel and cutters are HSS. Part thickness is 0.5 in. **[10]**

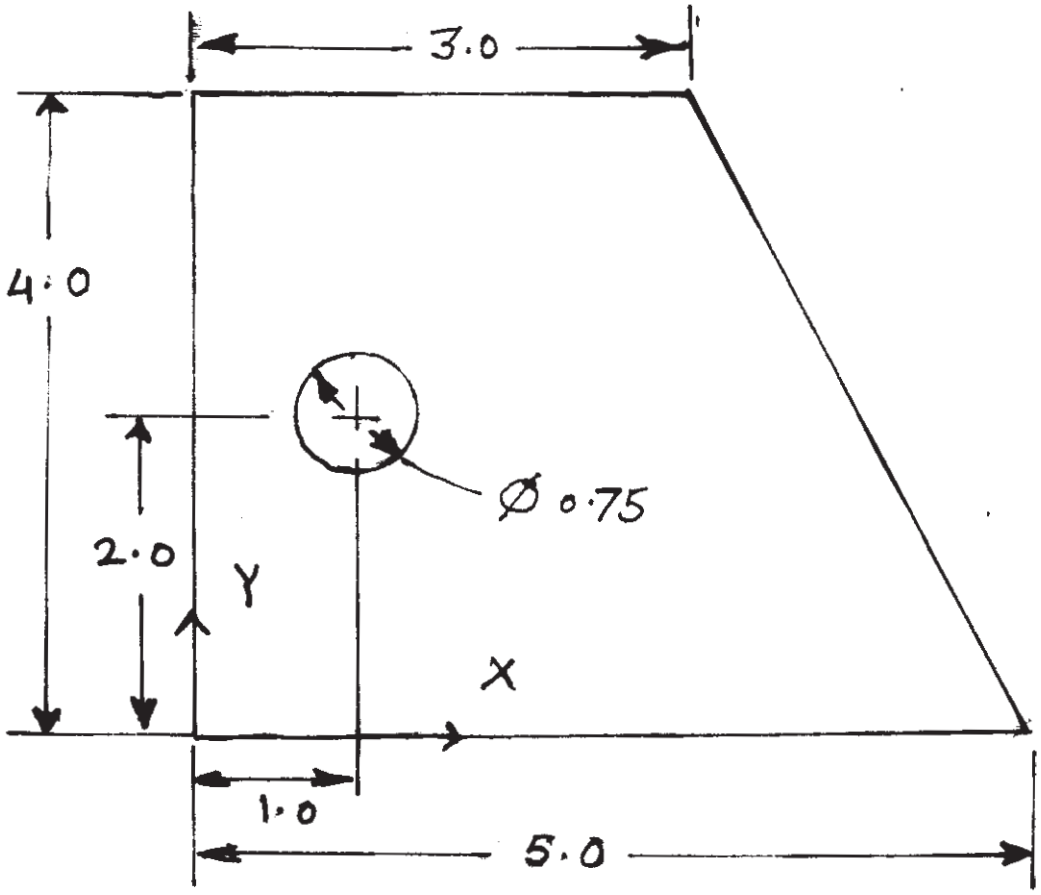

Figure 2

b) Describe how industrial robots are used to automate the welding process. **[6]**

Q4) Write short notes on any three of the following: **[18]**

a) Virtual machining
b) Canned cycles
c) CNC - EDM
d) Direct Numerical Control (DNC)
e) CNC presses

SECTION - II

Q5) a) What are the major types of conveyors? List the suitable application of each type in any industrial setup. **[6]**

b) What are the attributes considered for selection of AGVs? **[5]**

c) What are the types of AS/RS? **[5]**

Q6) a) Ashok Leyland has a unit load AS/RS with six aisles. Six S/R machines are used, one for each aisle. The aisle length (rack length) is 275 ft and aisle height is 77.5 ft. The horizontal and vertical speeds are 300 ft/min and 70ft/min respectively. A P/D operation of S/R machine takes approximately 0.35 minutes. Determine the single and dual-command cycle time for a unit load AS/RS of the company. **[8]**

b) Describe the types of automated assembly system with suitable examples. **[8]**

Q7) a) What are the three phases in a shop floor control system? **[6]**

b) Distinguish between off-line and online inspection methods. **[5]**

c) How do you integrate computer aided quality control with CAD/CAM? **[5]**

Q8) Write short notes on any three of the following: **[18]**

a) Techniques of automatic identification.

b) Social impact of future automated factory.

c) Manufacturing Automation Protocol.

d) Optical triangulation techniques.

e) Sensor technologies for automated inspection.

Total No. of Questions : 8]

SEAT No. :

P2133

[Total No. of Pages : 2

[4165] - 734

M.E. (Production) (CAD/CAM)

INDUSTRIAL ROBOTICS & ARTIFICIAL INTELLIGENCE

(2008 Course) (Elective - I(c)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are the industrial applications of robots? Explain in brief. **[10]**

b) Explain the relation between industrial automation and robotics. **[8]**

Q2) a) Define and explain the factors affecting accuracy & repeatability of a robot. **[8]**

b) Compare hydraulic, pneumatic & electrical actuators w.r.t. following points. **[8]**

i) Weight
ii) Power to weight ratio
iii) Operating pressure
iv) Stiffness
v) Compliance
vi) Resolution
vii) Cost
viii) Ease of operation

Q3) a) Discuss a brief classification of grippers. **[8]**

b) Explain:
i) Criteria for gripper design.
ii) Rules for gripper design. **[8]**

Q4) a) Explain:
i) Lead through mode of programming.
ii) Textual robot Language. **[8]**

b) Explain methods of defining positions in space. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain the need of Artificial Intelligence in the present scenario. **[10]**

b) Explain forward and backward reasoning in A.I. **[8]**

Q6) a) Explain any two search strategies used in A.I. **[8]**

b) Explain local search algorithms in brief. **[8]**

Q7) a) Define and explain the different ways of knowledge representation. **[8]**

b) Explain the terms knowledge, information and intelligence. **[8]**

Q8) a) Explain First order predicate logic with suitable examples. **[8]**

b) Explain simple rational knowledge and inheritable knowledge in brief. **[8]**

Total No. of Questions : 8]

SEAT No. :

P2135

[Total No. of Pages : 2

[4165] - 789

M.E. (Chemical)

MANAGEMENT OF RESEARCH AND DEVELOPMENT IN CHEMICAL INDUSTRIES

(Chemical Engineering) (2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Solve any three questions from each section.***
2) ***Every answer shall be explained by taking a proper case study from chemical/ ancillary chemical industry.***

SECTION - I

Q1) Establish relation of R & D growth to G.D.P. growth of a country. Correlate growth in research in field of pharmaceutical/pesticides/drug manufacture/ construction chemicals/any other (of your choice) sector which had impact on GDP improvement. **[17]**

Q2) What are the typical manpower needs of a research project on process development of a known chemical compound? How well they can be managed? Explain with a typical example in practice. **[17]**

Q3) Explain with at least one example, the nature of difficulties involved in managing interdisciplinary research than for a purely conventional chemical engineering field. Take a proper example from industry. **[17]**

Q4) What is the role of money management in research and development in industry? What are the ways to control/monitor expenses on R & D? Explain with example. **[16]**

SECTION - II

Q5) How according to you the developments related to research in pollution control is poised for in the coming decade. Discuss by taking a proper case study.**[17]**

P.T.O.

Q6) Mass transfer technologies have improved markedly over last few decades. From highly inefficient technologies it has reached a stage where these technologies have become efficient. Explain the component of research in this sector of Chemical Engineering. **[16]**

Q7) What are vision and creativity? How a planned research be strengthened by visionary technocrats? What are the qualities to be a visionary? Give one example in Indian context. **[17]**

Q8) Write short notes on (Any three) **[16]**

a) Developments in CO_2 sequestration research.
b) Research for modifications in existing chemical processes.
c) Industrial Vs Academic Research.
d) Innovative component in the research.

Total No. of Questions : 8]

SEAT No. :

P2136

[Total No. of Pages : 3

[4165]-801
M.E. (Chemical)
ADVANCED PROCESS CONTROL
(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With neat sketch explain the interacting and non-interacting arrangement of two liquid tanks. **[4]**

b) If two cylindrical tanks (1) & (2) having same cross-section area are connected in non-interacting arrangement, derive the transfer function between height of liquid h_2 in tank (2) and flow rate Fi of liquid entering first tank (1). Find the poles of the transfer function and derive the expression for unit step response of liquid level h_2 in tank (2). Assume $A_1 = A_2 = A$ and $R_2 = 2R_1$ where the symbols have their usual meaning.

c) If the same liquid tanks are connected in interacting arrangement, derive the transfer function $\bar{h}_2(s)/\bar{F}i(s)$ and hence its poles. Also derive the expression for unit step response of liquid level h_2 in tank (2).

d) Sketch and compare the level response in interacting and non-interacting arrangement. **[12]**

Q2) For a feedback control system having the transfer functions

$$Gp(s) = \frac{1}{s+1},\ Gm(s) = Gf(s) = 1,\ G_{load} = \frac{1}{(s+1)(3s+1)}$$

P.T.O.

a) Draw block diagram of the system. **[2]**

b) If a P-controller having gain 2 is used to control the output of the process derive the servo and regulator transfer functions of the closed-loop system. **[4]**

c) Derive the expression for output response if set-point is given unit step change at constant load. Calculate the offset in the ultimate output response. **[4]**

d) If P-controller is replaced by a PI-controller having $K_c = 2$, $T_I = 1$, derive the expression for output servo response for unit step change in SP. Calculate the offset. **[4]**

e) Sketch the open-loop response and closed-loop response of process with P & PI-controller. Show the offset. **[4]**

Q3) a) Draw the root locus of a closed-loop system having the following component transfer functions -

$$G_p(s) = \frac{1}{(s+1)(2s+1)},\ G_c(s) = K_c\ Gm(s) = Gf(s) = 1$$

Indicate segments of the root locus corresponding to overdamped, critically damped and under damped closed-loop response. **[8]**

b) In the above example (Q.3-a), find the range of values of the proportional gain Kc that produce stable closed-loop response (if possible). Also find the gain Kc which will produce oscillatory response with constant amplitude. Find the frequency of oscillations. **[8]**

Q4) a) Explain feed forward control strategy for maintaining liquid level in the boiler drum constant by manipulating two disturbances-steam flow from the boiler and flow of feed water to the drum. **[8]**

b) Explain selective override control strategy for safe operation of boiler drum by manipulating both, water level inside the drum and pressure of steam inside the vessel. **[8]**

SECTION - II

Q5) A 2 × 2 process is modeled as

$$\bar{y}_1 = \frac{2}{10s+1}\bar{m}_1 + \frac{1.5}{s+1}\bar{m}_2$$

$$\bar{y}_2 = \frac{1.5}{s+1}\bar{m}_1 + \frac{2}{10s+1}\bar{m}_2 \ .$$

a) Draw open-loop block diagram of the process. **[2]**

b) Find process transfer function matrix GP and its poles, zeros. **[4]**

c) If 2 controllers having transfer functions Gc_1 & Gc_2 are installed between m_1-y_1 & m_2-y_2 respectively, draw the block diagram of closed-loop system. **[4]**

d) Calculate the RGA for the system. Justify whether m_1-y_1 & m_2-y_2 is the best pairing of input-output variables, else recommend the best pairing. **[4]**

e) Design the decouplers D_1, D_2 so that we get non-interacting control loops. **[4]**

Q6) A 3 × 3 process is modeled as

$$\dot{X} = AX + Bu,\ Y = CX$$

where $A = \begin{bmatrix} -2 & 0 & 1 \\ 1 & -2 & 0 \\ 1 & 1 & -1 \end{bmatrix}$ $B = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$ $C = \begin{bmatrix} 2 & 1 & -1 \end{bmatrix}$

a) Find transfer function matrix GP(s).

b) Find poles and zeros of GP.

c) Comment on open-loop stability of the process. **[16]**

Q7) a) Design a PI controller for a process having transfer function

$GP(s) = \dfrac{5}{8s+1}$ using IMC strategy (Assume First order filter). **[8]**

b) Explain MPC control strategy. What are its advantages over conventional feedback control. **[8]**

Q8) a) Explain interaction of plant design and control system design in plant wide control system. **[8]**

b) Explain fuzzy logic control system. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P2138

[Total No. of Pages : 3

[4165]-852

M.E. (CSE) (Information Technology)

SOFTWARE ARCHITECTURE

(2008 Course) (Elective - I (a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer ANY THREE questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write short notes on ANY THREE : **[18]**

a) Iterator pattern.

b) Growing importance of software architecture.

c) Module view concepts: decomposition, uses, layers, generalization.

d) Civil (buildings, houses) architecture and its impact on quality of houses built.

e) Categories of java middleware.

Q2) Explain ANY FOUR of the following concepts with examples. **[16]**

a) Composite pattern.

b) Adaptor pattern.

c) Identity field, single table inheritance.

d) Working of MVC pattern, with Sequence diagram.

e) Code view concepts: configuration management, testing.

f) Software connectors: procedure calls, stream, event.

P.T.O.

Q3) Write in brief on ANY FOUR : **[16]**

a) Pessimistic and optimistic locks for concurrency control.

b) Archetype pattern : CRM

c) Concurrent, networked, distributed systems.

d) Allocation view.

e) EAI.

f) C++ or java declaration for singleton pattern.

Q4) Explain the following : **[16]**

a) How software architecture relates to other SDLC phases requirements, design, implementation.

b) How does the architectural pattern BROKER work? (Hint: proxies, client, server...)

c) Resource pooling and caching.

d) Object-relational mapping.

SECTION - II

Q5) In brief state the concept/term: illustrate with good examples for Any FOUR of the following concepts. **[16]**

a) Java middleware: JSP, servlets

b) IPC versus RPC.

c) Location transparency in distributed systems.

d) Making websites better in presentation, look and feel.

e) Threads, thread safety, thread specific storage.

Q6) Write short notes on ANY THREE : **[18]**

a) Client server architectures.

b) Advantages of Distributed Systems.

c) Java Middleware: RMI, JDBC.

d) XML and XML related technologies.

e) RDBMS, TP Monitor, ERP.

Q7) Consider a website for a typical engineering college. Assume suitable scope for your website. Assume that you have been appointed as software architect for the college website. Answer the following in the context of above system. **[16]**

a) What will be your responsibilities as an architect.

b) What functionality/features will you provide on the website and how will you make your site user-friendly.

c) What different techniques you can use to secure your website access.

d) What options are available for improving response time and performance of the system.

Q8) Write in brief on ANY FOUR of the following : **[16]**

a) Login, password for security.

b) Reliability, modifiability of software.

c) User friendly features in Microsoft WORD.

d) Registry of components.

e) Object oriented approach and its advantages.

f) Remote procedures, remote objects.

✷✷✷

Total No. of Questions : 6]

SEAT No. :

P2139

[Total No. of Pages : 2

[4165] - 828

M.E. (Petroleum Engineering)

NUMERICAL METHODS AND SIMULATION IN PETROLEUM ENGINEERING

(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer two questions from each Section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) For the following system of equations, find x,y,z using SOR, Gauss and Gauss Jordon method, w = 1.1. **[25]**

$2x + y + z = 6$

$2x + 3y + z = 13$

$x - y + 6z = 2$

Q2) a) Solve the following system of equations by Newton Raphson method.

$x^2 y + \cos(xy) = 54$

$\sin(xy) + xy = \cos y.$

b) Find the roots of the equation by Graeffe method:

$x^3 + 6x^2 + 5x - 4 = 0.$

[25]

Q3) Solve $y' = y + \sin(x) + 4, y(1) = 5$ using Heun, RK - 4 and Adam Bashforth predictor corrector method. **[25]**

P.T.O

SECTION - II

Q4) Given a 1 D reservoir. Find the pressures in the interior of the reservoir, if the pressures are at 100 psi for one well and 6000 psi at the other well, both at each boundary, Length of the reservoir are 400 ft. Assume delx = 100 ft. Pi = 6000 psi. Solve by explicit, crank-nicolson and implicit method. Only set up the matrix. **[25]**

Q5) Find the finite difference approximations for the following: **[25]**

a) First derivative forward of order del x squared.

b) Second derivative forward of order del x squared.

c) Third derivative central.

Q6) Write an essay on Reservoir Simulation. **[25]**

Total No. of Questions : 7]

SEAT No. :

P2140

[Total No. of Pages : 3

[4165] - 829

M.E. (Petroleum Engg.)

PETROLEUM (INTEGRATED) RESERVOIR MANAGEMENT

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate books.***
2) ***Attempt any two questions each from Section I and from Section II.***
3) ***Assume additional data if required.***
4) ***Use of graph paper is allowed.***

SECTION - I

Q1) a) Consider the following stages during exploration and development of an oil and gas field. **[10]**

i) 2D geophysical survey has been performed in an unexplored region of a petroleum basin. Possible existence of a medium to large size field is indicated.

ii) An exploratory well is drilled which has a yield of with 1200 BOPD.

iii) A second well is drilled at 600 m from the first well. Initial production is 300 BOPD.

What are the most likely rock properties that can be obtained from the data recorded in above three activities? What could be the reasons for large variation in production rate? What would be the plausible recommendation for development of the reservoir? Would the expectations be any different if field encountered is small in size than expected? Discuss.

b) Why are relative permeability, wettability, capillary pressure and certain other properties referred as dynamic properties? Give at least two examples of the significance of the dynamic properties in understanding reservoir performance. **[15]**

OR

Q2) a) The initial production rate of an oil reservoir was 10,800 stb/d. Over a span of a year, the rate declined to 8,700 stb/d. What are the possible reasons for this reduction in the production rate? Which mode of decline leads to estimation of largest discovery? **[15]**

P.T.O.

b) Name and describe the rock properties and reservoir characteristics that would be necessary to estimate original hydrocarbons in place. Define the 'recovery factor' of oil and gas. **[10]**

Q3) a) The table given below shows porosity values as per increasing depth in a vertical well. **[15]**

Sr. No.	Depth, m	Porosity, ϕ, (%)
1	1256	12.3
2	1257	13.2
3	1258	11.3
4	1259	8.2
5	1260	9.8
6	1261	9.5
7	1262	6.2

Generate semi-variogram for porosity as a function of lag distance. Interpret the graph using behavior of different parameters like sill, range, nugget value etc.

b) Test runs on three core samples from three wells in a field yielded the following three sets of values for water saturation (Sw), porosity (φ), and permeability (k). It is believed that these three properties can be used to determine the recovery fraction (RF). **[10]**

	Core 1	Core 2	Core 3
ϕ	0.185	0.157	0.484
Sw	0.476	0.527	0.637
k	0.614	0.138	0.799
Recovery factor	0.283	0.212	0.141

The recovery factor can be expressed by the following equation:
$RF = a_0 \varphi + a_1 Sw + a_2 k$, where a_0, a_1, and a_2 are constants
Calculate Recovery Factor if: Sw = 0.75, φ = 0.20, and k = 0.85

OR

Q4) Answer **<u>any five</u>** of the following: **[25]**

a) Five important components of a petroleum system.
b) Effective permeability and relative permeability.
c) Hydraulic units or Flow units.
d) Net thickness and gross thickness of a formation.
e) Static and dynamic properties.
f) Porosity permeability relationship.
g) Stochastic modeling.
h) Reservoir drive mechanism.
i) Up scaling of reservoir properties.

SECTION - II

Q5) a) Explain the role of reservoir simulation in designing a water flood project, name at least five parameters related to water flooding that can be optimized by reservoir simulation. **[15]**

b) Why is a history match of primary production performance necessary in the study? **[10]**

Q6) a) Describe the factors to be considered in the selection of potentially applicable enhanced oil recovery process for a given field. What are the preferred oil viscosity ranges and depth limitations for applying different EOR methods? **[15]**

b) Write a detailed note on Role of horizontal wells in increasing reservoir recovery. **[10]**

Q7) a) A detailed account of production history along with cost incurred during the project span is given in the following table. Oil price is assumed to be $ 75 / bbl throughout the tenure of the project.

All values for costs are in million dollars, and oil production in millions of barrels annually.

Using given data, prepare a detailed spreadsheet showing gross revenue, royalty, net revenue, yearly total expenditure and net profit per year.

Royalty is 10% per year on annual production, which has to be paid with the beginning of commercial production.

Income tax is 30% of net profit. **[20]**

Table: Economic evaluation data for the project

Year	Oil production MM bbl/y	Capital cost ($MM)	Operation cost ($ MM)	Production cost ($ MM)
1	0	15.125	-----	-----
2	0	60.750	-----	-----
3	5.6	120.50	4.345	12.225
4	11.2	3.975	10.900	22.260
5	5.6	-----	19.500	12.982
6	2.1		12.500	5.200
7	1.05	-----	11.500	2.765
8	1.2	-----	12.500	2.450
9	2.7	-----	9.500	5.910
10	1.9	-----	9.500	4.505
11	0.9	-----	9.500	2.500
12	0.6	-----	9.500	1.750
13	0.2	12.300	8.250	0.590

b) What is a Petroleum Fiscal System? **[5]**

Total No. of Questions : 8]

SEAT No.:

P2141

[Total No. of Pages : 3

[4165]-830
M.E. (Petroleum)
HORIZONTAL MULTILATERAL AND INTELLIGENT WELLS
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of graph paper is allowed.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss drill string design in detail. **[8]**

b) It was desired to complete a well at 12,000 ft., using a 6.625 inch production casing. The pore-pressure and fracture gradient data are given in table below. Design a complete casing program for all casing shoe depths. Assume suitable safety margin and graphical method. **[10]**

Depth (ft.)	Formation Pressure gradient (lbm/gal)	Fracture gradient (lbm/gal)
1,000	8.8	12.1
2,000	8.8	12.5
3,000	8.8	13.7
4,000	8.9	14.3
5,000	8.9	14.8
6,500	9.1	15.2
7,000	9.0	15.5
8,500	9.2	15.9
9,000	12.1	16.8
10,000	14.1	17.3
11,500	15.0	17.6
12,000	16.0	18.1

P.T.O.

Q2) It is desired to drill using a build, hold and drop trajectory. Horizontal departure to the target is 2,600 ft. at a TVD of 9000 ft. The recommended rate of build is 2.0°/100 ft. The kick off depth is 1700 ft. Determine **[16]**

a) The radius of curvature, R_1.

b) The maximum inclination angle, θ.

c) The measured depth to the end of the build.

d) The total measured depth.

Q3) a) A development rig has the following grades of drill pipe to be run in 13000 ft. deep well. **[10]**

Grade E : OD/ID 5/4.276, 19.5 lbm/ft. Yield strength = 390000 lb.

Grade G : OD/ID 5/4.276, 19.5 lbm/ft. Yield strength = 550000 lb.

The total length and weight of drill collars plus heavy-wall drill pipe is 884 ft. and 147374 lb respectively. The maximum expected mud weight at given depth is 13.4ppg. Given : steel density = 489.5 pcf. Calculate :

i) Maximum length that can be used from each grade of drillpipe, if an MOP of 50,000 lb is to be maintained for the lower grade.

ii) The MOP of the heavier grade.

b) Draw the sketches of various types of horizontal wells. **[6]**

Q4) Write short notes on : **[16]**

a) Drilling fluids.

b) Sidetracking.

c) Casings grades.

d) Deflection tools.

SECTION - II

Q5) a) Describe GTO in brief. **[6]**

b) Explain the equation to calculate drilling cost per feet. **[6]**

c) Write the benefits of horizontal wells. **[6]**

Q6) a) Determine pump pressure for following hydraulic system. Also prove that, flow inside drill collar is turbulent and outside is laminar. Use the general critical velocity equation. Data given : **[12]**

1) Length of 5" D/P = 9813 ft ID = 4.276 inch.
2) Length of 6.5" D/C = 273ft ID = 2.815 inch.
3) Well depth = 3200 m contains 9 5/8" casing up to 2300 m.
4) PV = 6 CP, Yield point = 25 lB/100 ft^2.
5) Mud Density = 11 ppg. Flow rate = 430 gpm.
6) Open hole size = 8.5 inch.
7) Nozzle size = 13/32. Number of nozzles = 3.
8) Surface equipment pressure loss = 30 psi.
9) Pressure loss inside drill pipe and drill collar in psi = $(8.91 \times 10^{-5} \times \rho^{0.8} \times Q^{1.8} \times PV^{0.2} \times L) / D^{4.8}$
10) Annular pressure loss against drill pipe in cased hole is 280 psi and open hole is 80 psi.
11) Annular pressure loss against drill collar = 21 psi.

b) Draw sketch of any one type of bit. **[4]**

Q7) Discuss geometrical planning and overall well planning objectives for Type-I directional well and find co-ordinates of this well using following data : **[16]**

Slot Co-ordinate 15.32ft.N, 5.06 ft.,E.
Target Co-ordinate 1650 ft.N, 4510 ft.,E.
TVD Target = 9000 ft.
TVD KOP = 1600 ft.
Build up rate = 1.6 degree per 100 ft.

Q8) a) Explain any one method of well control in brief. **[8]**

b) Write short note any two : **[8]**

i) Factors affecting ROP.
ii) Mud properties.
iii) Horizontal well planning.

Total No. of Questions : 6]

SEAT No. :

P2142

[Total No. of Pages : 1

[4165] - 833

M.E. (Petroleum Engineering)

OIL AND GAS FIELD DEVELOPMENT

(Elective - I(c)) (2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Answer any two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data, if necessary and clearly state it.***

SECTION - I

Q1) Explain how geology affect planning and development of the filed? **[25]**

Q2) Explain how material balance calculations can be used for development of an oil field. **[25]**

Q3) Explain how seismic data is used in field development? **[25]**

SECTION - II

Q4) How is reservoir simulation used in field development? **[25]**

Q5) Explain the special development of Offshore Marginal Oil Fields. **[25]**

Q6) How can the Field development be influenced by EOR? **[25]**

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Total No. of Questions : 8]

SEAT No. :

P2143

[Total No. of Pages : 2

[4165] - 836

M.E. (Petroleum Engg.)

WELL DESIGN AND ENGINEERING

(2008 Course) (Elective - II(b)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Mollier charts, non-programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Discuss in detail well design considerations from the point of, **[18]**

a) Drilling fluid
b) Bit planning
c) Power requirement
d) Drilling equipments
e) Well control

Q2) a) Explain the graphical method to select casing setting point. **[10]**

b) Write a note on well integrity in brief. **[6]**

Q3) a) Describe repeat formation testing in detail. **[10]**

b) Write the various reservoir aspects to be considered in the selection of well trajectory. **[6]**

Q4) Write a short notes on: **[16]**

a) Types of bit
b) development wells
c) Types of rig
d) API types of Casing

SECTION - II

Q5) a) Draw a typical layout for an onshore drilling rig-site. Indicate various features and explain important aspects of it. **[10]**

b) What is fracture gradient? How to calculate it? Explain. **[8]**

P.T.O.

Q6) a) What is D-exponent? Using Dexponent Curve and bulk density plot find, pore pressure at 2400 M, 2600 M, 2800 M, 3000 M, 3200 M normal pressure at 2400 M is 1.27 gm/cc

2600 M is 1.36 gm/cc

2800 M is 1.40 gm/cc

3000 M is 1.55 gm/cc

3200 M is 1.67 gm/cc **[8]**

b) Discuss sub-sea well completion program in brief. **[8]**

Q7) Write short notes on: **[16]**

a) Multilateral wells

b) Well Control

c) Hole problems

d) LWD

Q8) What is horizontal well? What are it's types? Describe in detail one case study of horizontal well technology from the point of its application in field development. Write various equations, show graphs to elaborate various factors to be considered in the design and planning of this well. Also write the field objectives, challenges and merits of horizontal wells in this application. **[16]**

Total No. of Questions : 6]

SEAT No. : ____

P2144

[Total No. of Pages : 1

[4165] - 837

M.E. (Petroleum Engineering)

WELL TESTING AND ANALYSIS

(Elective - II(c)) (2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer two questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams should be drawn wherever necessary.***
5) ***Use of a non-programmable calculator, log-log, semi-log paper is allowed.***
6) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) Derive the diffusivity equation in cylindrical coordinate system. **[25]**

Q2) Write an essay and give suitable examples of Derivative Plots. **[25]**

Q3) Derive the Laplace solution to the diffusivity equation. **[25]**

SECTION - II

Q4) State the complete methodology in analysis of a Pressure Draw down Test. **[25]**

Q5) State the complete methodology in analysis of Naturally fractured wells. **[25]**

Q6) Explain Buildup test for gas wells using pseudo pressure, pressure squared and pressure analysis. Which is the best and why? **[25]**

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Total No. of Questions : 8]

SEAT No. :

P2145

[Total No. of Pages : 3

[4165] - 838

M.E. (Petroleum)

WELL CONTROL

(2008 Course) (Elective - II(d)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of cm scale graph paper is allowed.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define and explain in brief. **[12]**

i) Filter loss ii) Lost circulation

iii) Primary well control iv) Mud weight

b) Following data is available:

Well depth = 8588 ft. (TVD), Casing shoe depth = 5600 ft. (TVD)

Mud weight = 12.5 ppg., Open hole capacity = 0.1486 bbl/ft. Casing capacity = 0.1711 bbl/ft., Drill pipe metal displacement = 0.0076 bbl/ft., Length of one stand = 92 ft. While pulling out driller forgot to fill the hole and 33 stands of drill pipes were pulled out wet. Calculate reduction in bottom hole pressure. **[6]**

Q2) a) Discuss surface set up of hydro-pneumatic well control unit. **[8]**

b) How much barite is required to increase the mud density to 15 ppg.? **[4]**

Well is being drilled with 11 ppg mud.

Hole volume = 700 bbl. Surface volume = 300 bbl

Barite density is 35.4 ppg

c) For following data, determine the height in feet of the influx. **[4]**

Pit gain = 49 bbl

Hole size = 8.5 in

Drill collar OD = 6.5 in

Drill collar length = 850 ft.

Drill pipe OD = 5.0 in

P.T.O.

Q3) a) Draw neat schematic sketch of a subsea well Completion. Show its components. **[8]**

b) What is surface choke? Draw the schematic sketch and explain it. **[8]**

Q4) Write short notes on: **[16]**

a) Hole problems

b) Mud pressure losses

c) Well kick

d) Functions of drilling fluids

SECTION - II

Q5) A kick was observed after closing the surface BOP. Fill out a kill sheet. Prepare step down plan on graph paper for drillers method and calculate: **[18]**

a) Initial circulating pressure

b) Kill mud weight

c) Final circulating pressure

d) Surface to bit, and bit to surface strokes.

Following data is available:

Data: Original mud weight = 9.7 ppg,

Measured depth = 8,800 ft.,

Kill rate pressure @ 50 SPM = 820 psi

Kill rate pressure @ 30 SPM = 750 psi

Drill string - drill pipe 5.0 in. –19.5 lb/ft. capacity is 0.01779 bbl/ft.

HWDP 5.0 in. 49.3 lb/ft., capacity = 0.00883 bbl/ft., length = 240 ft.

Drill collars –8.0 in. O.D. –3.0 in. ID, capacity is 0.0087 bbl/ft., length = 366ft.

Annulus - Hole size = 12 ¼ in. drill collar/open hole capacity = 0.0836 bbl/ft., drill

pipe/open hole capacity = 0.1215 bbl/ft.,

Drill pipe/casing capacity = 0.1303 bbl/ft.

Mud pump (7 in. X 12 in. triplex @ 95% eff.) = 0.136 bbl/stk.

Leak of test with 9 ppg mud = 1130 psi

Casing setting depth = 5580 ft. Pit gain = 49 bbl, TVD = 9300 ft.

Shut in drill pipe pressure = 490 psi, Shut in casing pressure = 590 psi.

Q6) a) Calculate

i) No.of sacks ii) volume of water in bbl.

iii) Displacement volume.

If 800 ft. of 13 3/8" surface casing is to be set in 16" hole. The slurry yield is 1.2 cubic ft/sack & 33% excess is needed. The cement slurry weight is 12 ppg & requires 5 gal/sack of water. Cement is circulated to the surface. Capacity of the annulus to be cemented is 0.4231 cubic ft/ft. Capacity 13 3/8" Casing is 0.1495 bbl/ft. **[6]**

b) Write a short note on: **[10]**

i) Well control during perforation.

ii) Multiple zone well completion.

Q7) a) Write the merits and demerits of various methods of well control. **[10]**

b) Discuss under balanced drilling in brief. **[6]**

Q8) a) Explain annular and shear ram BOP. **[8]**

b) Draw various types of blowout preventors stacks along with their features. **[8]**

Total No. of Questions : 7]

SEAT No. :

P2146

[Total No. of Pages : 3

[4165] - 839

M.E. (Petroleum Engg.)

GIS AND COMPUTER APPLICATIONS IN PETROLEUM INDUSTRY

(2008/2002 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate books.***
2) ***Attempt any two questions each from Section I and from Section II.***
3) ***Assume additional data if required.***
4) ***Use of graph paper is allowed.***

SECTION - I

Q1) a) What is the difference between raster and vector GIS? Discuss their advantages and limitations. **[15]**

b) How is data stored in BSQ and BIP or in full raster structure? **[10]**

OR

Q2) a) List and define an example of a spatial object type from each of the 0-D, 1-D, 2-D and 3-D groups of object types. **[15]**

b) Figure given below shows information about an object showing variation in values. Prepare a continuous surface map giving shape of the object. Assume value of 1 for the open squares with no value. **[10]**

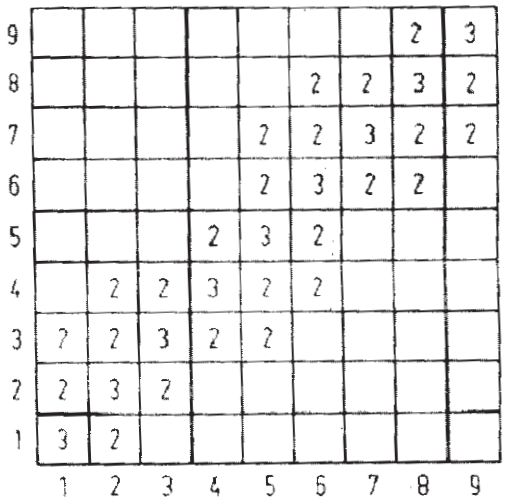

Figure for Q.2.B.

P.T.O.

Q3) a) What is a Spatio-temporal data model in GIS? Explain in brief main concepts defined for a space-time path. **[10]**

b) Discuss the relative importance of each map projections: equal-area, equidistant and conformal. **[15]**

OR

Q4) a) What are buffers/ Dilation? Explain in brief basic methods of using buffer operations. **[10]**

b) How does Structured Query Language help in the creation of maps based on selective attribute data? What are the major types of SQL? **[15]**

SECTION - II

Q5) a) The vector-line subsurface marker horizon map below is overlain with a raster grid of columns and rows. Determine the value for each intersecting point in the grid marked at the centre. Prepare a table to create a raster-based, grid DEM data set. **[15]**

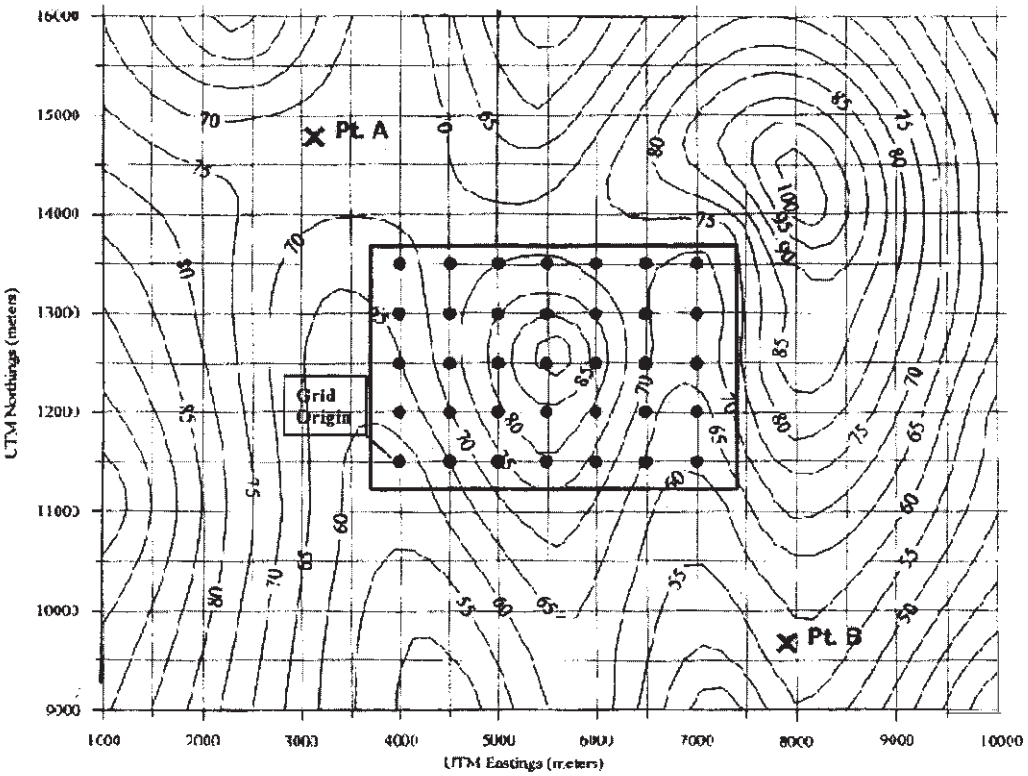

Figure for Q. 5. (A)

Find out their respective elevations using interpolation method. How is autocorrelation attempted in this map?

b) Explain the difference between static maps and dynamic maps with supporting examples. How is anisotropy taken into consideration? **[10]**

OR

Q6) a) What are Digital Elevation Models (DEM)? How are they created? **[10]**

b) What is the difference between deterministic and probabilistic approach in the mapping of oil spill hazard and contingency planning using GIS and Remote Sensing techniques? **[15]**

Q7) a) Answer **any two** of the following **[20]**

i) Site selection using different Boolean operations.

ii) Utility of GIS in integrating the information in the life span of typical oil and gas field development project.

iii) Implementation of environmental management model in the oil and gas operations by means of Remote Sensing and GIS.

iv) Geostatistics in GIS.

v) Data required in the understanding of a three-dimensional reservoir model.

b) Figure shown below gives contamination concentration values at B, C and D along with distance between them. **[5]**

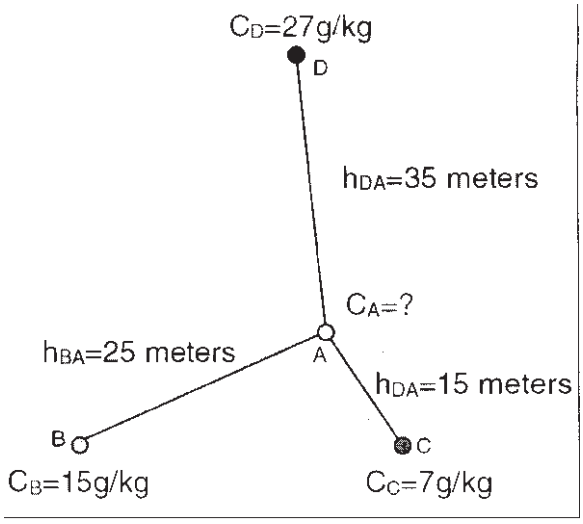

Figure for Q. 7. B.

Calculate the contaminant concentration at point A using inverse distance weighted (IDW) interpolation method.

How is autocorrelation attempted in such cases?

Total No. of Questions : 6]

SEAT No.:

P2148

[Total No. of Pages : 3

[4165]-841
M.E. (Petroleum Engineering)
ADVANCED NATURAL GAS ENGINEERING
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer two questions from each section.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of a non-programmable calculator is allowed.***
6) ***Assume suitable data, if necessary and clearly state it.***

SECTION - I

Q1) Describe phase behavior for a gas reservoir. **[25]**

OR

Following surface conditions are given :

a) API gravity of condensate = 50
b) GOR in the first separator = 10,500 scf/stb
c) Pressure in the first separator = 550 psi
d) Temperature in the first separator = 90 deg F
e) Specific gravity of gas in the first separator = 0.69

Calculate the wellstream specific gravity, and critical properties of gas.

Q2) Derive the pipe line flow equation hence derive an equation for parallel pipelines. **[25]**

OR

The following data are provided for air-water flow. Estimate the slip and no-slip mixture properties. Estimate the gravitational and frictional pressure gradients using both slip and no-slip properties.

a) Q1 = 0.15 ft3/sec
b) Qg = 0.2 ft3/sec
c) Rho-1 = 62.4 lbs/ft3
d) Rho-g = 1.5 lbs/ft3
e) Mu-1 = 1 cp

P.T.O.

f) Mu-g = 0.015 cp
g) D = 4 inches
h) HI = 0.45
i) Theta = 90 degrees
j) Roughness = 0.00006 ft

Q3) Explain the design of a reciprocating compressor. **[25]**

OR

Natural gas with the following properties and conditions is to be compressed by a centrifugal compressor.

a) Gamma-g = 0.64
b) Ps = 256 psia
c) Pd = 665 psia
d) k = 1.24
e) ts = 99 deg F

If the desired flow rate is 45 MMSCFD, what horsepower is required to compress the gas assuming 75% adiabatic efficiency and 95% mechanical efficiency?

SECTION - II

Q4) Derive the material balance equation for a gas reservoir with compaction. **[25]**

OR

For water drive reservoirs (with no water production at the wells), derive the following equation :

$P/Z = (Pi/Zi) [(1 - (Gp/Gi)] / [(1 - (WeBw/GiBgi))]$.

Q5) Draw a process flow diagram to show two methods how H_2O is removed from a natural gas stream. **[25]**

OR

Draw and explain process flow sheet for H_2S removal.

Q6) Explain isochronal and modified isochronal testing. **[25]**

OR

Following data were provided for a multi-rate isochronal test. Generate inflow performance relationship using the analytical m (p) method and the empirical m (p) method.

a) Pr = 352.4 psia.

b) M (p) = m (Pr) = 9.9714 × 10 ^ 6 psia ^ 2/cp.

Time (hours)	Qg (MMSCF/D)	Pwf (psia)	M (pwf)
0.5	0.983	344.7	9.6386 × 10 ^ 6
0.5	2.631	329.5	9.0027 × 10 ^6
0.5	3.654	318.7	8.5674 × 10 ^6
0.5	4.782	305.5	8.0534 × 10 ^6
1	0.977	342.4	9.5406 × 10 ^6
1	2.588	322.9	8.7351 × 10 ^6
1	3.565	309.5	8.2071 × 10 ^6
1	4.625	293.6	7.6136 × 10 ^6
2	0.97	339.5	9.4179 × 10 ^6
2	2.533	315.4	8.4371 × 10 ^6
2	3.453	298.6	7.7922 × 10 ^6
2	4.438	279.6	7.0990 × 10 ^6
3	0.965	337.6	9.3381 × 10 ^6
3	2.5	310.5	8.2458 × 10 ^6
3	3.39	291.9	7.5435 × 10 ^6
3	4.318	270.5	6.7797 × 10 ^6

Total No. of Questions : 8]

SEAT No. :

P2151

[Total No. of Pages : 4

[4165] - 848

M.E. (Petroleum Engineering)

OPEN ELECTIVE PIPING DESIGN AND ENGINEERING

(2008 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answer any two questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the piping codes and standards related piping design and engineering. **[10]**

b) Calculate the pressure drop for rate 25 liters/sec for following cases: **[15]**

i) Newtonian fluid with viscosity 10 poise.

ii) fluid with zero shear viscosity = 10 Poise and flow behavior index, n = 0.9.

iii) Fluid with zero shear viscosity = 10 Poise and flow behavior index, n = 1.1.

Q2) a) Discuss in brief flow patterns and flow regimes in multiphase mixtures. **[10]**

b) Sand with a mean particle diameter of 0.2 mm is to be conveyed in water flowing at 0.5 kg/s in a 25 mm internal diameter horizontal pipe 1100 m long. Assuming fully suspended flow, estimate the maximum amount of sand which may be transported in this way if the head developed by the pump is limited to 300 kN/m^2?

The terminal falling velocity of the sand particles in water may be taken as 0.0239 m/s. **[15]**

Q3) a) Write short notes on : **[15]**

i) Types of pipe supports and their selection.

ii) Bellows type expansion joints.

iii) Pipeline material and components.

b) Discuss in brief piping fabrication and inspection and non-destructive testing methods used in Piping Engineering and design. **[10]**

P.T.O.

Q4) A process sketch of a fractionating tower is given in Figure 1. The vessel has the following specifications. Shell thickness is to be determined. As thumb rule. it is to be noted that for each 5-6 m height, shell thickness can be increased by 1-2 mm. This is required to determine the number of shell courses. **[25]**

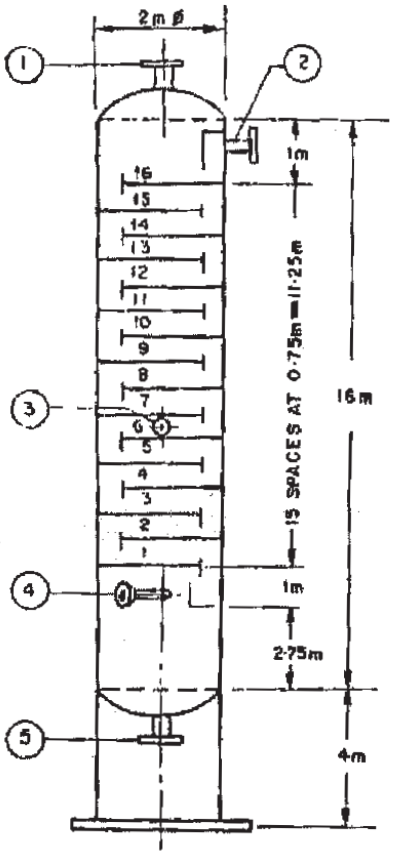

Figure 1 for Q.4

Max. Wind. Velocity expected (for height up to 20)	=	140 km/hr
shell OD	=	2.0 m
Shell length tangent to tangent	=	16.0 m
Skirt height	=	4.0 m
Operating Temperature	=	573 K
Operating Pressure	=	0.7 MN/m^2
Design Temperature	=	593 K
Design Pressure	=	0.8 MN/m^2
Shell material: Shell, double welded butt joints, no stress relieving or radiographing	=	IS: 2002-1962, Grade 2B
Corrosion Allowance	=	3 mm
Tray Spacing	=	0.75 m
Top disengaging space	=	1.0 m
Bottom Separator space	=	2.75 m
Weir height	=	75 mm for all trays
Downcomer clearance	=	25 mm for all trays

Weight of each head	=	7.5 kN
Tray loading excluding liquid (alloy steel trays)	=	1.0kN/m^2 of tray area
Tray Support rings	=	60 mm × 60mm × 10 mm angles
Insulation	=	75 mm asbestos
Accessories	=	One caged ladder

Manways, gauge glass and level control connections are provided.
Design in accordance with IS: UPV code for class 2 vessels neglecting seismic for ces.
Nozzle specifications are given below

No.	Size (m)	Service
1	0.400	Overhead Vapor
2	0.075	Reflux
3	0.300	Feed inlet, internal distributor designed to provide distribution across length of tray
4	0.400	Reboiler, made tangential
5	0.200	Bottoms

SECTION - II

Q5) a) Discuss in brief the application and techniques of carthodic protection for underground pipeline systems. **[10]**

b) Discuss with process flow diagram the considerations for piping for distillation systems. **[10]**

c) Write a brief note on : "Pipeline construction for cross country and offshore system". **[5]**

Q6) a) Calculate the minimum required wall thickness and choose suitable pipe schedule for 250 NB (OD = 273 mm) pipe under following conditions :
Internal Pressure = 30 kg/cm^2
Joint efficiency factor = 85%
Corrosion allowance = 1.7 mm
Material of construction = Carbon steel, having maximum allowable stress = 900 kg/cm^2 at operating temperature.
Assume standard mill tolerance
Also calculate maximum allowable internal pressure for above pipe of adopted schedule. **[10]**

b) Write short notes on : **[15]**

i) Plot plan and Equipment Layout

ii) HAZOP

iii) Fire Protection Systems.

Q7) a) Discuss the importance and principles of Piping Network analysis in Piping Engineering and design. Derive an equation for flow of liquids through circular circular pipe that relates relationship between friction head loss and flow as well as branch parameters (such as equivalent length and diameter) State the assumptions made in this derivation. **[15]**

b) Discuss various factors to be considered for piping design for flow through perforated pipes and porous media. **[10]**

Q8) Consider the process flow sheet for distillation plant (Capacity = 30 KLPD) for Ethyl alcohol from fermented molasses as shown in Figure 2. **[25]**

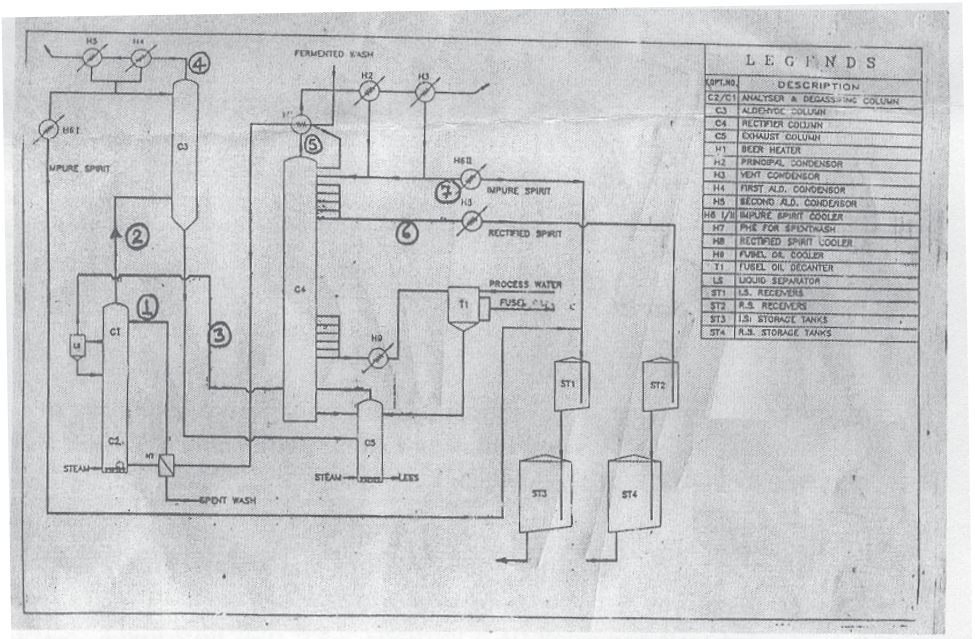

Figure 2 for Q.8

Do the Pipe size analysis for stream No. 1 to 7 as shown in Figure 2.
Alcohol concentration in fermented wash = 9.0% (v/v)
Alcohol concentration in Rectified spirit = 95% (v/v)
Alcohol concentration in vapors generated in Analyzer column = 44.5% (w/w)
Optimum velocity for rectified spirit vapors = Range 15-20 m/s
Optimum velocity for pump discharge liquid = Range 1.2-2.0 m/s
Optimum velocity for gravity flow = Range 0.3-0.5 m/s
Reflux Ratio (R) = 7.0.

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Total No. of Questions : 8]

SEAT No. :

P2152

[Total No. of Pages : 3

[4165] - 849
M.E. (Information Technology)
APPLIED ALGORITHMS
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer three questions from each Section.***
2) ***Answers to the two sections should be written in separate answer - books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the proof by contradiction or indirect proof of proof technique. Why do we need these proof technique? And with the help of proof by contradiction "prove that there exist 2 irrational numbers X and Y such that X^Y is rational. **[8]**

b) What is the principle of mathematical induction and variations of the principle of mathematical induction? Prove by mathematical induction. **[8]**

$1^2 + 2^2 + ... + n^2 = n (n + 1) (2n + 1)/6$

Q2) a) Explain the following algorithms with example: **[10]**

i) Iterative algorithm.

ii) Recursive algorithm.

iii) Serial algorithm.

iv) Parallel algorithm.

v) Deterministic algorithm.

vi) Approximation algorithm.

b) Solve the following recurrence relations: **[6]**

$t_n = 0$ if $n = 0$

$t_n = 5$ if $n = 1$

$t_n = 3\ t_{n+1} + 4\ t_{n-2}$ otherwise.

P.T.O

Q3) a) What is worst case, average case and best case time complexity of an algorithm? Illustrate the Quick sort and Merge sort algorithm and Analyze the same to find out its worst case, average case and best case complexity. **[8]**

b) Trace the action of binary search algorithm, including listing the value of Low, High and Mid after each iteration, for the list {2,3,5,7,11,13,17,19,23,29,31,37} for each of the following search elements. **[8]**

i) X = 2

ii) X = 24

iii) X = 31

iv) X = 13

And give the number of comparison required in each case.

Q4) a) What is time complexity and space complexity of an algorithm? How do we measure these complexities of an algorithms? Discuss the recursive and non-recursive version of finding the maximum value in the array of 10 elements and compare the time space complexity requirement in the same. **[8]**

b) Assume you have functions f and g such that f(n) is O(g(n)). For each of the following statement, decide whether you think it is true of false. And give a proof or counter example. **[10]**

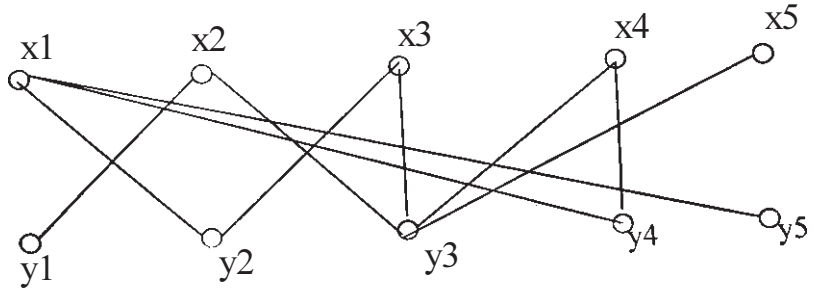
i) $\log_2 f(n)$ is $O(\log_2 g(n))$

ii) $2^{f(n)}$ is $O(2^{g(n)})$

iii) $f(n)^2$ is $O(g(n)^2)$.

SECTION - II

Q5) a) Consider the bipartite graph G. **[10]**



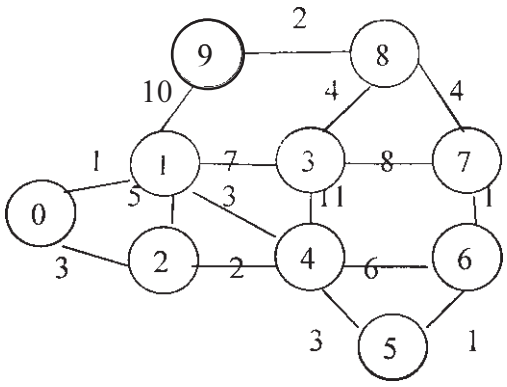
Starting with given matching M = {x1, y1, x3, y3}, determine the perfect matching output by Hungerian. Show each augmenting path that is generated.

b) Explain the following with respect to geometric algorithm. **[6]**

i) Voronoi diagram, Voronoi edges, Voronoi vertices with example.

ii) Convex hull.

Q6) a) Show the action 2-approximation algorithm for finding an approximation to the following tree. For the set S in the following weighted graph, where the nodes S are shaded. **[10]**



b) Explain the following with respect to approximation algorithm. **[8]**

i) Absolute approximation algorithms.

ii) f(n) - approximation algorithms.

iii) $\in$ - approximate algorithm.

iv) Approximate scheme.

Q7) a) Write a short note on: **[10]**

i) Self - adjustment.

ii) Persistence and multi-dimensional tress.

b) Is P = NP? Prove it. Why should we prove P = NP? **[6]**

Q8) a) What is parallel algorithms? How does it different than its counterpart i.e. serial algorithm? Give suitable example. And discuss various parallel computational model and how do they achieve the parallelism in the algorithmic design. **[10]**

b) Let there be n numbers (where $n = 2^i$) and there sum needs to be found out using multiple processor. Design the algorithm using parallel computation. **[6]**

Total No. of Questions : 12]

SEAT No. :

P2153

[Total No. of Pages : 3

[4165] - 850

M.E. (IT)

SOFTWARE ENGINEERING METHODOLOGIES

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate answer books.***
2) ***From section I answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and section II answer Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) What are the Umbrella activities in the software process model? State the significance of each in brief. **[18]**

OR

Q2) a) With the help of a neat diagram, write short note on iterative software process model. **[10]**

b) State one application for using prototype software process model and justify for the selection of the model. **[8]**

Q3) a) Read the following description of the system and answer the questions given below.

An insurance portal is planned which will provide following facilities to the users. If you are a new user, you need to register on the portal. Unregistered users can view various plans of life insurance, travel insurance, vehicle insurance and property insurance. User has to login to take up the policy for any type of insurance. Users can register their life insurance policy on the portal by providing required data. Users can pay premium of the life insurance policy though the portal. Portal takes the help of Third party Payment Gateway.

If you are a new insurance agent, you need to register on the portal. The agents can upload their client details on the portal. Agents can schedule reminders of premium payment for their clients. Agents can send receipts of premium through the portal. Agents can also view their data about commissions and targets.

P.T.O.

i) Identify the actors in the system. **[4]**

ii) Identify the use cases for each actor and draw use case diagram for the system, using applicable notations from UML 2.0 **[8]**

b) Write the relevance of any one of following diagrams with the context of UML 2.0 **[4]**

i) State diagram.

ii) Deployment diagram.

OR

Q4) An election management system manages the elections of an engineering college. Management department flashes the announcement of the number of posts, criteria for contesting each post and criteria for voting each post. This announcement has the complete election schedule displayed on it. Students willing to contest the election are required to fill and submit the forms at the collection centre. This continues for three days from the start date.

The scrutiny department checks the credentials of the contestants and if fulfilled, confirms the registration otherwise rejects that After three days, a first list of students contesting the election is displayed by the scrutiny department. This department displays the notice for withdrawing the applications of contestants, if any. The students willing to withdraw, submit the request to the collection centre. This continues for two days. After two days, the final list of students contesting the election is displayed by the scrutiny department. The students do campaigning in the college campus, hostel and classes. In case of any criminal activity students can register the complaint at security post. Security Department will resolve such cases. This continues for next two days. The election execution department's multiple groups conduct voting parallel in all the classes. Every student of the college will be a valid voter for the election. Scrutiny department checks the validity of the student and allows him/her to vote if valid. The vote counting department counts the votes for all the posts and declares the result of the elections.

Draw the activity diagram for the system using all applicable notations from UML 2.0 **[16]**

Q5) a) Explain the relevance of component diagram and explain the meaning of the keywords provided interface, required interface, ball and socket symbol, port. **[10]**

b) In the context of sequence diagram, what is ref and alt, explain in brief. **[6]**

OR

Q6) a) Write short note on CORBA. **[8]**

b) What is requirement elicitation for functional and non functional requirements? Explain in brief. **[8]**

SECTION - II

Q7) a) Explain the importance of inheritance and modularity in software design. **[8]**

b) Identify the following symbols of UML 2.0 and show their usage in class diagram with relevant examples. **[10]**

i) ---------- ▶

ii) _____

iii) ◆————

iv) ---------->

v) inheritance

OR

Q8) a) Explain the lifecycle of designing a system from Object oriented perspective. **[10]**

b) Explain the steps involved in user interface design. **[8]**

Q9) a) What is white box testing? What is the purpose of static testing? **[8]**

b) What are the methods of conducting static testing by humans? Explain in brief. **[8]**

OR

Q10)a) What is Black box testing? Why is it needed? How is back box testing done? **[8]**

b) What is use case based software estimation? Explain in brief. **[8]**

Q11)a) Explain Ishikawa's seven tools for quality in brief. **[10]**

b) What are types of non functional testing? Explain their importance in brief. **[6]**

OR

Q12)a) Explain software debugging. **[8]**

b) State the salient features of process assessment model CMMI. **[8]**

☛ ☛ ☛

Total No. of Questions : 10]

SEAT No. :

P2154

[Total No. of Pages : 2

[4165] - 853

M.E. (IT)

REAL TIME AND EMBEDDED SYSTEMS

(2008 Course) (Elective - I(b)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Briefly describe the distinction between requirements and specifications of the embedded system. **[8]**

b) Discuss the advantages and disadvantages of top-down and bottom-up design process in embedded system design. **[8]**

Q2) a) Explain the behavioral description with respect to state machine diagram and sequence diagram with suitable example. **[8]**

b) What are the key features of SHARC processor and discuss the targeted application areas for this processor. **[8]**

Q3) a) What are interrupt sources in ARM processor? Describe the interrupt mechanism in ARM processor. **[8]**

b) Explain the branching and pipelining function in SHARC processor with suitable examples. **[8]**

Q4) a) List the special features of ARM processor. Explain ARM and THUMB instruction processing with help of ARM and ARMT instruction pipelines. **[8]**

b) Draw SHARC core processor block diagram and explain SIMD engine (PE) composition and operation in brief. **[8]**

P.T.O.

Q5) Write short note on ANY three **[18]**

a) Caching in ARM processor.

b) DMA in SHARC processor.

c) Microprocessor in Circuit Emulator.

d) List ARM CPU modes of operations with brief description of each.

SECTION - II

Q6) a) List all assumptions for priority driven scheduling of periodic tasks and explain same with suitable scheduler. **[8]**

b) Discuss the assumption for clock driven scheduling and explain cyclic scheduler in detail. **[8]**

Q7) a) Give the classification of the scheduling algorithms, compare and contrast static vs. dynamic algorithms with examples. **[8]**

b) What is a design flow model? Explain any one with suitable diagram. **[8]**

Q8) a) Explain the structure of I2C bus. Draw state transition diagram for I2C bus master. **[8]**

b) What is CRC card? Describe stages for CRC card methodology. **[8]**

Q9) a) Briefly describe the difference between waterfall and spiral development module. **[8]**

b) Discuss the data transfer format of I2C bus with respect to read and write cycle. **[8]**

Q10) Write short notes on any three **[18]**

a) Weighted round-robin approach.

b) Schedulable set of jobs and optimal scheduling.

c) Periodic Task notations and their significance.

d) Debugging tools in embedded system.

Total No. of Questions : 10]

SEAT No. :

P2155

[Total No. of Pages : 2

[4165] - 855

M.E. (Information Technology)

INFORMATION ASSURANCE AND SECURITY

(2008 Course) (Elective - II(a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is double DES? What kind of attack on double DES makes it useless? **[8]**

b) Differentiate between the following terms:- **[10]**

i) Confidentiality and authentication.

ii) Active and Passive attack.

iii) Known plain text attack and chosen plain text attack.

iv) Cryptography and steganography.

Q2) a) What basic arithmetical and logical functions are used in MD5? Explain SHA-1 logic. Compare SHA-1 and MD5. **[8]**

b) What do you understand by Digital signature? What is the difference between direct and arbitrated digital signature? **[8]**

Q3) a) What are the requirements for a Hash function? What is Birthday attack on Hash codes? What do you understand by Weak collision resistance and strong collision resistance? **[8]**

b) In a public key system using RSA, if the Cipher text C = 10, public key e = 5, n = 35, what is the plain text corresponding to the Cipher text C? **[8]**

P.T.O.

Q4) a) What services does IPSec provide? What is the difference between transport mode and tunnel mode? **[8]**

b) What is Kerberos? Describe Kerberos version 4. **[8]**

Q5) a) What do you understand by web security? What are the secure socket layers and their functions? **[8]**

b) Describe the four categories of security threads? **[8]**

i) Interruption ii) Interception

iii) Modification iv) Fabrication

SECTION - II

Q6) a) What is Trojan horse? What is the principle behind it? What do you understand by computer viruses and worms? **[8]**

b) Why security policies are important? How Security can be achieved with the help of setting of the data integrity policy. **[8]**

Q7) a) Explain Diffie-Hellman key exchange algorithm. Explain man-in-the-middle attack. **[10]**

b) Which are the system security levels defined in Orange Book? Which are the primary requirements of B1 standard? **[8]**

Q8) a) What is difference between warm and virus? Explain micro virus. List three names of system threat and program threat. **[8]**

b) Draw and explain the architecture for distributed Intrusion Detection. **[8]**

Q9) a) Given the four firewalls: Application proxy firewall, Packet filter firewall, Stateful firewall and the Personal firewall; in what order would you place them from the Internet towards a network and explain why would you place so? **[8]**

b) Define Cyber-law terms. Integrate concepts of Cyber-law into everyday business practices by reviewing Cyber-law Internet security issues. **[8]**

Q10)a) Describe important functions in Information Security w.r.t.: **[8]**

i) Protect the organization's ability to function

ii) protects the data the organization collects and uses

iii) Safeguards the technology assets in use at the organization

b) What is PGP? Explain with example the reasons for using PGP? **[8]**

Total No. of Questions : 8]

SEAT No. :

P2156

[Total No. of Pages : 2

[4165] - 857

M.E. (IT)

GEOGRAPHICAL INFORMATION SYSTEMS

(2008 Course) (Elective - II(c)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Question Nos. 4 and 8 are compulsory. Out of the remaining attempt 2 questions from Section I and 2 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the concept of map projections. What are the different types of scales used in map projections? **[8]**

b) Explain the integration of 'Remote sensing and GIS'. How does it help in decision support systems? **[8]**

Q2) a) Explain how GPS helps in GIS data management. How will you ensure data accuracy? **[8]**

b) Explain neighborhood operations and their applications. **[8]**

Q3) a) Explain the working of multispectral imaging sensor systems with suitable diagram. **[8]**

b) What is the basic principle of 'RADAR'. Explain the geometrical characteristics observed in radar images. **[8]**

Q4) Write short notes on the following:

a) Grid system in India **[6]**

b) Temporal topology **[4]**

c) Spatial aggregation **[4]**

d) Radiometric resolution **[4]**

P.T.O.

SECTION - II

Q5) a) Explain the general procedure for interpretation of remotely sensed images. **[8]**

b) Explain the spatial filtering techniques used for image enhancement alongwith their significance. **[8]**

Q6) a) Explain use of variograms for spatial analysis. Give significance of variograms fitted by different models. **[8]**

b) What are the various procedures provided by statistical packages for data analysis? Explain each one of them in brief. **[8]**

Q7) a) Explain the GIS data processing methodology with suitable diagram. **[8]**

b) Assume that regions of our country are to be supplied with adequate drinking water. How will your knowledge of GIS data processing help in this task. **[8]**

Q8) Write short notes on the following:

a) Role of satellite imagery in analysis of agricultural land use patterns in India. **[6]**

b) Topographical mapping. **[4]**

c) Random noise removal. **[4]**

d) Common data transformations. **[4]**

Total No. of Questions : 8]

SEAT No. :

P2157

[Total No. of Pages : 2

[4165] - 858

M.E. CSE (Information Technology)

NET CENTRIC COMPUTING

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt any Three questions from Section - I and Three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicates full marks.***
5) ***Use of non-programmable calculator is allowed.***

SECTION - I

Q1) a) How OSI model has defined the following functionalities to support the network communication? **[10]**

i) Method by which device knows when to transmit data and when not to.

ii) Method to ensure that n/w transmission is received correctly and by the right recipient.

iii) Method to ensure that network devices maintain a proper DTR of data flow.

iv) Method to represent data on the n/w media.

b) How is the collision detected over the physical communication medium in IEEE802.3 Ethernet Networks? **[6]**

Q2) a) Why Poisson distribution is important in queuing analysis? How can it be applied to the arrival rate? **[10]**

b) The owner of the shop observes that on average 18 customers per hour arrive and there are typically 8 customers in the shop. What is the average length of time each customer spends in the shop? **[6]**

Q3) a) Assume that you are an administrator of the network in your organization. How will you deal with the following problems of network? **[10]**

i) Polling Delay ii) Link Delay

iii) Component Latency iv) Very high rate of collision.

P.T.O.

b) What does 20/80 traffic distribution means? How it can be implemented over the network? **[6]**

Q4) Write short notes on (Any Three): **[18]**

a) Network design tools.

b) Internetworking.

c) Terminal assignments and concentrator location.

d) Network design issues.

SECTION - II

Q5) a) State the basic principle of Constrained Minimum Spanning Tree (CMST) algorithm. How suitable is this algorithm for obtaining multipoint line layout. **[8]**

b) How tradeoff function is calculated in the Esau-Williams algorithm? How effective is it for obtaining the multipoint configuration? **[8]**

Q6) a) Justify or nullify the following statement. **[8]**

"Fixed cell length in ATM makes the ATM switch faster."

b) Why two different data rates CIR and EIR supported by the frame Relay Network? **[8]**

Q7) a) Describe any four functions provided by ISDN physical layer at reference point S or T. **[8]**

b) How LZ77 compression algorithm makes the use of two buffers for matching the strings? **[8]**

Q8) Write short notes on (Any Three) **[18]**

a) DWDM

b) DSL

c) Kerberos

d) VOIP.

Total No. of Questions : 9]

SEAT No.:

P2158

[Total No. of Pages : 3

[4165]-860
M.E. (Information Technology)
MANAGEMENT TRENDS IN INFORMATION TECHNOLOGY
(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Any hospital is dedicated to a single objective-to provide the best possible care for their patients. "e-Sushrut" C-DAC's Hospital Management Information System is a complete ERP solution for hospitals. What are the Information Systems needed to develop such HMIS? What steps must be taken while developing such systems to supports variety of hospitals such as medium sized clinic, large sized hospitals, and super specialty hospitals. Briefly write the importance of Information System in health care. **[8]**

b) Explain the process of building Information Model of the organization. **[8]**

Q2) a) You have identified a market opportunity for home media players that would cater for older members of the population. Many older people have difficulty understanding the operating principles of devices such as MP3 players, internet radios for streaming audio and personal video recorders and players. Describe design and evaluation processes that could be used by a start-up company to improve the usability of such devices for this population. **[8]**

b) Why requirement elicitation is difficult? What is meant by requirement negotiation? Why requirements need to be stable and correct? **[8]**

P.T.O.

Q3) a) You are the IT Project Manager of a network upgrade project. Your Lab consists of 256 work station. You have to establish a new WiFi lab. We have three access points. You have to set up the lab in a glass circular building. (Approx. 5 km rad). Total new 100 terminals with same configuration with additional wireless port you have to add. Additionally you required one wired network with 50 terminal from same gate way. (Assume additional technical information if needed related to project). Create Work Breakdown structure with proper information. Explain its importance. **[9]**

b) RCT University has expanded very rapidly introducing a number of programmes and increasing student intake capacity. It has recently computerized its examination process based on some off-the-shelf software. The library had already been computerized a couple of years back using a freely distributed Library Automation System. Daily cash transactions are also handled by computers in the Finance and Accounting Division, using accounting software. For further improvement of efficiency, the new governing body of the University have entrusted the task of developing an MIS for the University to a software company. All these developments were welcomed by a cross-section of the University Community except a few. One of them is a faculty member at the Management Science Department who commented that the University is burdening itself with too many independent information systems. He strongly favored an integrated information system on the lines of an ERP for a business organization.

Questions :

i) Visualize that the University governing body decides to drop the MIS plan and agrees to the idea of developing an integrated IS. What problems are likely to creep in?

ii) Comments on Establishing Project Priorities (make assumptions if required).

iii) Prepare a project plan for the above system. **[9]**

Q4) a) Explain different disaster recovery strategies. **[8]**

b) What is the purpose of CMMI? List and explain generic goals and practices for project planning process area. **[8]**

Q5) a) Elaborate on the various constraints the team has to deal with in building the project plan. Also write need for revision of plan. **[8]**

b) Define project quality. Explain in Impact of IT on Quality Management Systems. **[8]**

SECTION - II

Q6) a) What are attributes of a good project manager in regard to leading a team? How does he/she will lead a team when project is consistently going away? **[8]**

b) Compare the process assessment model CMMI with reference to CMM on the basis of KPAs. **[8]**

Q7) a) Explain the theory of Group Formation. Also write formal and informal groups and their Interaction. **[8]**

b) What is Conflict Management? Explain how traditional and Modern View of Conflict different? **[8]**

Q8) a) Read the following news snippets and answer the questions : **[8]**

- On 20 November, 1985, the Bank of New York lost over $ 5 million as a result of an error in the software of the digital system that registered all the bank's financial transactions.
- In 1992, a software problem created total chaos in the communication system of ambulance services in London. The delay in communications caused the death of 30 people.
- On 7 August, 1996, the computer system of Internet-provider America Online (AOL) failed for 19 hours when new software had been installed. Over 16 million subscribers were affected. Before this took place, the AOL experts had strongly suggested that the system was immune to this kind of disaster.

i) Is it justified to say that digital systems are unreliable and carries enormous risks?

ii) What countermeasures should be put in place to minimize damages due to failure of digital systems? Give your answer for each of the above three situations.

b) "Intellectual Property is known as a power tool for economic growth". Explain this statement with suitable example. **[4]**

c) Write down the term of copyright in literary, dramatic, musical or artistic works. **[4]**

Q9) Write short note on <u>any three</u> of the following : **[18]**

a) Indian Copyright Act.

b) Stress Management.

c) Learning Organizations.

d) The Consumer Protection Act.

Total No. of Questions : 8]

SEAT No. :

P2161

[Total No. of Pages : 2

[4165] - 891

M.E. (Instrumentation & Control) (Process & Bio.)

TRANSDUCER DESIGN

(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Design a temperature measuring system for a boiler in a sugar industry. The temperature is to be monitored from the boiler inlet to steam outlet. Maximum dry steam temperature is expected to be 200ºC. Suggest suitable temperature sensors with the signal conditioning and appropriate monitoring system. **[16]**

Q2) Discuss the selection criteria for Sensors required for monitoring the pollution in the crowded locality like Deccan Gymkhana, Pune. Suggest suitable sensors and their ranges. Propose a compact Data Acquisition System. **[16]**

Q3) a) Discuss the factors considered to select sensors for flow measurement in sewage industry. Explain one such design set up. **[10]**

b) Explain potentiometric displacement transducer. List two applications in which it is used. **[6]**

Q4) a) Explain the design considerations for measurement of acceleration in a moving vehicle. **[9]**

b) Explain Fiber Optic Displacement sensor to measure the vibrations of a turbine blade in wind tunnel test room, noninvasively. **[9]**

P.T.O

SECTION - II

Q5) Explain the design steps for measuring static plus fluctuating pressures on a hydraulic turbine. Consider a situation where the static head is of 200 mtr of water and dynamic fluctuations are of one quarter of the static head, with fluctuations having instantaneous rise of around 1ms maximum. The fundamental frequency of fluctuations is around 3000 rpm. What material of diaphragm would you prefer? What sensing element would you prefer for such transducer? State your assumptions. **[16]**

Q6) Design a simple digital liquid level sensor to monitor liquid level in a large reservoir using float level switches. Suggest one more setup using non contact type sensor. Compare both the techniques. **[16]**

Q7) A vibrating wire transducer system is designed for monitoring earth pressure and strain in large bridge on the river Narmada. Discuss the principle and monitoring instruments. **[16]**

Q8) Write short notes on: **[18]**

a) Nano Sensors.

b) Laser Doppler Velocity meter.

Total No. of Questions : 8]

SEAT No. :

P2162

[Total No. of Pages : 2

[4165] - 892

M.E. (Instrumentation & Control) (Process Inst./Biomedical Inst.)

MATHEMATICAL METHODS IN INSTRUMENTATION

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain followings with suitable examples.
i) Basis Vectors.
ii) Norm of Vectors. **[8]**

b) Obtain orthonormal vectors of the following vectors. **[10]**

$$A=\begin{bmatrix}1 & 2 & 1\\ 0 & 2 & 0\\ 2 & 3 & 1\\ 1 & 1 & 0\end{bmatrix}$$

Q2) a) Explain orthogonal transformations with suitable examples. **[6]**

b) Find singular value decomposition of **[10]**

$$A=\begin{bmatrix}4 & 11 & 14\\ 8 & 7 & -2\end{bmatrix}$$

Q3) a) Find real root of $x - \log_{10} x = 1.2$ using Newton - Raphson's method. **[8]**

b) Solve the following equations using Gauss elimination method. **[8]**

$x + 4y - z = -5$
$x + y - 6z = -12$
$3x - y - z = 4$

P.T.O.

Q4) a) Explain Linear transformations with suitable examples. **[8]**

b) Explain Runge-Kutta Numerical Method. **[8]**

SECTION - II

Q5) a) State & explain axioms of probability. **[8]**

b) Two cards are drawn from a well shuffled ordinary deck of 52 cards. Find the probability that they are both aces if the first card is

i) replaced ii) not replaced **[8]**

Q6) a) Find the probability that in a family of 4 children there will be **[10]**

i) at least one boy.

ii) at least one boy & at least one girl.

b) Explain poisson's distribution function with suitable example. **[8]**

Q7) a) Discuss the role of mathematical expectations in Biomedical/process measurement applications. **[8]**

b) A random variable X has following density function. **[8]**

$$f(x)=\begin{cases}\frac{1}{2}x & 0<x\leq 2\\ 0 & \text{otherwise}\end{cases}$$

Calculate mean & variance.

Q8) a) Define: **[6]**

i) Mean ii) Variance

iii) Standard deviation.

b) Discuss probability distribution function. **[10]**

Total No. of Questions : 8]

SEAT No. :

P2164

[Total No. of Pages : 2

[4165]-894

M.E. (Instrumentation & Control) (Process Instru. & Biomedical Instru.)

ANALYTICAL INSTRUMENTATION

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) With appropriate examples, discuss Qualitative and Quantitative analysis. Also discuss trace analysis. **[10]**

b) Classify chemical instrumental methods with examples. **[8]**

Q2) Explain with a block diagram working of a scanning type of UV – VIS Spectrophotometer. Also discuss what are the advantages and disadvantages of scanning type of spectrophotometer. **[16]**

Q3) Explain Atomic Emission Spectrometry with various types of excitations. And explain flame emission spectrometry. **[16]**

Q4) a) What is Auger Electron? Explain a Chemical Analytical method which is based on Auger electron detection. **[8]**

b) Explain with neat diagram working of Scintillation Counter. **[8]**

SECTION - II

Q5) Explain with neat diagram working of Atomic Absorption Spectrometer. Also explain working of hollow cathode lamp. **[17]**

Q6) a) Explain working principle of GC with neat diagram. Also enlist various GC detectors and explain any one detector in detail. **[10]**

b) Write a short note on "Sample introduction in HPLC". **[7]**

P.T.O.

Q7) Explain with neat diagram working of IR spectrophotometer. Why mirrors are preferred over lenses in IR spectrometry. **[16]**

Q8) What is Nuclear Magnetic Resonance? How it is helpful in chemical analysis? Also explain chemical shift in the context of NMR. **[16]**

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Total No. of Questions : 8]

SEAT No. :

P2165

[Total No. of Pages : 2

[4165] - 895

M.E. (Instrumentation & Control) (Process & Biomedical Instrumentation)

INDUSTRIAL AUTOMATION

(Elective - I (a)) (2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from Section - I & Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe the internal PLC operation for analog I/O. **[8]**

b) Discuss in brief with suitable block diagram any four major components of the DCS. **[8]**

Q2) Describe in brief SCADA systems in terms of their architecture, interface to process hardware and the functionality. **[16]**

Q3) Develop DCS based configuration in a Power Plant. Discuss in brief recent developments in Power Plant Technology. **[18]**

Q4) Write notes on: **[16]**

a) Model Predictive Control.

b) Hybrid DCS/PLC.

SECTION - II

Q5) What is the role of teamwork in process improvement? Give reasons why the system and SPC techniques should be introduced together for maximum beneficial effect. Also, List applications of SPC. **[16]**

P.T.O.

Q6) a) Explain with suitable schematic Fuzzy Logic Controller. **[8]**

b) Explain in brief interfacing of PLC with SCADA software. **[8]**

Q7) Explain in brief related to DCS system: **[16]**

a) System Elements.

b) Data communication links.

Q8) Write notes on: **[18]**

a) Artificial Neural Network.

b) OPC.

Total No. of Questions : 6]

SEAT No. :

P2166

[Total No. of Pages : 3

[4165] - 900

M.E. (Instru. & Control) (Process Instru. & Biomedical Instru.)

CONTROL SYSTEM DESIGN

(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer 2 questions from Section - I and 2 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) List the various types of compensators. Explain the series compensators with respect to the following points. **[9]**

i) Pole - zero location.

ii) Its Effect on root locus.

iii) Its Effect on transient and steady state response.

b) The forward path transfer function of a unity feedback control system is **[16]**

$$G(s)H(s)=\frac{100}{s(s+4)(s+5)}$$

It is desire to have peak overshoot as 9% and natural frequency of oscillation 10 *rad /sec*. Design a suitable compensator.

Q2) a) Design a controller for the following first order system: **[10]**

$$G_p(s)=\frac{K_p e^{-\alpha s}}{(T_p s+1)}$$

Using the direct synthesis approach, and given that the desired closed - loop behavior is:

P.T.O

$$G_{CL}=\frac{e^{-\alpha_r s}}{(\lambda s+1)}$$

[Use first order pade approximation for approximation of delay time]

b)
$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix}=\begin{bmatrix} \frac{1.66e^{-3.6s}}{7.7s+1} & \frac{-0.61e^{-2.5s}}{20s+1} & \frac{-0.007e^{-s}}{9.6s+1} \\ \frac{1.14e^{-6.5s}}{3.5s+1} & \frac{-2.5e^{-2.5s}}{7s+1} & \frac{-0.017e^{-2.2s}}{7.9s+1} \\ \frac{33.28e^{-9.2s}}{8.5s+1} & \frac{46.7e^{-9.5s}}{10.6s+1} & \frac{0.89e^{-1.2s}}{8.9s+1} \end{bmatrix}\begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix}$$

Find the RGA for the given system. **[15]**

Q3) Consider a unity feedback system has forward path transfer function. **[25]**

$$G(s)=\frac{K}{s(s+8)}$$

Design a digital control scheme for the system to meet the following specifications.

[Use Bode approach]

a) $K_v \geq 11$.

b) Peak overshoot ≤ 25%.

c) Settling time ≤ 2.5 *Sec*.

SECTION - II

Q4) a) State and explain concept of controllability. **[10]**

Determine the state controllability of the system.

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix}=\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 2 & 1 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}+\begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 0 & 1 \end{bmatrix}u$$

b) Consider a system with state space model. **[15]**

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \\ x_3(k+1) \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -0.8 & -0.14 & -0.7 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \\ x_3(k) \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k)$$

Design a state feedback controller using Ackerman's formula such that closed closed-loop poles are at $z_1 = -0.8$, $z_2 = -0.6$, $z_3 = -0.7$.

Q5) a) A control system represented by the following state and output equations.

$$\dot{x}_1 = -4x_1 + x_2$$
$$\dot{x}_2 = -5x_2 + u$$

and

$$y = x_1$$

Design observer gain vector such that observer poles are located at $s_1 = -10$ and $s_2 = -20$. **[16]**

b) Explain the design procedure of minimum order state observer. **[9]**

Q6) a) A control system represented by the following state equations. **[20]**

$$\dot{X} = Ax + Bu$$

where

$$A = \begin{bmatrix} 1 & 2 \\ 0 & -4 \end{bmatrix}, \qquad B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

The performance index J is given by

$$J = \int_0^\infty \left(x^{\mathrm{T}} \mathrm{Q} x + u^{\mathrm{T}} \mathrm{R} u \right) dt$$

where

$$Q = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}, \qquad R = [1]$$

Determine the optimal feedback gain matrix *K*.

b) Write a short note on MPC. **[5]**

Total No. of Questions : 10]

SEAT No.:

P2169

[Total No. of Pages : 4

[4165]-915
M.E. (Polymer Engineering)
MATHEMATICAL AND STATISTICAL METHODS
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Solve the following system of equations by Gauss Elimination method: **[8]**

$2x_1 + x_2 + x_3 = 10,$
$3x_1 + 2x_2 + 3x_3 = 18,$
$x_1 + 4x_2 + 9x_3 = 16.$

b) Find the inverse of the matrix $A=\begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & 4 \\ 1 & 2 & 2 \end{bmatrix}$, by LU decomposition method. **[8]**

Q2) a) Reduce the following matrix to tridiagonal form, using Householder's method : **[8]**

$$A=\begin{bmatrix} 1 & 3 & 4 \\ 3 & 2 & -1 \\ 4 & -1 & 1 \end{bmatrix}$$

P.T.O.

b) Obtain the largest eigen value and corresponding eigen vector for the matrix $A=\begin{bmatrix} 2 & -2 & 2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$, taking the vector $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$, as initial approximation.

[8]

Q3) a) Apply Gauss-Jordan method to solve the system of equations : **[8]**

$2x_1 - 3x_2 + x_3 = -1$

$x_1 + 4x_2 + 5x_3 = 25$

$3x_1 - 4x_2 + x_3 = 2$

b) State sylvester's formula and use it to evaluate sin A and e^A where,

$$A=\begin{bmatrix} 4 & -1 \\ 2 & 1 \end{bmatrix}$$ **[8]**

Q4) a) Use Newton-Raphson method to solve the equations $x^2 + xy + y^2 = 7$,

$x^3 + y^3 = 9$.

Take initial approximation as $x_0 = 1.5, y_0 = 0.5$. Perform three iterations. **[8]**

b) Solve the difference equation : **[8]**

$f(k + 2) + 3f(k + 1) + 2f(k) = 0, f(0) = 0, f(1) = 1.$

Q5) a) Find the z-transform of the following (any two) : **[8]**

i) $f(k) = 5^k, k < 0$

$= 3^k, k \geq 0$

ii) $f(k) = 2^k \cos(3k + 2), k \geq 0$

iii) $f(k) = ka^{k-1}, k \geq 1.$

b) Find the inverse z-transform of the following (any two) : **[10]**

i) $z^{-1}\left\{\dfrac{z^2}{\left(z-\frac{1}{4}\right)\left(z-\frac{1}{5}\right)}\right\}, \dfrac{1}{5}<|z|<\dfrac{1}{4}$

ii) $z^{-1}\left\{\dfrac{z^3}{(z-1)^2(z-2)}\right\}, \text{for}\,|z|>2$

iii) $z^{-1}\left\{\dfrac{z(z+1)}{z^2-2z+1}\right\}, |z|>1$

SECTION - II

Q6) a) Solve the system of equations by Runge-Kutta method (fourth order), $\begin{bmatrix} y_1^1 \\ y_2^1 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 1 & -3 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \end{bmatrix}$, with initial conditions $y_1(0) = 0, y_2(0) = 0.5$. Find the values of y_1 and y_2 at $t = 0.2$, taking stepsize $h = 0.1$. **[8]**

b) Solve $4\,\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$, given

$u(0,t) = 0 = u(4, t)$,

$u(x, 0) = x(4 - x)$, $\frac{\partial u}{\partial t} = 0$ at $t = 0$.

Taking $h = 1$ and $k = \frac{1}{2}$, calculate values of $u(x, t)$ upto $k = 1$. **[8]**

Q7) a) Using Adams-Bashforth method, obtain the solution of $\frac{dy}{dx} = x - y^2$ at $x = 0.8$, given the values :

x :	0	0.1	0.2	0.3
y :	1	1.0025	1.0101	1.0228

[8]

b) Solve the equation $\frac{dy}{dx} = 1 - y$, $y(0) = 0$, taking $h = 0.1$, by Euler's modified method. Find the approximate solution at $x = 0.2$, and compare with the exact solution. **[8]**

Q8) a) Find the equation of the curves for which the functional $I = \int_0^1 \left[\left(\frac{dy}{dx} \right)^2 + 12xy \right] dx$, with $y(0) = 0, y(1) = 1$ can be extremized. **[8]**

b) Apply Galerkin's method to the boundary value problem $y'' + y + x = 0$ $(0 \le x \le 1)$, $y(0) = y(1) = 0$, to find the coefficients of the approximate solution $\bar{y}(x) = c_1 x(1 - x) + c_2 x^2 (1 - x)$. **[8]**

Q9) a) An I.Q. test was administered to 5 persons before and after they were trained. The results are given below : **[8]**

Candidates :	1	2	3	4	5
I.Q. before training :	110	120	123	132	125
I.Q. after training :	120	118	125	136	121

Test whether there is any change in I.Q. after the training programme. [$t_{0.01;4} = 4.6$]

b) The number of parts in demand for a particular spare part in a factory was found to vary from day to day. In a sample study the following information was obtained.

Days :	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
No. of parts demanded :	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the days of the week. (Table value of χ^2 for 5 d.f. at 5% level of significance is 11.07). **[8]**

Q10) a) A sample of 900 members is found to have a mean of 3.4cms. Can it be reasonably regarded as a truely random sample from a large population with mean 3.25cms. and s.d. 1.61cms? |z| = 1.96 at 5% level of significance. **[8]**

b) The following data represent the number of units of a commodity produced by 3 different workers using 3 different types of machines:**[10]**

Workers	Machines		
	A	B	C
X	16	64	40
Y	56	72	56
Z	12	56	28

Test :

i) Whether the mean productivity is the same for the different machine types,

ii) Whether the three workers differ with respect to mean productivity.

(Given : Table value of F for depress of freedom $v_1 = 2$ and $v_2 = 4$ is 6.94, at 5% level of significance).

Total No. of Questions : 10]

SEAT No. : ____

P2170

[Total No. of Pages : 4

[4165] - 916

M.E. (Polymer Engg.)

PRINCIPLES OF MANAGEMENT

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Q.No.1 from Section I and Q. No. 6 from section II are compulsory. Answer any other two questions from section I and answer any other two questions from section II.***
2) ***Answers to the two sections should be written in two separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of statistical charts, scientific calculator, and graph paper is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q. No. 1 Answer any two

Q1) a) Define in short following financial ratios-

i) Acid - test ratio

ii) Debt - Equity ratio

iii) Return on assets

iv) Return on Equity

b) What do you understand by concept of zero working capital? How does it benefit a company?

c) Solve the game whose pay off matrix is given by-

		Player B	
		B_1	B_2
Player A	A_1	3	2
	A_2	4	1

Solve by algebraic method **[20]**

Q2) a) Find the present value of the following cash flow of a project if the discount rate is 14 percent. **[5]**

Year	0	1	2	3	4
Cash flow	5000	6000	8000	9000	8000

P.T.O.

b) A manufacturer of gloves has to supply 10,000 surgical gloves to a large hospital establishment. His production rate is 50,000 gloves per day and production set up cost is Rs 20,000/-. Cost of holding a single glove in invitatory for a year is Rs 0.1/-. How frequently should production run be made? **[5]**

c) Customers arrive at single window manned by one person according to Poisson's distribution with mean rate of 30 per hour. Time required to serve the customer has exponential distribution with a mean of 200 seconds. Calculate average waiting time of the customer. **[5]**

Q3) a) The activity durations are given below. Draw the PERT network. Find project completion time. Find free float, independent float and total float. **[10]**

Activity	Activity duration in days
1-2	4
1-3	3
1-5	5
1-7	6
2-4	2
3-5	0
3-6	1
4-9	8
5-7	0
5-8	5
6-8	0
7-9	4
8-9	0
9-10	2

b) With suitable examples explain how project scheduling by PERT/CPM networks can also be formulated as optimization problem using linear programming. **[5]**

Q4) a) A purchase inventory model makes following assumptions:

i) Demand rate is constant.

ii) Demand is fixed and is known.

iii) Set up cost, unit purchase cost are known.

iv) Shortages are not allowed and consequently cost of shortage is infinite.

Obtain expressions to find out

1) How often should parts be purchased?

2) How many units should be purchased at any time? **[8]**

b) A travelling salesman wants to visit cities A, B, C, D and E. He cannot visit any city twice before returning to the point of starting the journey. Also he must visit all the cities and should return to the point of starting journey. Cost of visiting one city to another is known and is given below.

	A	B	C	D	E
A	0	5	5	6	1
B	5	0	3	8	3
C	3	7	0	4	5
D	10	4	6	0	5
E	1	3	5	5	0

Find optimum solution to minimize cost. **[7]**

Q5) a) Estate agent is required to sell three properties at commission of 5% from each sale with sales cost and probability of sale listed below: **[8]**

Property	Property price, Rs	Sales cost, Rs	Probability of sale, %
A	12,000	400	0.7
B	25,000	225	0.6
C	50,000	450	0.5

Client puts following conditions:

i) Agent must sale property A first and that too within 60 days

ii) He can back out at this stage or sale one of the remaining property within 60 days or nominate.

iii) If he does not succeed to sale the nominated property in the given period, he does not have the opportunity to sale the other.

iv) If he succeeds, agent will have the opportunity to sale the third remaining property on the same previous conditions.

Draw decision tree for the estate agent and find the best optimal strategy for the estate agent.

b) Find the basic feasible solution of following transportation problem using Vogel's Approximation. **[7]**

	W_1	W_2	W_3	W_4	W_5	*Available*
F_1	3	4	6	8	8	20
F_2	2	10	1	5	30	30
F_3	7	11	20	40	15	15
F_4	2	1	9	14	18	13
Required	40	6	8	18	6	Total 78

SECTION - II

Q.No. 6 Answer any two

Q6) a) What benefits Customer Relationship Management (CRM) system offer to an organization and to a customer?

b) Explain the need for Product Differentiation. How it can be achieved?

c) Explain the concept of Customer Perceived Value (CPV). Discuss the determinants of CPV.

[20]

Q7) What are the benefits of direct marketing? Discuss various direct marketing channels and explain the effectiveness of each. **[15]**

Q8) Write short notes on any three **[15]**

a) Niche Marketing

b) Local Marketing

c) Mark up pricing

d) "Cost Plus" Pricing.

Q9) a) What is the importance of Packaging, Labeling, Warrantees and Guarantees in the overall product marketing? **[8]**

b) Write in short about consumer buying behavior. **[7]**

Q10) Discuss methodology of building brand equity. Explain various ways of measuring the brand equity. **[15]**

Total No. of Questions : 8]

SEAT No. :

P2172

[Total No. of Pages : 2

[4165]-920

M.E. (Polymer Engineering)

SYNTHESIS AND CHEMISTRY OF POLYMERS

(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt any three questions from Section I and any three questions from Section II.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Derive Carother's equation. Explain the importance. **[9]**

b) Explain the thermodynamics of polymer dissolution. **[8]**

Q2) a) Explain with step by step illustrations emulsion polymerization technique. **[9]**

b) Differentiate between solid phase and gas phase polymerization. **[8]**

Q3) a) Discuss how plasma polymerization is different from other polymerization techniques in general. **[8]**

b) Explain the concept of average molecular weights in polymers. Mention the equations for various average MWs. **[8]**

Q4) a) Explain mechanical degradation process. Draw the graph. **[8]**

b) Give the mechanism of ROP. **[8]**

SECTION - II

Q5) a) What are polymer supported reactions? Explain with suitable examples. **[9]**

b) Give the synthesis of USPE resin. **[8]**

Q6) a) Write a note on - Polymer as a substrate. **[9]**

b) Discuss in detail vulcanization with and without sulfur. **[8]**

P.T.O.

Q7) a) Discuss synthesis and properties of PU resins. **[8]**

b) Discuss chemistry of epoxy resins. **[8]**

Q8) a) Discuss step copolymerization in detail. **[8]**

b) Explain GPC technique to determine MW and MWD. **[8]**

✷✷✷

Total No. of Questions : 10]

SEAT No. :

P2173

[Total No. of Pages : 7

[4165] - 922

M.E. (Polymer Engg.)

MOLD AND DIE DESIGN

(Sem. - I) (2008 Course) (Elective - II (b))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Q.No. 1 from Section I and Q.No.6 from Section II are compulsory. Answer any other two questions from section I and answer any other two questions from II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of scientific calculator, graph paper and log-log graph paper is allowed.***
5) ***Assume suitable data, if required.***
6) ***Draw neat sketches wherever required.***

SECTION - I

Q1) (Any two) **[20]**

a) With neat sketches explain the standard guide bush assembly and spigotted guide pillar-guide bush assembly. State the advantages of using a spigotted assembly.

b) List the various factors responsible for determination of ejector force magnitude. With neat sketches explain any two methods for stripper plate actuation.

c) Explain stepwise design procedure for designing cooling channels with all relevant design formulae required for calculations. Explain various factors that are considered.

Q2) For the component shown in figure 1, draw a sectional view to bring out details of the feed system and ejection system if a rectangular edge gate and stripper plate ejection is used. Assume multi-cavity (at least two cavities) mould. **[15]**

P.T.O.

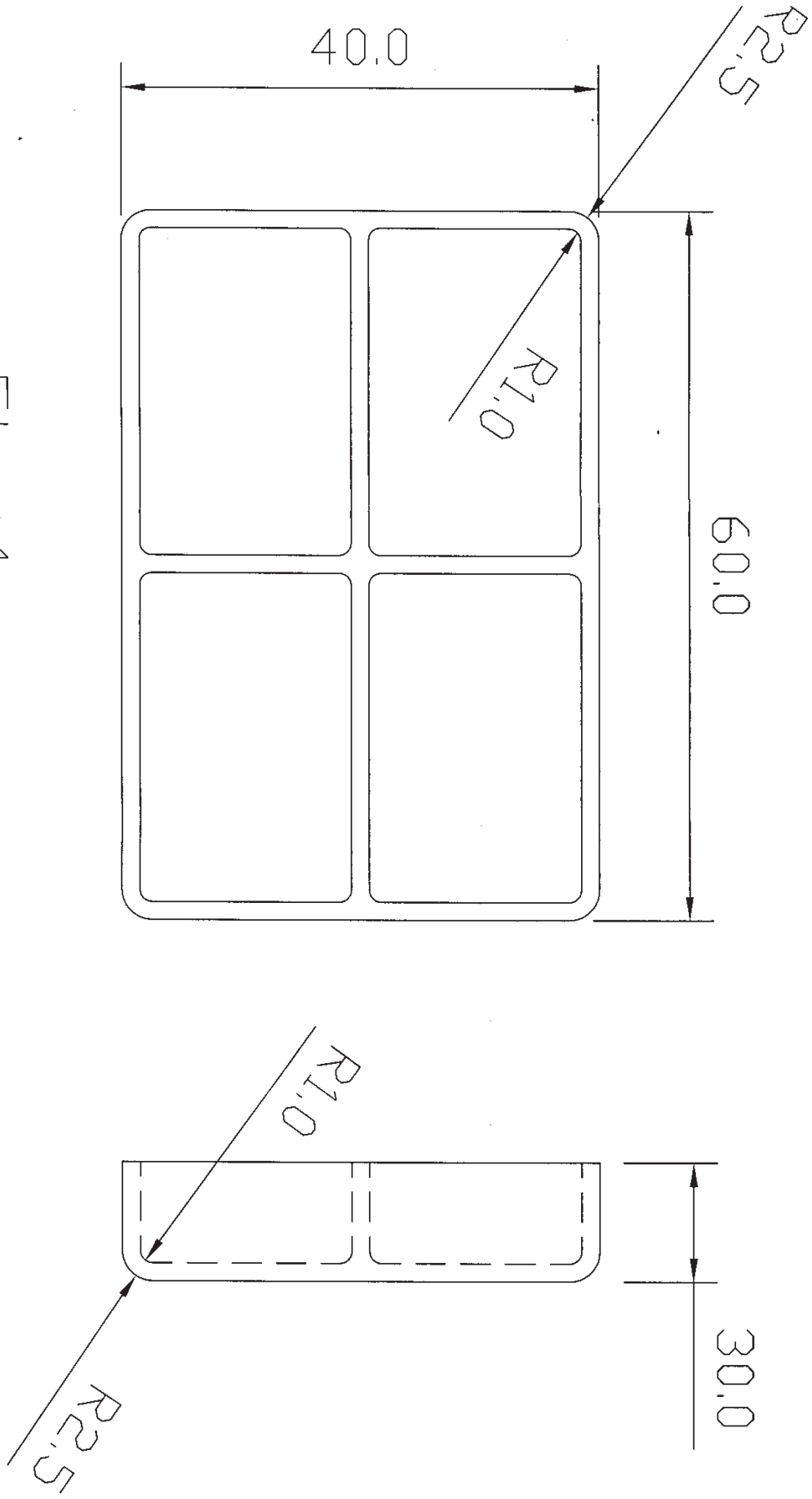
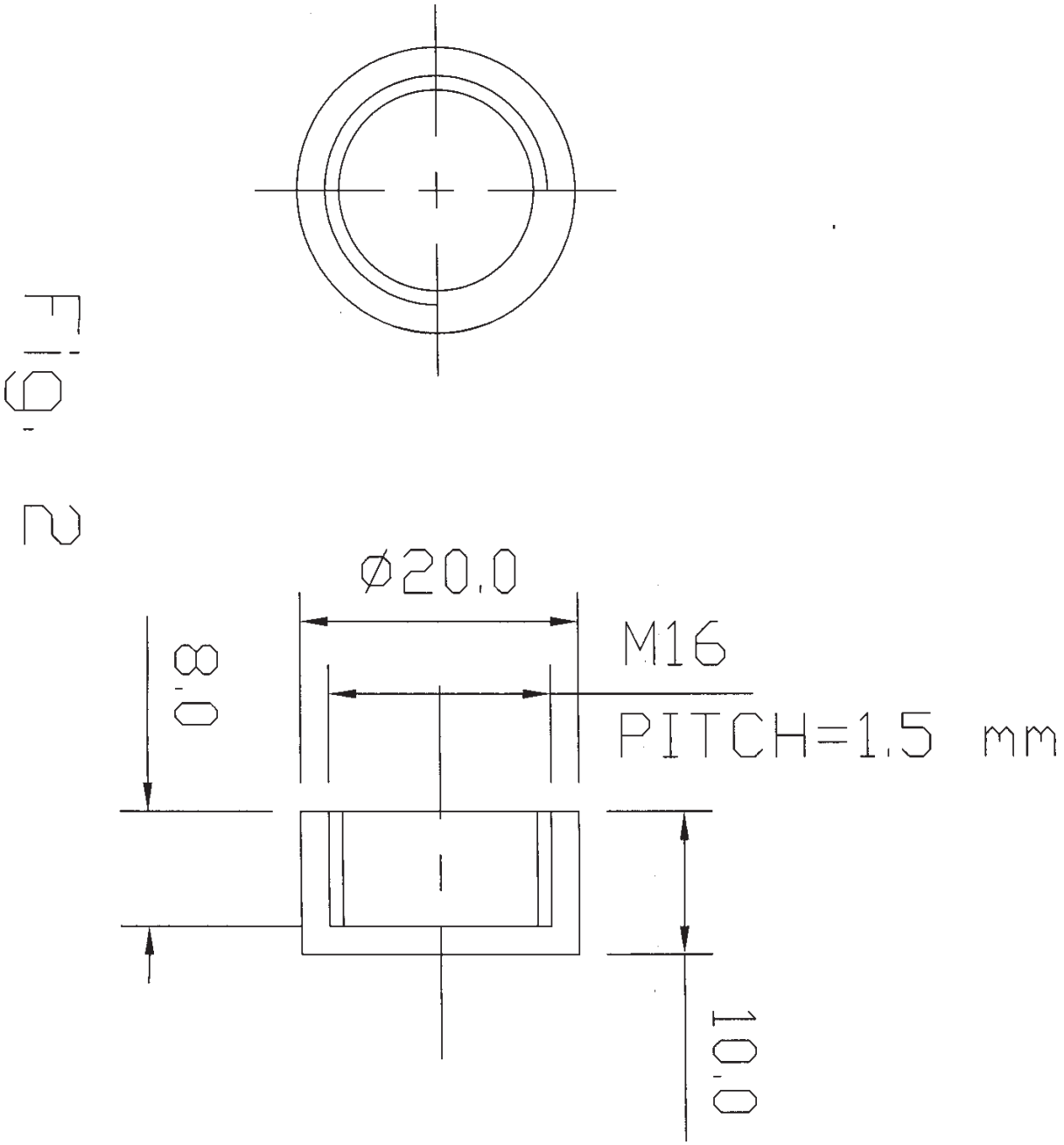


Fig. 1

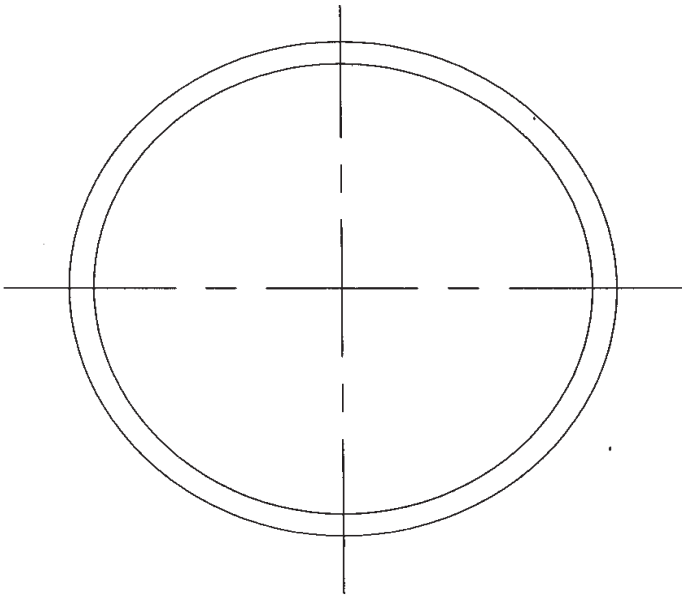
Wall thickness = 1.5 mm

Q3) For the component shown in fig 2, draw a sectional view through the mold to bring out details of ejection system if rotating withdrawing core is used for ejection. **[15]**



Q4) Explain with neat sketches, finger cam actuation used for a split cavity mold. With suitable examples, explain the relevant design calculations. **[15]**

Q5) For the component shown in Fig 3, draw a sectional view indicating bubbler cooling system. Discuss design considerations. **[15]**



Wall thickness = 2.0 mm

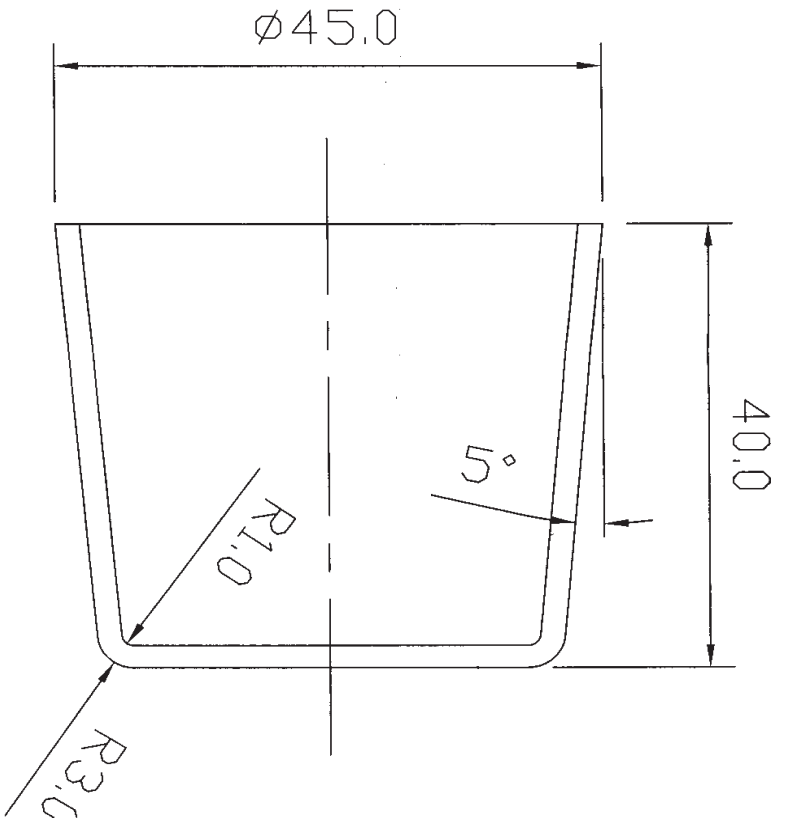


Fig. 3

SECTION - II

Q6) Answer any two **[20]**

a) With neat sketch, explain the constructional features of T shaped manifold die used for flat film extrusion.

b) Explain with neat sketches, any three types of secondary nozzles used in hot runner mold.

c) Estimate the solidification time for a 1mm pin point gate. Melt temperature is 240ºC, temperature of the coolant is 60ºC, no flow temperature of the melt is 132ºC.

Take thermal diffusivity of the mold material as $\alpha = 8.69 \times 10^{-8}\ m^2/sec$.

Q7) Explain with sketch side fed blown film die. Name the parts and explain in short important function of the same. **[15]**

Q8) Write a note on material of construction for the various mold parts given below using BIS or any commonly used material standard. Give composition and the properties expected. Write details of hardening or special surface treatment, if applicable. **[15]**

a) Cavity for PVC fittings.

b) Ejector pins.

c) Core and cavity back up plates.

Q9) Design a rod die for manufacturing a rod of 20 mm diameter for a thermoplastic material obeying power law of the following kind– **[15]**

$\tau = 1,20,000 \times \gamma^{0.33}$ where τ is in N/m^2 and γ is in sec^{-1}

Given

Melt density = 0.76 gms/cm^3

Extruder size = 50 mm

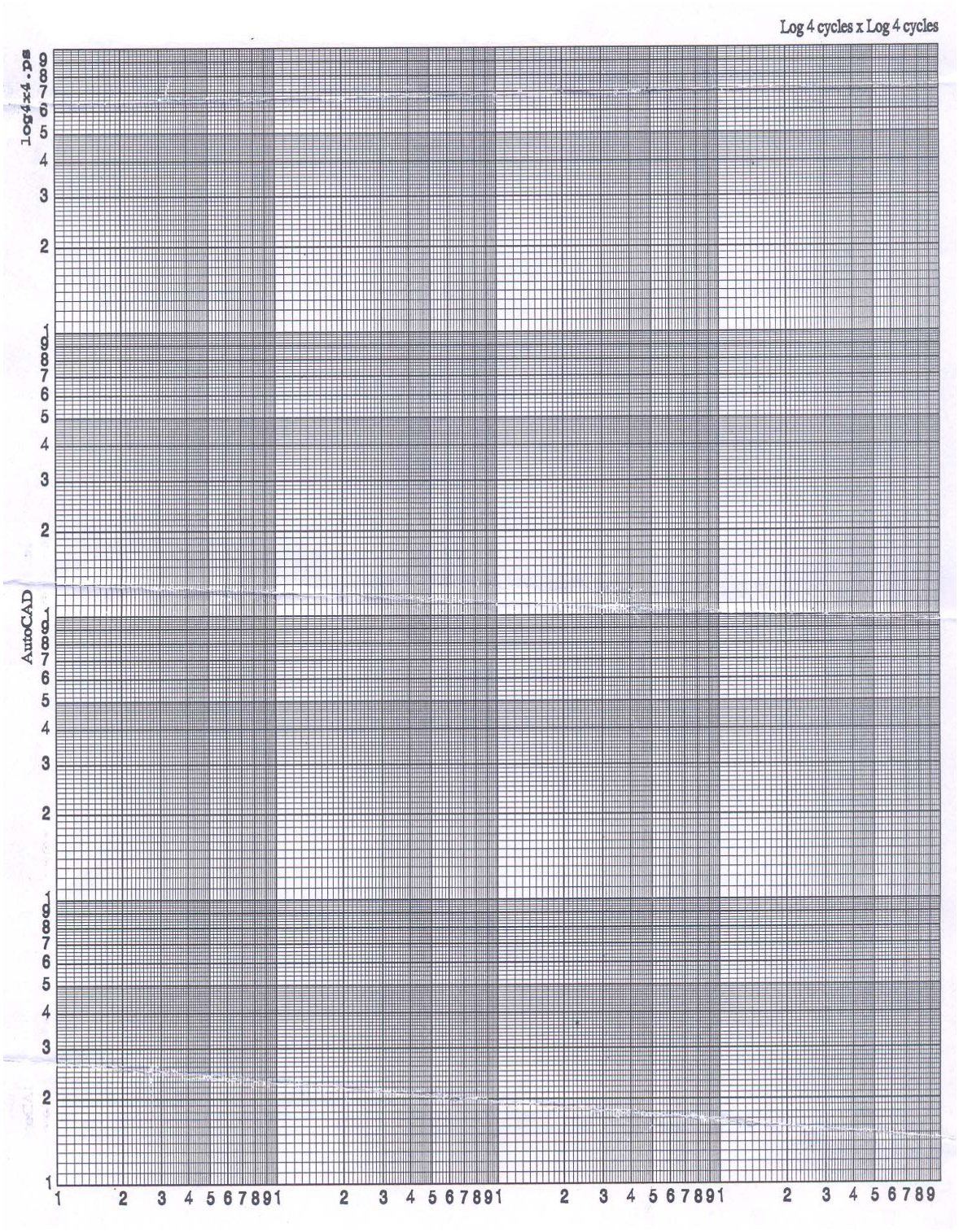
Output = 35 kg/hr

Extensional viscosity = 0.9 N –sec/m^2

Swelling ration = 1.7

Q10)a) Discuss design features of subsurface gate and diaphragm gate with neat sketches. Explain how pressure drop can be calculated. **[10]**

b) Write in short about runner balancing. **[5]**


Log 4 cycles x Log 4 cycles
log4x4.ps
AutoCAD
1 2 3 4 5 6 7 8 9 1 2 3 4 5 6 7 8 9 1 2 3 4 5 6 7 8 9 1 2 3 4 5 6 7 8 9

Total No. of Questions : 8]

SEAT No. :

P2174

[Total No. of Pages : 2

[4165] - 924

M.E. (Polymer Engineering)

POLYMER PHYSICS AND CHARACTERIZATION

(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Attempt any three questions from Section - I and any three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Write a note on size and shape of polymer chain in solution. **[9]**

b) Give the principle of FTIR. With any simple structure explain the FTIR spectrum. **[8]**

Q2) a) Give the principle of NMR. Illustrate NMR spectrum for ethanol. **[9]**

b) Discuss in detail the light scattering technique. **[8]**

Q3) a) Discuss how elemental analysis is an useful characterization technique. **[8]**

b) Explain how GPC can be utilized to determine MW and MWD. **[8]**

Q4) a) Write a note on thermodynamics of polymer solutions and melt. **[8]**

b) Write a note on relationship between viscoelastic properties and viscometric functions. **[8]**

SECTION - II

Q5) a) Differentiate NMR and C-13 NMR with suitable example. **[9]**

b) Write a note on solubility parameter. **[8]**

P.T.O

Q6) a) Write a note on viscometry. **[9]**

b) Discuss role of TGA in polymer degradation study. **[8]**

Q7) a) Write a note on use of DSC to determine kinetics of crystallization. **[8]**

b) Discuss solid state properties. **[8]**

Q8) a) Discuss X-ray studies for polymers. **[8]**

b) Write a note on complex modulus and storage modulus in polymers. **[8]**

Total No. of Questions : 6]

SEAT No. :

P2179

[Total No. of Pages : 2

[4165] - 933

M.E. (Printing Engg. & Graphic Communication)

PROBABILITY, STATISTICS AND QUEUEING THEORY

(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any two questions from each sections.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures on right indicates marks.***

SECTION - I

Q1) a) What is probability concept? **[10]**

b) Write notes on: **[15]**

i) Random variables.

ii) Binomial.

iii) Negative Binomial.

Q2) a) Explain with formula, Mean, Median, Standard deviation and Percentile. **[15]**

b) What is Multivariate probability distribution and sampling distribution. **[10]**

Q3) a) Explain Simple and Multiple linear regression. **[15]**

b) What is non-linear regression. **[10]**

P.T.O

SECTION - II

Q4) What is Statistical Quality Control? Explain with one example. **[25]**

Q5) Explain in details design of experiments for Quality Improvement. **[25]**

Q6) a) Explain Queueing Model. **[10]**

b) What is Kendels notation? **[8]**

c) Explain Problem Solving for Queue Theory. **[7]**

Total No. of Questions : 6]

SEAT No. : ____

P2180

[Total No. of Pages : 2

[4165] - 934

M.E. (Printing Engg.)

PRINTING TECHNOLOGY MANAGEMENT

(2008 Course) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer any two questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, wherever necessary.***
5) ***Figures on right indicates marks.***

SECTION - I

Q1) a) What are the different production systems in printing industry. **[15]**

b) What are functions of production department in offset printing press? **[10]**

Q2) a) What is product life cycle? **[15]**

b) What is product policy of organisation? **[10]**

Q3) a) How the forecasting in done in printing industry. **[15]**

b) Explain in details the relationship between annual profit and research expenditure. **[10]**

SECTION - II

Q4) Write Notes on following: **[25]**

a) Maximum inventory.

b) Cycle Time.

c) Economic order Quantity.

d) Maximum shortage Quantity.

e) Just in Time Concept of Inventory.

P.T.O.

Q5) What is Quality Assurance? How it affects quality and cost? **[25]**

Q6) a) What are the tools used in statistical process control in print industry. **[15]**

b) What are the control charts used in printing industry. **[10]**

Total No. of Questions : 6]

SEAT No. :

P2181

[Total No. of Pages : 1

[4165]-938

M.E. (Printing Engg. & Graphic Communication)

DESIGN OF EXPERIMENTS & RESEARCH METHODOLOGY

(2008 Course) (Sem. - I) (Elective - I (C))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Explain Descriptive research, conceptual, Theoretical, Applied & Experimental researcher. **[25]**

Q2) What is the importance of Literature Review and Methods? **[25]**

Q3) a) Give classification of mathematical models. **[10]**

b) What is the process of formulation of model based on Simulation. **[15]**

SECTION - II

Q4) a) Explain with example Experimental Design. **[15]**

b) What are the guide lines for designing experiments. **[10]**

Q5) a) Explain types of data. **[12]**

b) What is testing of linearity and non linearity of models. **[13]**

Q6) Explain in details Report Writing. **[25]**

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Total No. of Questions : 6]

SEAT No. :

P2182

[Total No. of Pages : 2

[4165] - 939

M.E. (Printing Engg. & Graphic Communication)

DIGITAL PRINTING

(Sem. - I) (2008 Course) (Elective - II (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any two questions from Section - I and any two questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare the following: **[10]**

i) LED and LASER Printers.

ii) Passive and Active Thermography.

b) List and explain various components which must be considered as a part of Prepress at one. **[15]**

Q2) a) Explain the following non-impact Printing Process in brief: **[10]**

i) Magnetography.

ii) Ionography.

b) Justify 'Computer-to-plate (CTP)' technology and 'Direct-imaging (DI)' can help Printers to address Staying state-of-the-art and Shortage of skilled production Personnel concerns. **[15]**

Q3) a) Explain the following in brief: **[10]**

i) Ghost script.

ii) Work flow Integration.

b) What is PDF/X? Explain PDF/X Standards in detail. **[15]**

P.T.O

SECTION - II

Q4) a) Explain the following in brief: **[10]**

i) Visual Assessment of Inkjet print.

ii) Calorimetric Assessment of Inkjet print.

b) Justify that 'Profits from print on demand publishing are on a per-sale basis and Royalties vary' with proper examples. **[15]**

Q5) a) Explain the following in brief. **[10]**

i) Variable Data Printing.

ii) Web2 Print.

b) State and explain in detail the future trends in Printing Industry. **[15]**

Q6) a) Explain the following in brief: **[10]**

i) Color Management.

ii) Eco-friendly Approach in Printing.

b) State the main Image quality attributes. List different tools used for verification and explain one tool in detail. **[15]**

Total No. of Questions : 6]

SEAT No. :

P2183

[Total No. of Pages : 1

[4165] - 940

M.E. (Printing Engg. & Graphic Communication)

ENTREPRENEURSHIP IN PRINTING AND ALLIED FIELDS

(Elective - II (b)) (2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any two question from each Sections.***
2) ***Answer to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) What is entrepreneurship in Printing Industry? **[25]**

Q2) Explain in details laws affecting printing concern, publisher and an author. **[25]**

Q3) What is work flow Management in Printing Industry? **[25]**

SECTION - II

Q4) What is Production standard and budgeted hour rates for printing? **[25]**

Q5) Explain in details Management Technology and Innovation. **[25]**

Q6) Explain the legal Aspects of Taxes; Excise and customs. **[25]**

Total No. of Questions : 6]

SEAT No. :

P2184

[Total No. of Pages : 2

[4165] - 942

M.E. (Printing & Graphic Communication)

PRINT MEDIA COMMUNICATIONS

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any two questions from Section - I and any two questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Compare the skills used in creating and exploring technical and production designs in the following areas: **[10]**

i) Glass. ii) Plastic

b) Explain in detail various methods for Surface Design with the focus on technical Skills. **[15]**

Q2) a) List various ways to create a stencil for screen printing. Explain in brief Photo Emulsion Technique. **[10]**

b) State and explain in brief the best practices used in Digital Asset Management. **[15]**

Q3) a) Explain the following in brief: **[10]**

i) SPEEDBALL ii) CAD Engines.

b) Explain how CAD can be used in the field of Creative Media Production? **[15]**

P.T.O.

SECTION - II

Q4) Design a book for 'Cakes and Cookies' to be published in Indian market. **[25]**

Q5) What are the requirements of starting new 'News Paper' for district level Coverage? **[25]**

Q6) a) What is Printing Design Concept? **[10]**

b) Design a Newspaper page covering a Festival Season. **[15]**

Total No. of Questions : 8]

SEAT No.:

P2189

[Total No. of Pages : 2

[4165]-635
M.E. (E & T/C) (VLSI & Embedded Systems)
ANALOG AND DIGITAL CMOS IC DESIGN
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Question No. 1 & 5 are Compulsory. Out of the remaining attempt 2 questions from section-I and 2 questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How MOS transistor is used as a switch? Comment on signal degradation in pass transistor? **[4]**

b) Realize the function using CMOS logic : **[4]**

F (A, B, C, D) = A' + (B' + C') D'

c) Explain in short : Implementation of current sink and current source using MOSFET. What are the voltage compliances? How to improve them? **[8]**

Q2) a) Design CMOS current mirror for load current of 100μA. Assume suitable data. Compute output resistance. Comment on the performance of circuit. **[8]**

b) Explain in detail wire and device parasitic. How it affects the performance of CMOS design? **[8]**

Q3) a) What is the use of Micro Power Opamp? Explain in short techniques used in Micro Power Opamp. **[8]**

b) What is Macromodel for opamps? Explain in brief static or dynamic macromodel for opamps. **[8]**

P.T.O.

Q4) Write short notes on any three : **[18]**

a) Cascode Amplifiers.

b) High Speed Opamp.

c) Current and Voltage References.

d) Output amplifiers.

SECTION - II

Q5) a) Answer the following questions in short : **[4]**

i) Why is the substrate in NMOS connected to ground and in PMOS to VDD?

ii) For CMOS logic, how one can minimize power consumption?

b) Compare synchronous and asynchronous machines. **[4]**

c) Design two input XOR gate using CMOS transistor. How many MOS transistors are required to design the same? Design XOR gate using transmission gate and CMOS static inverter. Comment on the design? **[8]**

Q6) a) Explain with suitable example sources of static and dynamic hazards. How to eliminate hazards? **[8]**

b) Derive an expression for Power Delay Product (PDP) and Energy Delay Product (EDP). How does PDP & EDP help CMOS designers? **[8]**

Q7) Design a lift controller for 4 floor building. Assume standard specifications. Draw the minimized state diagram. Write VHDL code and test bench for the same. **[16]**

Q8) Write short notes on any three : **[18]**

a) Domino Logic.

b) NORA Logic.

c) CMOS Layout and λ parameter.

d) Metastability and Synchronizers.

Total No. of Questions : 8]

SEAT No. :

P2190

[Total No. of Pages : 2

[4165]-699

M.E. (E & TC) (Communication Networks)

WIRED & WIRELESS NETWORKS

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Describe the CSMA/CD Protocol. **[8]**

b) Explain ALOHA system with its two versions (Pure ALOHA & Slotted ALOHA). **[8]**

Q2) a) Explain the following internet control protocols: **[8]**

i) ICMP.
ii) ARP.
iii) RARP.
iv) BOOTP

b) Explain NAT in detail. **[8]**

Q3) a) Explain working of SONET in brief. **[9]**

b) Explain IPV4 addressing scheme. **[8]**

Q4) a) What is Network programming? Explain in brief. **[8]**

b) Explain design issues for the protocol layers? **[9]**

SECTION - II

Q5) Explain the following routing algorithms.

a) Fixed routing algorithm. **[8]**

b) Flooding routing algorithm. **[8]**

P.T.O.

Q6) Discuss the following :

a) Internet Trends & Internet Applications. **[8]**

b) Stop and Wait ARQ. **[8]**

Q7) a) Explain VPN in detail. **[8]**

b) What is VLAN? Discuss. **[9]**

Q8) a) Describe need of sub netting in internet addressing. **[8]**

b) An address in block is given as 167.199.170.82/27. Find the class of address, the number of addresses in block, the first address and the last address. **[9]**

Total No. of Questions : 8]

SEAT No. :

P2191

[Total No. of Pages : 2

[4165]-901

M.E. (Instru. and Control) (Process and Biomedical Instru.)

ADVANCED SIGNAL PROCESSING

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain different steps in sampling rate conversion by rational factor I/D. **[10]**

b) Explain in brief Multirate filtering applications. **[8]**

Q2) a) What is Time Frequency analysis in signal Processing and explain its need? **[8]**

b) Explain Short Time Fourier Transforms with properties. **[8]**

Q3) a) Discuss spectral factorization in random process. **[8]**

b) List models of stochastic processes. Explain any one. **[8]**

Q4) a) Discuss need and applications for power spectrum estimation. **[8]**

b) Compare parametric and non parametric methods of power spectral estimation. **[8]**

SECTION - II

Q5) a) Explain LMS algorithm for adaptive filters. **[8]**

b) Explain in detail any one application of homomorphic signal processing. **[8]**

P.T.O.

Q6) a) Explain the term Cepstrum? Explain the properties of the Cepstrum. **[8]**

b) Explain QMF filter banks. **[8]**

Q7) a) Enlist various orthogonal transformation. Explain any one with properties. **[6]**

b) What is Multiresolution Signal Analysis? Compare STFT and Wavelet transform? Explain in brief signal analysis and synthesis using wavelet transform. **[10]**

Q8) a) Explain the theory of sub band decomposition. **[9]**

b) Explain in brief International Standards for any two of speech or image or video compression for personnel communication? **[9]**

Total No. of Questions : 6]

P2192

SEAT No. : ____

[Total No. of Pages : 3

[4165] - 434

M.E. (Civil) (Structures)

STRUCTURAL DYNAMICS

(2008 Course) (Sem. - I)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the difference between response of structure to static loading and dynamic loading? **[5]**

b) Describe the approaches of analysis of structural response to dynamic load. **[5]**

c) Derive the formula for dampening ratio using logarithmic decrement principle. **[7]**

d) A vibrating system of SDOF consists of mass of 5 kg and a spring of constant 30 kN/cm. The system is viscously damped such that the ratio of any consecutive amplitudes is 1.00 : 0.90.

Determine :

i) Natural Frequency

ii) Logarithmic Decrement

iii) Damping Factor

iv) Damping Coefficient. **[8]**

P.T.O.

Q2) a) Obtain general solution for Un-damped Forced SDOF system? Hence derive the equation for Dynamic Amplification Factor. **[7]**

b) A weightless steel cantilever beam of 0.70 m long has cross section 50mm deep and 20mm wide. It supports a load of 1000 N at free end through a spring of onstant 10kg/cm. Determine the natural frequency and natural period of vibrations. **[8]**

c) A machine of 200 kg is placed on roof supported by four columns of stiffness 185 N/m each, creates an unbalanced disturbing force 350 kN at a frequency of 2121 rpm. If damping ratio is 0.2, determine **[10]**

i) Amplitude of motion due to unbalance.

ii) Transmissibility.

iii) Transmitted Force.

Q3) a) Using Duhamal's Integral, determine response of an un-damped system to a rectangular pulse force of magnitude 'Fo' and time 'T'. **[7]**

b) Explain non-linear analysis by Linear Variation Method for response of SDOF. **[8]**

c) Illustrate how to obtain characteristic shapes and corresponding natural frequencies using matrix method in case of lumped mass multi-degree of freedom system. **[10]**

SECTION - II

Q4) a) Explain the concept of Shear Building. **[5]**

b) Explain Rayleigh's Method to determine frequency in fundamental mode of vibrations. **[10]**

c) Explain MDOF and write in matrix form the equation of motion. Hence determine the natural frequencies and mode shapes assuming mass and stiffness of ground storey equal to that of first storey. **[10]**

Q5) a) State and prove the Orthogonally Property of mode shapes. **[7]**

b) Explain the Stodola Method of determining the fundamental frequency of MDOF and obtain the mode shapes of two storey RC Building Frame having equal mass of first floor twice the second floor. Assume stiffness of both storey and column height equal. **[8]**

c) Determine the natural frequency and plot all mode shapes for the three storey shear building shown in Figure 5.1. Assume EI for each column 4.8×10^6 N/m^2. **[10]**

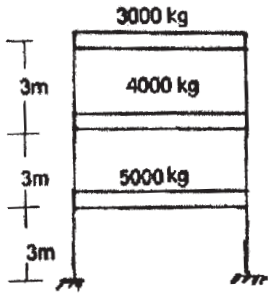

Figure 5.1

Q6) Write notes on (any five) : **[25]**

a) Free Vibrations of Uniform Shear Beam.

b) Modal combination Rules.

c) Non Linear Analysis by Wilson Theta Method.

d) Structural Response to Ground Motion.

e) Response Analysis using Half Cycle Sine Pulse Force.

f) Frequency Response Curves.

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Total No. of Questions : 8]

SEAT No. :

P2193

[Total No. of Pages : 2

[4165] - 664

M.E. (E & TC) (Signal Processing)

ADVANCED DIGITAL SIGNAL PROCESSING

(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Use of scientific calculator is allowed.***
4) ***Assume suitable data wherever required.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the term interpolation. Explain sampling rate conversion by a factor of 3/2. **[8]**

b) Why anti aliasing filter is required in a decimator? Draw spectrum at each stage of a decimator. **[8]**

Q2) a) What are poly phase filters? Draw a poly phase interpolator for a I = 3. **[8]**

b) What is the advantage of using a multistage filter? Design the specifications for a two stage interpolator to increase the sampling frequency from 128KHz to 512KHz. **[10]**

Q3) a) Explain any one application of multi rate DSP. **[8]**

b) Explain the method to solve a problem using least squares technique. **[8]**

Q4) a) Explain Wiener filter design. **[8]**

b) Explain Prony's method for determining poles and zeros of a transfer function. **[8]**

P.T.O

SECTION - II

Q5) a) Draw a second order filter using lattice structure and derive expressions for the output of each stage. **[8]**

b) Explain the design of optimal equi-ripple Linear phase FIR filters. **[8]**

Q6) a) Explain alternation theorem. What is the application of this theorem? **[8]**

b) Explain gradient adaptive lattice filter design. **[8]**

Q7) a) What is beam forming? Explain adaptive beam forming for any one application. **[10]**

b) Explain application of filter design in sonar. **[8]**

Q8) a) Explain modified Harvard architecture for DSP. What are its advantages. **[8]**

b) Explain the implementation of adaptive filter using a code composer studio. **[8]**

Total No. of Questions : 12]

SEAT No. :

P2195

[Total No. of Pages : 4

[4165]-575

M.E. (Electrical) (Control System)

SYSTEM IDENTIFICATION & ADAPTIVE CONTROL

(2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of unprogrammable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define identification of a system. Explain the procedure of identification with flow chart. **[8]**

b) A linear underdamped second order system is given by **[8]**

$$\frac{Y(s)}{U(s)} = \frac{w_0^2}{s^2 + 2\xi w_0 s + w_0^2}$$

Derive the expression for

i) Damping ratio ξ and

ii) Natural frequency of oscillation w_0, in terms of peak overshort M_P.

OR

Q2) Consider the FIR model $y(t) = b_0\, u(t) + b_1\, u(t-1) + e(t)$;
Where $t = 1, 2, \ldots N$, and $e(t)$ is a white noise with zero mean and standard deviation λ^2.

a) Determine the regressor vector and parameter vector of the linear regression model. **[6]**

b) Data collected from the above FIR model is given below: **[10]**

t	1	2	3
$u(t)$	1000	1001	1000
$y(t)$	0	2001	2001

P.T.O.

Estimate the parameter vector $\hat{\theta}$ from the available data using least square estimation method.

Q3) Consider the estimate $\hat{\theta}$, with usual notations, given by

$$\hat{\theta} = (\phi^T \phi)^{-1} \phi^T y$$

Assume that the data obey

$$y(t) = \phi^T(t)\theta_0 + e(t)$$

With $e(t)$ as white noise of zero mean and variance λ^2.
Now prove the following properties :

a) $\hat{\theta}$ is an unbiased estimate of θ_0. **[6]**

b) The covariance matrix of $\hat{\theta}$ is given by **[6]**

$$\text{cov}(\hat{\theta}) = \lambda^2 (\phi^T \phi)^{-1}.$$

c) An unbiased estimate λ^2 is given by **[6]**

$$s^2 = \frac{2V(\hat{\theta})}{(N - n)}$$

OR

Q4) a) Discuss the various model structures that are commonly used in system identification technique. **[8]**

b) An experiment conducted on a dynamic system gave the following observations :

Sample t	:	1	2	3	4	5
Input $u(t)$	:	0	1	0.1667	-0.5	2
Output $y(t)$	:	1	1.25	0.75	0	1.5

Assume model structure as

$$y(t) = -a_1 y(t-1) + b_0 u(t) + e(t)$$

where $e(t)$ is the white noise.

Estimate the parameter vector $\hat{\theta} = [a_1 \;\; b_0]^T$. **[10]**

Q5) Write detailed notes on any two of the followings : **[16]**

a) Persistent excitation.

b) Learning systems with and without supervision.

c) Recursive Estimation Method.

OR

Q6) Write detailed notes on any two of the followings: **[16]**

a) Recursive (on-line) Identification Methods.

b) Image Processing.

c) Bayesian learning.

SECTION - II

Q7) a) Explain the various "Adaptive Schemes", with the help of neat diagrams. **[8]**

b) Prove the Matrix Inversion Lemma : **[8]**

$$[A + BCD]^{-1} = A^{-1} - A^{-1}B[C^{-1} + DA^{-1}B]^{-1}DA^{-1}$$

OR

Q8) a) Explain the ship steering dynamics. **[6]**

b) The ship steering dynamics is approximated by the function **[10]**

$$G(s) = \frac{b}{s(s+a)}$$

and is controlled by a PD type controller with transfer function

$$G_c(s) = K(1 + sT_d)$$

Where T_d is the derivative time constant of PD controller. Parameters a and b have speed dependency given by

$$a = a_0\left[\frac{u}{l}\right];\ b = b_0\left[\frac{u}{l}\right]^2$$

Where a_0 and b_0 are ship constants, u is the actual velocity of the ship and l is the length of the ship.

Assume that the ship steering model has the values a_{nom} and b_{nom} at the nominal ship velocity u_{nom}.

Obtain the expression showing the dependency of characteristic frequency w_n and the damping ratio ξ, on the ship velocity u.

Q9) a) Explain the pole placement design and derive the Diophantine equation. **[8]**

b) Consider a process characterized by the transfer function **[8]**

$$G(s) = \frac{K}{1+sT}e^{-sL}$$

Where K is static gain, L is the apparent time delay, T is the apparent time constant.

Explain the Zigler-Nichol's step response method to determine the parameters of the PID regulator.

OR

Q10) a) Explain the PID controller and discuss the closed loop method of tuning of PID controller. **[8]**

b) An ideal relay with a saturation level ± 1 unit, is connected in series with a linear transfer function $G(s)=\frac{50}{s(s+1)(s+10)}$ in a unity feedback control system. Calculate the critical gain K_u and critical period T_u, using the method of Describing Function. **[8]**

Q11) a) Explain with neat diagrams, Model Reference Adaptive Scheme (MRAS). **[9]**

b) Consider a system described by $\frac{dy}{dt}=-ay+bu$ where a & b are unknown parameters, u is the input variable and y is the measured output. Assume that it is desired to obtain a closed loop model described by $\frac{dy_m}{dt}=-a_m y_m+b_m u_c$, where u_c is the controlled input. The controller is given by $u(t)=\theta_1 u_c(t)-\theta_2 y(t)$.

Draw a MRAS based on the MIT rule. Explain any approximations made and comment on the prior knowledge about the plant that may be required. **[9]**

OR

Q12) a) Explain what do you understand by Model Reference Adaptive System (MRAS) and also explain the MIT rule. **[9]**

b) Consider the process $G(s)=\frac{1}{s(s+a)}$ where a is an unknown parameter.

Determine a controller that can give the closed loop system

$$G_m(s)=\frac{w^2}{s^2+2\xi ws+w^2}.$$

Determine a Model Reference Adaptive Controller based on the gradient theory. **[9]**

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Total No. of Questions : 6]

P2196

SEAT No. : [ ]

[Total No. of Pages : 2

[4165] - 592
M.E. (Electrical) (Power Systems)
HIGH VOLTAGE POWER TRANSMISSION
(2008 Course) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***
5) ***Use of pocket electronic calculator is allowed.***

SECTION - I

Q1) a) Discuss the advantages and limitations of HVDC transmission over HVAC transmission. **[12]**

b) Show that the output voltage of a 6 pulse, 3-phase bridge rectifier can be expressed as $V_{dc} = K[\cos\alpha + \cos(\alpha + \mu)]$ if the output current of the rectifier is continuous where α is the delay angle and μ is the overlap angle. Identify the value of k. **[8]**

c) A 3-phase, 275kV, 50Hz mains feeds a 3-phase, 6pulse rectifier through a 275kV/120kV transformer. The rectifier operates with $\alpha = 20°$ and $\mu = 12°$ and delivers ripple free current of 1000 A d.c. calculate the rating of the transformer and commutation reactance neglect losses.**[5]**

Q2) a) Draw the layout of a typical HVDC station. Mark therein the important components of HVDC system. State the function of each component. **[10]**

b) Develop the equivalent circuit of a 3-phase, 6 pulse bridge inverter.**[5]**

c) Explain the operation of 12 pulse converter using a cascade of two, 6 pulse, 3-phase bridges. Draw a neat circuit diagram. State clearly any assumptions made. **[10]**

P.T.O.

Q3) Write short notes on <u>any three</u> of the following :

a) Multi-terminal HVDC systems; **[8]**

b) hierarchial levels of control in HVDC systems; **[9]**

c) HVDC converter characteristics; and **[8]**

d) HVDC system protection. **[8]**

SECTION - II

Q4) a) Using the travelling wave concept, obtain the step response of an open-circuited transmission line with losses neglected. Draw the response. Explain how the response is modified if losses and attenuation are included. **[12]**

b) Derive the expressions for reflection and transmission coefficients for voltage and current. Obtain these coefficients for **[13]**

i) a short-circuited line; and

ii) matched line.

Q5) a) A transformer whose winding has a surge impedance of 1000Ω is to be connected to an overhead line with Z_o = 400Ω. A lightning surge with a peak value of 1250 kV is coming in the line and the transformer voltage is to be limited to 600kV peak. Suggest an alternative to a lightning arrester and determine its surge impedance and voltage rating. **[12]**

b) Describe the different methods of voltage control employed in power systems. Draw diagrams wherever necessary to enhance your description of the methods. **[13]**

Q6) Write short notes on <u>any three</u> of the following :

a) Over voltages in power systems; **[8]**

b) Biological effects of electric field; **[8]**

c) Corona and its effects; and **[9]**

d) Bewley lattice diagram. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P2199

[Total No. of Pages : 2

[4165]-42
M.E. (Civil) (Structures)
HIGH RISE STRUCTURES
(2002 Course) (Elective - II (a))

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of cell phone is prohibited in the examinaion hall.***
7) ***Use of electronic pocket calculator, latest IS codes and steel table is allowed.***

SECTION - I

Q1) Design a RC chimney for the following data : **[25]**
Height = 64 m
External diameter = 5.00 m (at top)
Wall thickness = 280 mm at top (linearly varying)
Safe bearing capacity of soil = 300 kN/m^2.

Q2) A self supporting steel stack is 60 m high and its diameter at top is 3.0 m. Design the plates for the stack, base plate and anchor bolts. The stack is located in the industrial zone where intensity of wind pressure up to 30 m is 1.5 kN/m^2. Use IS: 6533 and IS: 875. **[25]**

Q3) A 64 m high steel tower is to be erected for transmission line for single circuit three phase 50 cycle per second. Suggest the suitable geometry and determine the various forces acting on tower under normal operating condition. **[25]**

SECTION - II

Q4) a) Give the qualitative comparison of 2-D and 3-D analysis of tall building. **[10]**

b) Describe the seismic behavior of various bracing system used in multistory buildings. **[15]**

P.T.O.

Q5) a) Compare the overall structural performance of shear walls, coupled shear and bracing in tall building with the earthquake excitations. **[10]**

b) Describe the drag and shielding effect due to wind in the design of building. **[15]**

Q6) a) Evaluate the maximum sag of the conductor due to temperature variation in the design of transmission line tower. **[13]**

b) Describe the evaluation of following loads in the analysis of transmission tower under the normal and broken conditions. **[12]**

i) Vertical load.
ii) Lateral load.
iii) Longitudinal load.
iv) Transverse load.

✷✷✷

Total No. of Questions : 8]

SEAT No. :

P2201

[Total No. of Pages : 2

[4165] - 58

M.E. (Mechanical) (Heat Power Engg.)

NON - CONVENTIONAL ENERGY SOURCES

(2002 Course) (Elective - II (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss the different renewable energy sources with their available potential with special reference to Indian context. **[10]**

b) Which type of non-conventional energy source is the best suitable for rural and agricultural applications & why? Explain in detail. **[6]**

Q2) a) Describe the principle of solar photovoltaic energy conversion. List its advantages & disadvantages of solar photovoltaic conversion. **[8]**

b) Explain the components of wind machines with neat sketch. **[8]**

Q3) a) Describe the procedure to evaluate the performance of flat plate solar collector. **[6]**

b) A propeller type, horizontal shaft wind turbine having following wind characteristics. Speed of wind 10m/s at 101.3 kPa &15ºC. The turbine has diameter of 120 m & its operating speed is 40 rpm of maximum efficiency. Calculate **[10]**

i) total power density in the wind stream.

ii) the max, obtainable power density, when $\eta = 40\%$.

iii) the total power produced.

iv) torque & axial thrust.

P.T.O

Q4) Write short notes on (any three): **[18]**

a) Biogas power plant.

b) Recent developments in solar power plants.

c) Geothermal power plant.

d) P-V andV-I characteristics of PV module.

SECTION - II

Q5) a) Write a short note on: **[10]**

i) SOFC.

ii) Acidic fuel cell.

b) Evaluate the feasibility of tidal energy source. **[6]**

Q6) a) Explain the principle of open cycle OTEC system with suitable diagram. **[8]**

b) What are tidal waves? How the power is produced in single basin & double basin tidal system? **[8]**

Q7) a) Explain : Clean Development Mechanism (CDM). **[6]**

b) Discuss the environmental impact of nuclear power plant. **[6]**

c) Give limitations and applications of fuel cells. **[4]**

Q8) Write short notes on (any three): **[18]**

a) Energy Wheel & Energy Bank.

b) Factors affecting generation of Biogas.

c) MHD.

d) Building Integrated photovoltaics (BiPv).

Total No. of Questions : 8]

SEAT No. :

P2202

[Total No. of Pages : 2

[4165] - 60
M.E. (Mechanical) (Heat Power Engg.)
GAS TURBINES
(2002 Course) (Elective - II(d))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail closed cycle gas turbine. **[8]**

b) List in brief advantages and disadvantages of closed cycle gas turbine over open cycle gas turbine. **[8]**

Q2) a) A gas turbine plant works between the fixed temperature limits of 290 K and 950K. the pressure limits being 1 bar and 4 bar. The isentropic efficiency of compressor = 0.85 and the turbine = 0.9. Estimate the actual thermal efficiency of the plant and power available for driving external load if the fuel consumption is 1.1 kg/s and the calorific value of the fuel = 42000kJ/kg. **[14]**

b) Write short note on the basic requirements of a working medium. **[4]**

Q3) For compressible flows:

a) Derive an expression for To/T and Po/P, where To and Po are the stagnation temperature and pressure respectively. **[8]**

b) What is the behavior of T, To, P, Po, M across a shock. **[8]**

P.T.O

Q4) Write short notes (any two): **[16]**

a) Losses in axial compressor stage.

b) Chocking and stalling phenomenon.

c) Slip factor and its effect on work input to centrifugal compressor.

SECTION - II

Q5) a) Explain the combustion mechanism and the physical process of combustion. Define combustion intensity and efficiency. **[8]**

b) Discuss the requirements of combustion chamber and working of can type combustor. **[8]**

Q6) In a turbojet, the exit velocity relative to the nozzle is twice the flight velocity. Determine the rate of fuel consumption when developing a thrust of 25000 N under the following conditions: **[16]**

Ambient pressure = 0.7 bar

Ambient temperature = 270 K

Flight speed = 800 kmph

CV of fuel = 42 MJ/kg

Isentropic efficiency of compressor = 0.85

Isentropic efficiency of turbine = 0.9

Turbine pressure ratio = 2.2

Neglect property variation and assume that the mass flow rate is constant.

Q7) Explain in context of axial flow turbines: **[16]**

a) Vortex theory.

b) Blade profile and blade loss coefficient.

c) Methods of blade cooling.

d) T-S diagram for a reaction stage.

Q8) Write short note on (any three): **[18]**

a) Turbo fan engine.

b) Gas turbine emissions.

c) Flame blade cooling.

d) Liquid propellant rocket engines.

Total No. of Questions : 10]

SEAT No. :

P2203

[Total No. of Pages : 2

[4165]-65
M.E. (Mech.) (Design Engg.)
MACHINE STRESS ANALYSIS
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive an equilibrium equation and compatibility equation for polar coordinate. **[10]**

b) Explain Saint Venants principle. **[6]**

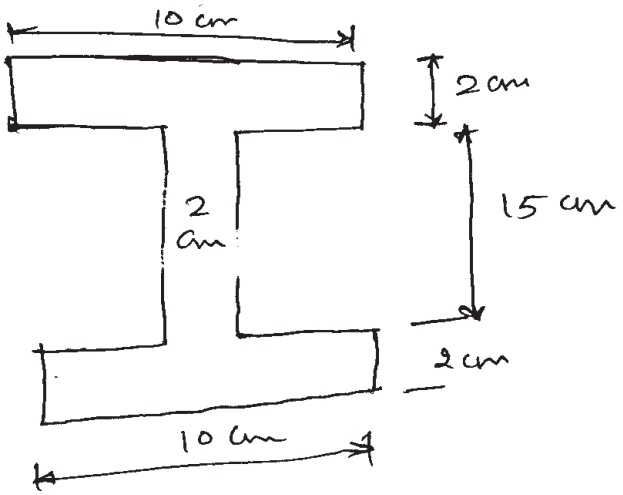
Q2) A simply supported beam carries a central load of 8 kN inclined at 45° with the vertical passing through centroid of section. If the span of beam is 2m find **[16]**

a) Max^{m} tensile stress.

b) Max^{m} compressive stress.

c) Deflection due to load.

d) Direction of neutral axis $E = 200 \times 10^5$ N/cm^2.



P.T.O.

Q3) State & explain theorem of virtual work. Find the defl^{n} of compliance beam of 'L' length & subjected to torque 'T' at free end. **[16]**

Q4) a) Explain in details. Use of energy method to find plastic deformation. **[8]**

b) Explain in detail FEM. **[8]**

Q5) Explain following : **[18]**

a) Rayleigh-Ritz method.

b) Plane strain problems.

c) Airy's stress function & its analysis.

SECTION - II

Q6) Explain in detail various methods used for experimental stress analysis. **[16]**

Q7) Derive Governing equation for stresses in thick walled cylinder under internal & external pressure. **[16]**

Q8) Two curved surfaces having different radius at point of contact are pressed together. Derive equation of contact stresses. Also state the assumptions made. **[16]**

Q9) a) Derive fundamental differential equation for cylindrical bending of rectangular plate with uniform leading damped at edges with usual notations. **[10]**

b) Obtain shape factor for rectangular section. **[6]**

Q10) a) Isoclinics & Isochromatics.

b) Brittle coating.

c) Stress intensity factor & stress concentration factor. **[18]**

Total No. of Questions : 10]

SEAT No. :

P2204

[Total No. of Pages : 3

[4165] - 67
M.E (Design)
MECHANICAL VIBRATIONS
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Derive from first principal dnhamel's integral for undamped system and hence find out response of the system to a resonating force. Sketch response of same. **[16]**

Q2) a) Find response of a damped spring mass system subjected to an impulsive force F_0. **[10]**

b) Give three examples of random i/p. How you will proceed to find their spectral density. **[6]**

Q3) An eccentric cam having eccentricity 'e' rotating with uniform angular velocity 'w' operated a roller follower of roass 'm' with push rod length 'L' and c/s area 'A' & youngs modulus 'E'. The push rod acts as spring has been compressed by an amount X_0 before Assembly determine. **[16]**

a) Equation motion of a follower.

b) Force exerted on the follower.

c) Condition under which the follower loose contact with cam.

Q4) For the system shown in fig. (1) form stiffness & mass matrix using influence coefficent find natural frequency & mode shape. **[16]**

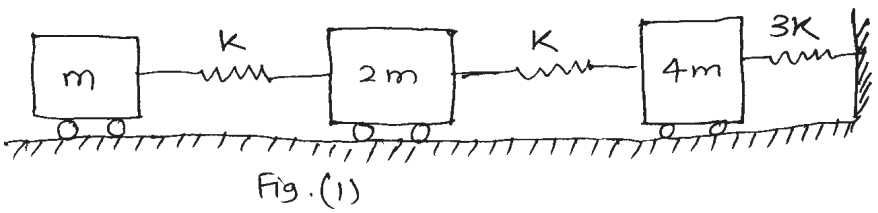


Fig. (1)

P.T.O.

Q5) Explain following : **[18]**

a) Eigen values & Eigen vector.

b) Modal analysis.

c) Holzors method.

SECTION - II

Q6) a) Explain wideband & narrow band random vibrations. **[6]**

b) Give three examples of random i/p. How you will proceed to find their spectral density.
Calculate autocorrelation function to ideal white noise & to the step function. **[10]**

Q7) A three degree freedom system has parameters m, k & c. it is subjected to a force of $e^{-\alpha t}$ find the response & sketch the same. **[16]**

Q8) a) What are self excited vibrations. **[4]**

b) Using Duffing's equation explain jump phenomenon for undamped & damped non linear system. **[12]**

Q9) a) Explain Rayleight - Ritz method for binding natural frequencies of continuous beam. **[8]**

b) Explain in detail pertubation method. **[8]**

Q10) Write short notes on **[18]**

a) Phase - plane techniques.

b) Static & dynamic coupling.

c) Centrifugal pendulum.

♦♦♦♦

Laplace Transform Pairs

	$f(t)$		$L[f(t)]$
1.	$f(t)$	—	$\int_0^\infty f(t)e^{-st}dt = F(s)$
2.	$x(t) \pm y(t)$	—	$X(s) \pm Y(s)$
3.	$Kf(t)$	—	$KF(s)$
4.	$u(t)$ *or* 1	—	$1/s$
5.	$\delta(t)$	—	1
6.	t	—	$1/s^2$
7.	t^n	—	$\frac{n!}{s^{n+1}}$
8.	$\sin \omega t$	—	$\frac{\omega}{s^2+\omega^2}$
9.	$\cos \omega t$	—	$\frac{s}{s^2+\omega^2}$
10.	e^{-at}	—	$\frac{1}{s+a}$
11.	$e^{-at} \sin \omega t$	—	$\frac{\omega}{(s+a)^2+\omega^2}$
12.	$e^{-at} \cos \omega t$	—	$\frac{s+a}{(s+a)^2+\omega^2}$
13.	$e^{-at} f(t)$	—	$F(s+a)$
14.	$u(t-a)$	—	$\frac{e^{-as}}{s}$
15.	$\partial(t-a)$	—	e^{-as}
16.	$\left.\begin{array}{l} 0 \text{ when } t < a \\ f(t-a) \text{ when } t > a \end{array}\right] = f(t-a)u(t-a)$		$e^{-as}F(s)$
17.	$\frac{df(t)}{dt}$	—	$sF(s) - f(o)$
18	$\frac{d^2 f(t)}{dt}$	—	$s^2F(s) - sf(o) - \frac{df(o)}{dt}$
19.	$\int_0^t f(t)dt$	—	$\frac{F(s)}{s}$

Total No. of Questions : 8]

SEAT No. :

P2206

[Total No. of Pages : 2

[4165]-123
M.E. (E & T/C) (Microwave)
ADVANCED DIGITAL SIGNAL PROCESSING
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the use of DFT in linear filtering. **[6]**

b) Show that the multiplication of two DFT's is equal to the circular convolution. **[6]**

c) Perform the circular convolution of the two sequences **[6]**

$$x_1(n) = \{\underset{\uparrow}{1}, 2, 1, 2\}$$

$$x_2(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}$$

Q2) a) Explain the following with the help of diagrams. **[6]**

i) Decimator.

ii) Interpolator.

b) Explain the concept of polyphase filter. Draw and explain decimation by polyphase filters with the help of block diagram. **[6]**

c) Draw and explain the direct form realization of FIR filter in interpolation by a factor I. **[4]**

P.T.O.

Q3) a) Explain the difference between FIR Wiener filter and IIR Wiener filter. **[6]**

b) Explain the Split-Radix FFT algorithm. **[6]**

c) Draw the block diagram of Subband speech coder and explain the same. **[4]**

Q4) a) Explain Levinson Durbin algorithm for solution of normal equations. **[8]**

b) Explain forward and backward linear prediction with the help of block diagram. **[8]**

SECTION - II

Q5) a) Explain the different methods for system modelling. Explain the advantages of least square method used for system modelling. **[8]**

b) What is the relationship between auto correlation function and filter parameters. **[8]**

Q6) a) Explain the difference between parametric and non parametric power spectrum estimation. **[6]**

b) Explain the periodogram method of power spectrum estimation. **[6]**

c) Compare MA, ARMA and AR models of linear predictive filters. **[4]**

Q7) a) Explain the operation of any DSP processor with architecture diagram. **[8]**

b) Explain the AR Lattice and ARMA Lattice Ladder structures. **[8]**

Q8) Write short notes on any three : **[18]**

a) DTMF.

b) Radar signal processing.

c) Eigen analysis algorithm for spectral estimation.

d) Pade approximation method for system model parameter optimization.

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Total No. of Questions : 8]

SEAT No.:

P2207

[Total No. of Pages : 2

[4165]-126
M.E. (E & TC) (Microwave)
MICROELECTRONICS
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) With reference to CMOS inverter explain the meaning of following terms **[8]**

i) Switching energy.
ii) (W/L) Ratio.
iii) Propagation Delay.
iv) Noise Margin.

b) What are the components that account for the power dissipation in a CMOS VLSI Circuit? Calculate approximate dynamic power dissipation in a chip operating with V_{DD} of 5 V at 100 MHz with an internal switched capacitance of 300 pF. **[8]**

Q2) a) What do you mean by JTAG and boundary scan? Explain the various standards involved in these techniques. **[8]**

b) What do you mean by transistor sizing? What is the impact of transistor sizing on voltage transfer characteristics of CMOS inverter. **[8]**

Q3) a) What is difference in design implementation flow of CPLD and FPGA? Draw and explain the architectures of CPLD and FPGA programmable logic devices. **[10]**

b) Design and implement a decade counter using VHDL. **[6]**

P.T.O.

Q4) Write short notes on (any three) : **[18]**

a) VHDL modeling styles.

b) Design for Testability.

c) Moore and Mealy Finite State Machines.

d) EDA Tools in VLSI.

SECTION - II

Q5) Implement the following circuits using transmission gates. **[16]**

a) 2 : 1 multiplexer.

b) 4 : 1 multiplexer.

c) XOR gate.

d) OR gate.

Q6) a) What do you mean by design verification? Explain Stuck at '0' and stuck at '1' faults in detail. **[8]**

b) What is Domino logic? Explain the operation of AND gate implemented using Domino logic. **[8]**

Q7) a) What do you mean by synthesizable and non-synthesizable statements. Explain with simple VHDL examples. **[8]**

b) With reference to VHDL explain following terminologies. **[8]**

i) Data Objects.

ii) Data Types.

iii) Subprograms.

iv) Packages.

Q8) Write short notes on (any three) : **[18]**

a) Analog VLSI Design.

b) Clock Distribution Techniques.

c) Power Optimization Techniques.

d) Antifuse SRAM Technology.

Total No. of Questions : 6]

SEAT No.:

P2209

[Total No. of Pages : 2

[4165]-168
M.E. (Electrical) (Control Systems)
NONLINEAR CONTROL SYSTEMS
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following terms for nonlinear control system with examples.

i) Hard and Soft spring.
ii) Hysterisis.
iii) Subharmonic generation.
iv) Jump resonance.
v) Limit cycle. **[15]**

b) Discuss different types of nonlinearities generally encountered in feedback control systems and their effects on the system performance. **[10]**

Q2) a) Compare advantages and disadvantages of phase plane method and describing function method for the analysis of nonlinear control system. **[7]**

b) Describe isoclines phase plane trajectory method. **[8]**

c) Draw phase plane trajectory using isocline method for **[10]**

$$\frac{d^2x}{dt^2}+2\frac{dx}{dt}+x=0$$

Take starting point as $\frac{dx}{dt}=1,\ x=0$.

P.T.O.

Q3) a) Write short note on delta method of constructing a phase plane trajectory. **[10]**

b) A unity feedback control system has the forward path transfer function $G(s)=\frac{1}{s(s+2)}$ in cascade with relay whose output equal to $\pm$ 1. For unit step input using isocline method, construct the phase plane trajectory. Also comment on stability. **[15]**

SECTION - II

Q4) a) Derive describing function for **[16]**

i) Saturation nonlinearity.

ii) Relay with dead zone.

b) Explain the application of Nyquist criterion for a nonlinear control system with help of describing function. **[9]**

Q5) For a unity feedback closed loop control system having forward path transfer function $G(s)=\frac{20}{s(s+1)(s+2)}$ in cascaded with ON-OFF relay with hysterisis as ON and OFF state ± 2 units, Hysterisis $\pm$ 1 unit. Determine the stability of control system and limit cycle if it exists. **[25]**

Q6) a) Explain the terms : **[8]**

i) Positive semidefinite and definite.

ii) Negative semidefinite and definite.

b) Explain the terms in the sense of Lyapunov : **[8]**

i) Stability.

ii) Asymptotic stability.

iii) Global asymptotic stability.

iv) Instability.

c) An autonomous system is given with $A=\begin{bmatrix} 0 & 1 \\ -2 & -1 \end{bmatrix}$. Explain stability using Lyapunov theorem. **[9]**

Total No. of Questions : 6]

SEAT No.:

P2210

[Total No. of Pages : 2

[4165]-182
M.E. (Electrical) (Power Systems)
POWER SYSTEM DYNAMICS
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any Two questions from each section.***
2) ***Answers to the two sections should be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***
5) ***Use of pocket electronic calculator is allowed.***

SECTION - I

Q1) a) Explain what is meant by steady state power limit of a power system. Explain the different measures employed to improve this limit. **[12]**

b) State and explain the equal area criterion used in power system stability studies. Describe any two applications of this technique. **[13]**

Q2) a) Explain the effects of **[10]**

i) Short-circuit ratio and

ii) Saliency on the steady state stability of a salient-pole alternator.

b) An alternator with E_1 = 1.32 p.u. and x_1 = 0.65 p.u. feeds power to infinite bus with E_2 = 1 p.u. and x_2 = 0.5 p.u. through a transmission line whose π-equivalent parameters are x_e = j 1.1 p.u. and $x_s = x_r$ = – j 5 p.u. Estimate the steady state power limit for the system. Use modified Clarke's diagram. **[15]**

Q3) Write short notes on the following :

a) Islanding in power systems; **[8]**

b) Classical multimachine model used in power system stability studies and its draw-backs; and **[9]**

c) Voltage instability in power systems. **[8]**

P.T.O.

SECTION - II

Q4) a) Explain Euler's modified method. **[10]**

b) A 50 MVA, 50Hz alternator has an internal voltage of 1.15 p.u. and is connected to an infinite bus through a reactor of 0.25 p.u. and the voltage of infinite bus is 1.0 p.u. The alternator supplies rated power when a 3-phase short-circuit occurs on the line. Subsequently the circuit-breakers operate and the reactance between the alternator and infinite bus becomes 0.4 p.u. Using Euler's method, determine the swing curve for the alternator for a time of 0.3 seconds before the fault is cleared. Take $h = 0.1$ second. The kinetic stored in the rotor of the alternator is 200 MJ. **[15]**

Q5) a) With a neatly drawn block schematic diagram of a power system stabiliser, explain the function of each block. **[12]**

b) Describe the dynamic stability of a SMIB system where the finite machine is unregulated and is subjected to small impact. **[13]**

Q6) Write short notes on the following :

a) Effect of excitation on generator power limits; **[8]**

b) Pre-calculated swing curves; and **[8]**

c) Runge-Kutta method of solution of transient stability problem in power systems. **[9]**

Total No. of Questions : 6]

SEAT No.:

P2211

[Total No. of Pages : 2

[4165]-236
M.E. (Instrumentation) (Process and Biomedical)
ADVANCED ELECTRONIC INSTRUMENTATION
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain dual slope integration cycle in ADC with the help of circuit schematic diagram. What is Auto-zero process and how does it function in ADC? Why does this ADC have good series mode rejection? **[25]**

Q2) Explain different errors occur in universal counter. Explain working of Temperature compensated crystal Oscillator. **[25]**

Q3) Explain following controls in cathode ray oscilloscope with an application of each : **[25]**

a) Auto mode.

b) Normal mode.

c) Variable Hold-off.

d) Chop mode.

e) Add mode.

SECTION - II

Q4) What is a principle of Lux meter? Explain with hardware and block diagram. What are the sensors used for Lux meter? **[25]**

P.T.O.

Q5) What are the internal blocks of Recorder? Explain the calibration Procedure followed for recorders. What is the process of finding out the dynamic response of recorder? **[25]**

Q6) Write short notes on : **[25]**

a) Gauss meter.

b) Semiconductor pressure sensor.

Total No. of Questions : 8]

SEAT No. :

P2213

[Total No. of Pages : 2

[4165]-408

M.E. (Civil) (Construction & Management)

RESOURCES MANAGEMENT

(2008 Course) (Elective - II (a)) (Sem. - I)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt any three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Discuss importance of the following inventory management systems. **[12]**

i) ABC.
ii) VED.
iii) HML.
iv) FSN.

b) Discuss balancing of primary and secondary materials objectives with examples from a building construction project. **[6]**

Q2) a) Discuss advantages of JIT system in the Japenese context and limitations of the same in the Indian context. **[6]**

b) Derive formula for EOQ and discuss practical constraints for the EOQ. Even then, is EOQ concept useful? **[6 + 3 + 1]**

Q3) What is value engineering? What are its advantages? Explain any 2 methods of performing value analysis in detail. **[1 + 3 + 6 + 6]**

P.T.O.

Q4) Discuss the following : **[16]**

a) TQM approach in materials procurement.

b) Re-order level system-Merits, demerits.

c) Use of material indices in construction.

d) MRP with use of softwares.

SECTION - II

Q5) Differentiate between HRM and HRD with examples and explain 4 steps in detail for achieving HRM and HRD in your organisation effectively. **[2 + 8 + 8]**

Q6) Explain the following with examples.

a) Enhancing construction equipment productivity. **[4]**

b) Construction equipment costing approach. **[4]**

c) Economic analysis of construction equipment. **[4]**

d) Equipment log book and its importance. **[4]**

Q7) Discuss various factors which need to be considered while selecting construction equipment (8 important factors). **[16]**

Q8) a) Explain qualities necessary and the role to be performed by the HR manager of a construction organisation. **[8]**

b) Explain any 2 methods of working out depreciation of construction equipment, (one method should be that which is recommended by plant and machinery committee India) **[8]**

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Total No. of Questions : 8]

SEAT No. :

P2214

[Total No. of Pages : 2

[4165]-409

M.E. (Civil) (Construction & Management)

TQM IN CONSTRUCTION

(2008 Course) (Elective - II (b)) (Sem. - I)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt any three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) a) Explain with examples the various principles that are involved in TQM programs. **[6]**

b) Explain benchmarking and its importance in TQM programs. Apply benchmarking concept for measuring the quality of materials used for the formwork of a column using wood as the basic material. **[6]**

c) Explain PDCA cycle and its importance with an example. **[6]**

Q2) Discuss the various barriers which affect the implementation of TQM in construction. Also offer your solutions to these barriers. **[16]**

Q3) In the context of ISO 9000 series, explain with examples the following terms: **[16]**

a) Characteristics.
b) Quality plan.
c) Efficiency.
d) Supplier.
e) Quality assurance.
f) Defects
g) Non-conformity
h) Stated and implied needs

P.T.O.

Q4) a) What is quality function deployment and how is it achieved in practice if a road project is to be planned and designed? The road is a bituminous pavement. **[8]**

b) Explain in detail, with examples the following ISO principles. **[8]**

i) Process Approach.

ii) Continual improvement.

SECTION - II

Q5) Classify the construction defects and explain how you would measure them in the construction of a bungalow. **[18]**

Q6) Conceptualize the various approaches to cost of quality. In your opinion, which approach is suitable in TQM? Elaborate with an example. **[16]**

Q7) "Six Sigma Tool is a boon to the construction industry". Explain this statement in the context of the globalization effects on the construction sector. **[16]**

Q8) Explain the following : **[16]**

a) PRRT Software.

b) Quality Circles.

c) CIDC-CQRA quality rating.

d) ISO audit.

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Total No. of Questions : 6]

SEAT No. :

P2216

[Total No. of Pages : 2

[4165] - 442
M.E. (Civil) (Structures)
DESIGN OF INDUSTRIAL STEEL STRUCTURES
(2008 Course) (Elective - II (d)) (Sem. - I)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of cell phone is prohibited in the examination hall.***
7) ***Use of electronic pocket calculator, latest IS codes and steel table is allowed.***

SECTION - I

Q1) The span of knee braced roof trusses over an industrial building 36m long is 16m. The spacing of roof trusses is 3m. The pitch of roof is 1 in 4. The A C sheets are used for roof covering. The basic wind pressure is 1.5 kN/ m^2. The height of eaves above ground level is 8.60m. Propose a suitable type of roof truss. Determine the load at the various panel points due to dead load, live load and wind load. Also determine the reactions. **[25]**

Q2) Taking data of Q.1 analysis and design a column in a knee braced shed for a case of wind normal to ridge with internal suction. Reaction due to dead load and live load on roof truss transferred to column top are 35 kN and 50 kN respectively. State the loading combination for the design. **[25]**

Q3) A gable portal frame is having span of 18 m. Height up to eaves level is 8 m and apex is at 12.5 m above bases. Wind pressure intensity is 1.5 kN/m. Column ends are hinged. The gable rafter is supported by five columns. The spacing between the roof trusses is 4 m . Design the gable rafter, side rails and gable wind girder. **[25]**

P.T.O

SECTION - II

Q4) Design an open web (castellated beam) for a span of 15 m. The dead load coming on roofing is 1.0kN/m^2 and live load on the roof is 1.6 kN/m^2. Calculate the spacing of the beam and check for shear and deflection. Adopt suitable pattern of castellation and adjust the section such that overall depth of section should not exceed 900 mm. Assume f_y = 250 Mpa. **[25]**

Q5) Design a trussed purlin to carry a uniformly distributed load of 30 kN/m over a simply supported span of 12 m. Use double angles for chord and single angles for web members. Select suitable geometry for truss purlin and draw its cross section. **[25]**

Q6) Explain the needs of bracing system in industrial shed. Describe neatly for which forces bracing systems are designed in industrial shed. Explain various bracing system with neat sketches. **[25]**

Total No. of Questions : 8]

SEAT No.:

P2217

[Total No. of Pages : 2

[4165]-447
M.E. (Civil) (Construction and Management)
INFRASTRUCTURE DEVELOPMENT
(2008 Course) (Elective - III (b)) (Sem. - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) Discuss the government policy of Minimum Alternate Tax (MAT) associated with the special economic zones in India (SEZ'S), the various issues associated with the policy and a few solutions which would ensure both revenues for the government and benefit the developer, particularly in the rural sector. **[18]**

Q2) With respect to the infra finance, discuss :

a) Single biggest post-investment risk faced by an infrastructure finance company in India. **[3]**

b) Emerging opportunities for private equity players in Infrastructure projects in India. **[5]**

c) Effect of increasing coal prices on the investors in the power sector. **[5]**

d) Viability of projects, gap funding and SPV's. **[3]**

Q3) With respect to the road sector, discuss :

a) Provisions in the Rural Road Development Plan Vision 2025 document (RRDPV). **[5]**

b) PPP for PMGSY projects. **[3]**

c) Findings, recommendations suggested by working group on rural roads (WGRR) in the 12th five year plan. **[6]**

d) PURA and Bharat Nirman. **[2]**

P.T.O.

Q4) With case studies, explain the following :

a) Economic Analysis of fly-overs. **[10]**

b) Comparision of flexible pavements with rigid pavements based on Net Present Value (NPV) or any other investment appraisal criteria. **[6]**

SECTION - II

Q5) a) List out different part of infrastructure project which help in development of national economy? **[10]**

b) Explain any one of them in detail giving different types of project which involved in same? **[8]**

Q6) a) What are the different methods of source of financing in development of ports? **[8]**

b) Which are the different areas through which ports are able to raise finance? **[8]**

Q7) a) What are the objectives foreseen in formation of national electricity policy? **[8]**

b) What are different provisions made provided in national policy for power distribution by Govt. at national level? **[8]**

Q8) Write short notes on <u>any four</u> of the following : **[16]**

a) Objectives of ppp method of contract used in airports infrastructure development.

b) The primary fuels used for energy which helps economic growth of India?

c) Advantages of BRTS proposal.

d) List out the opportunities in port development planning in Container and Bulk terminals.

e) Quality control systems implemented on Pradhan Mantri Gram Sadak Yojana (PMGSY)?

Total No. of Questions : 8]

SEAT No.:

P2218

[Total No. of Pages : 2

[4165]-448
M.E. (Civil) (Construction and Management)
INTERNATIONAL CONTRACTING
(2008 Course) (Elective - III (c)) (Sem. - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic table, slide rule, Moiller charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) a) Differentiate between domestic contracts and international contracts. Explain with examples how bidding for international contracts is more challenging as regards the preparation and submission of the bid, as well as the overall process of bidding and award of tender. **[10]**

b) Explain the macro, market and project level risk approach used for assessing risks on international projects with appropriate examples. **[8]**

Q2) a) Discuss the various problems faced in the execution of the Basrah housing project and for each problem identify the risk prevention system which could have been adopted and also the risk mitigation measure/s necessary to control the impacts of the risks. **[10]**

b) Explain the effect of the fluctuating global currencies on the financial performance, while implementing a contract under a clause of fixed currency exchange rate adopted as a tender condition, with help of an example. **[6]**

Q3) Explain in detail the role of the following as expected from the FIDIC New Red Book for :

a) Engineer. **[6]**

b) Contractor. **[10]**

P.T.O.

Q4) With respect to the dispute resolution explain :

a) The system commonly expected by the FIDIC document in brief. **[4]**

b) Detailed procedure of DRB. **[8]**

c) Advantages of CIDC-SIAC institutionalized arbitration system. **[4]**

SECTION - II

Q5) a) Explain the philosophy of the international contract bidding, the client should consider before it takes the decision? **[8]**

b) Explain the sequence of activities involved for project authority and bidder, for pre qualification and up to submission of bid for international contract? **[10]**

Q6) a) Give the specific details of items you will cover that form technical and ancillary documents in international contract bidding. **[8]**

b) List out the various documents which are generally included in the form of contract? **[8]**

Q7) a) Explain the sequence of activities involved project authority and bidder, for pre qualification and up to submission of bid for international contract? **[8]**

b) What are the guidelines in the procurement policy by World Bank in financing huge projects? Discuss. **[8]**

Q8) a) Which are the risk identification tools normally used in civil engineering contracts? Explain with a short note each of them. **[10]**

b) Which are common risks normally located in project? List out and explain any one of them in detail. **[6]**

Total No. of Questions : 8]

SEAT No. :

P2219

[Total No. of Pages : 3

[4165]-449

M.E. (Civil) (Construction & Management)

THRUST AREAS IN PROJECT MANAGEMENT

(2008 Course) (Elective - IV (a)) (Sem. - II)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Attempt any three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data wherever necessary.***

SECTION - I

Q1) As a manager of construction organisations (either client or contractor) executing construction projects, explain how the following thrust areas will benefit you, with proper examples :

a) SWOT Analysis **[4]**

b) Project Pre-planning. **[6]**

c) Supply chain Management. **[3]**

d) Competencies Mapping. **[5]**

Q2) What is project partnering? What constitutes a typical project partnering charter? Explain advantages of adopting project partnering approach in construction with the help of a case study detailed out. **[2 + 4 + 10]**

Q3) a) What is PDRI? How is it useful in the project pre-planning phase? Explain in detail. A larger PDRI score is good or bad? Why? Explain. **[1 + 6 + 1]**

b) Define the word 'competency'. Identify the competencies necessary with the resident engineer working on behalf of the project management consultant, on a road construction project based on flexible pavement design. **[8]**

P.T.O.

Q4) Explain the following : **[16]**

a) SWOT matrix for Indian construction industry.

b) Application of COVEY habits to construction projects management.

c) Fast Track construction projects.

d) Project Team selection for project Pre-planning.

SECTION - II

Q5) A contractor's organisation has to design and develop an effective training program for development of their technical and managerial staff. The firm has been executing construction of precast-pre-stressed segmental superstructure for marine works, generally having foundations with piles, use of cofferdams and also involving pneumatic sinking. The nature of the contract is typically design-build type of contract.

You are the HR manager of the firm.

a) Identify :

i) Generic competencies. **[3]**

ii) Functional competencies. **[5]**

iii) Strategic competencies. **[2]**

needed to execute the above nature of the work, through your organisation.

b) Explain, by what system you will conduct the training needs assessment of your staff. **[3]**

c) Identify the major areas which in your opinion should get included in your training and development program. **[3]**

d) Explain how you would work out the cost of your training and developmental program. **[2]**

Q6) a) Explain the various qualities needed by an entrepreneur. What challenges exist in entrepreneurship? Explain with examples. **[5 + 3]**

b) Explain in detail the John Mullion's idea evaluation 7 point framework test with a proper example. **[8]**

Q7) Explain the following :

a) 360° appraisal system and its advantages. **[3]**

b) Principle centered and transformational leadership. **[5]**

c) Process of strategic Management and importance in the context of globalisation. **[4]**

d) Ethics in construction - A truth or myth? **[4]**

Q8) Discuss the following :

a) Life cycle costing approach for projects. **[4]**

b) Difference between ISO 9004 and ISO 9001. **[2]**

c) SCM application in pre-tender phase. **[4]**

d) Six sigma applications in construction. **[3]**

e) Lean construction-Need of the hour. **[3]**

Total No. of Questions : 6]

P2220

SEAT No. :

[Total No. of Pages : 2

[4165] - 463
M.E. (Civil) (Hydraulics Engg.)
IRRIGATION & DRAINAGE
(2008 Course) (Elective - IV) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***All questions carry equal marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Neat diagrams must be wherever possible.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Calculate the frequency of irrigation, if **[10]**

i) Field capacity of soil = 29%

ii) Permanent wilting point = 11%

iii) Density of soil = 1300 kg/m^3

iv) Effective depth of root zone = 700mm

v) Daily consumptive use of water = 12mm

The moisture content must not fall below 25% of the water holding capacity between field capacity and permanent wilting point.

b) Explain evaporation and transpiration and its measurement by any one method. **[7]**

c) Write about the types of irrigation efficiencies and their significance. **[8]**

Q2) a) Describe the USLE method for Soil Loss Estimation. **[10]**

b) Write about : **[15]**

i) Terraces ii) Bunds

iii) Trenches iv) Gabion structures

v) Mulching, for soil and water conservation with neat diagrams.

P.T.O.

Q3) a) Explain the design concepts of Drip irrigation and field suitability conditions for drip irrigation. **[10]**

b) Write about the net and gross irrigation requirements of crops. **[7]**

c) What are the effects of irrigation soil management on soil salinity and alkalinity. **[8]**

SECTION - II

Q4) a) Design a tube well for 0.034 cumec discharge at a depression head of 5m. The water table varies between 10m below the ground level in winter (oct) and 15m in summer (june). Geological data of the well is as below. **[10]**

Depth m	Strata	Depth m	Strata
0-5	Clay with shingle	50-60	Clay
5-20	Very fine sand	60-80	Medium sand
20-35	Clay with kankar	Below 80	Clay
35-50	Coarse sand		

b) Explain the concept of economics in lift irrigation. **[7]**

c) Describe Kennedy's gauge outlet with diagram. **[8]**

Q5) a) Write about design concepts of sprinkler system. **[10]**

b) Explain the criteria for judging canal outlets behavior. **[7]**

c) Explain GCA, CCA, equitable water distribution system. **[8]**

Q6) a) In a drainage system closed drains are placed with their centres 10.5m above the impervious stratum and the maximum ht. of the drained water table above the centre of the drains is 0.3m. If the spacing of the drains is 36 m and the drains carry 1% of the average annual rainfall in 24 hrs, find the average annual rainfall. Take $k = 5 \times 10^{-6}$ m/sec. **[10]**

b) Write about the reasons for water logging and the ways for reclamation of water logged lands. **[8]**

c) Describe flexible modules and their advantages and disadvantages. **[7]**

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Total No. of Questions : 6]

P2221

SEAT No. : ____

[Total No. of Pages : 2

[4165] - 474
M.E. (Civil) (Structures)
OPTIMIZATION TECHNIQUES
(2008 Course) (Elective - IV (d)) (Sem. - II)

Time : 4 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How do you solve a maximization problem as a minimization problem. **[5]**

b) Formulate an optimization problem for minimum weight and minimum cost to design a rectangular reinforced concrete cantilever beam section with a constraint on deflection criteria. **[12]**

c) Find the maxima and minima of the function **[8]**
$f(x) = 4x^3 - 18x^2 + 27x - 7$

Q2) a) Explain Post-Optimality analysis and bounded variable method. **[6]**

b) Maximize $F = 5x_1 + 4x_2 + 3x_3$, Using simplex method. **[13]**
Subject to

$$2x_1 + 3x_2 + x_3 \leq 5$$
$$4x_1 + x_2 + 2x_3 \leq 11$$
$$3x_1 + 4x_2 + 2x_3 \leq 8$$
$$x_i \geq 0, \quad i = 1,2,3$$

c) Discuss the relationship between the regular simplex method, revised simplex method & Big M method. **[6]**

Q3) a) State the limitations for Fibinacci method. **[5]**

b) Find the value of x in the interval (0, 1) which minimizes the function $f = (x - 1.5)x$ to within ± 0.05 by using golden section method. **[10]**

P.T.O.

c) Derive the one-dimensional minimization problem for the following case **[10]**

$f = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$

From starting point $X_1 = \{0, 0\}$ along the direction S = {-1, 0}

Then minimize the function using quadratic interpolation method with an initial step length of 0.1.

SECTION - II

Q4) a) Minimize $f = (x_1 + 2x_2 - 7)^2 + (2x_1 + x_2 - 5)^2$ **[12]**

If a base simplex is defined by the Vertices

$$X_1 = \begin{Bmatrix} -2 \\ -2 \end{Bmatrix}, X_2 = \begin{Bmatrix} -3 \\ 0 \end{Bmatrix}, X_3 = \begin{Bmatrix} -1 \\ -1 \end{Bmatrix}$$

Find a sequence of two improved vectors using reflection, expansion and/or contraction.

b) Minimize $f = 100(x_2 - x_1^2)^2 + (1 - x_1)^2$ from the starting point {–1.2, 1.0} using steepest descent method (two iterations only). **[13]**

Q5) a) Minimize $f = x_1^2 + x_2^2 - 6x_1 - 8x_2 + 10$ **[13]**

Subject to $4x_1^2 + x_2^2 \leq 16$

$3x_1 + 5x_2 \leq 15$

$x_i \geq 0, i = 1,2$

Use a starting point $X_1 = \begin{Bmatrix} 1.0 \\ 1.0 \end{Bmatrix}$

Using SLP complete one step of the process.

b) Complete one iteration of the GRG method for the problem **[12]**

Minimize $f = x_1^2 + x_2^2$

Subject to $x_1x_2 - 9 = 0$

Starting from $X_1 = \begin{Bmatrix} 2.0 \\ 4.5 \end{Bmatrix}$

Q6) a) Illustrate the working principles of Genetic Algorithms with an example of unconstrained optimization problem. **[13]**

b) What is a neural network? How is a neuron modeled in neural network based models? **[12]**

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Total No. of Questions : 10]

SEAT No. :

P2223

[Total No. of Pages : 2

[4165] - 518

M.E. (Mechanical) (Design Engg.)

MATERIAL HANDLING EQUIPMENT DESIGN

(2008 Course) (Elective - II (a)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Give objectives and benefits of material handling. **[8]**

b) Explain Mechanization principal and flexibility principle of material handling with suitable example. **[8]**

Q2) a) A good management practice is to weigh benefits against disadvantages of the material handling system before deploying; elaborate the possible negative consequences of a material handling system before being deployed. **[8]**

b) Explain how plant layout affects the selection of material handling system. **[8]**

Q3) a) What are classical layouts? Explain each in relation with material handling. **[8]**

b) Give considerations while selecting a suitable material handling system for a specific application. **[8]**

Q4) a) Explain types of loads. What are basic ways to move these loads? **[8]**

b) Explain the considerations in obtaining the operational data while evaluating the existing material handling system. **[8]**

P.T.O.

Q5) a) Give advantages and applications of E.O.T.crane. **[8]**

b) What are the parameters considered while designing the E.O.T. crane? **[10]**

SECTION - II

Q6) a) Explain the role of Robots in material handling. **[8]**

b) Give advantages and limitations of Pneumatic conveying system. **[8]**

Q7) a) List and different hooks and explain their applicability along with suitable sketch. **[8]**

b) Give crane attachments for handling liquid materials with sketch of any one. **[8]**

Q8) a) Discuss Bucket and screw conveyers. **[8]**

b) What are the objectives of a storage system? **[8]**

Q9) a) What are common storage systems? Elaborate use of any two of them. **[8]**

b) Discuss objectives of warehousing. **[8]**

Q10) Write short notes on any three of the following: **[18]**

a) Factors considered in a new warehouse building.

b) Storage systems for bulk material.

c) Warehouse automation.

d) Safety considerations in design of a material handling system.

e) Different types of ropes used in Material handling system.

Total No. of Questions : 8]

SEAT No.:

P2226

[Total No. of Pages : 2

[4165]-561
M.E. (Mechanical) (Automotive Engineering)
AUTOMOTIVE MATERIALS
(2008 Course) (Elective - III (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are HSLA Steels. Explain its characteristics with one example. **[6]**

b) Explain in detail maraging steel w.r.t. its chemical composition and heat treatment. **[6]**

c) What are the methods of identifying alloy grades. **[4]**

Q2) a) How Metal Matrix Composites (MMCs) are classified based on reinforcements? What are the characteristics of MMCs. **[6]**

b) Explain and compare flake and fiber composites. **[6]**

c) Explain the alpha and beta polymorphs of Titanium. **[4]**

Q3) a) Explain with a neat schematic diagram near net-shape sinter forging technique. **[8]**

b) What are new plastic materials. Why are they said superior to rubber explain. **[6]**

c) What is micro-alloyed steel. **[2]**

Q4) Write short note on (any three) : **[18]**

a) Properties of rubber and its auto applications.

b) Nano composites.

c) Flame and induction hardening.

d) Isothermal transformation diagrams.

P.T.O.

SECTION - II

Q5) a) Explain the characteristics of fatigue fracture with neat diagram. **[6]**

b) Explain the methodology of material selection for design and manufacture of crank shaft in a truck. **[6]**

c) What is spheroidizing? Explain with an example. **[4]**

Q6) a) What are adhesives? How the adhesives are classified? Explain in brief the properties and applications of adhesive materials? **[10]**

b) What are the properties of brake fluids? Explain. **[6]**

Q7) a) Discuss briefly on electrical insulating materials used in auto applications? **[8]**

b) Describe the following manufacturing methods : **[8]**

i) Reaction injection molding.

ii) Filament winding.

Q8) Write short note on (any three) : **[18]**

a) Types of fracture mechanisms.

b) OSHA standards.

c) Antifreeze engine coolants.

d) Causes, effects and prevention of corrosion.

Total No. of Questions : 6]

SEAT No. :

P2227

[Total No. of Pages : 2

[4165]-585
M.E. (Electrical) (Power Systems)
POWER SYSTEM MODELLING
(2008 Course) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections must be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and state clearly the same.***
5) ***Use of pocket electronic calculator is allowed.***

SECTION - I

Q1) a) Write the machine equations in phase variables of a 2 pole, 3 phase, 50 Hz, salient pole synchronous machine which has one damper winding each on its *d* - and *q*-axis. Obtain the machine equations in *dqo* variables using Park's transformation. State any assumptions made. **[20]**

b) Determine the expressions for L_d and L_q of an alternator given the following data :-

$L_{aa} = (2.95 + 0.048 \cos 2\theta)$mH.

$$L_{ab} = -\left[1.48 + 0.048 \cos\left\{2\theta + \frac{\pi}{3}\right\}\right] m\text{H}.$$

$L_{afd} = (38 \cos\theta)$mH.

$L_{ffd} = 491$ mH. **[5]**

Q2) a) State and explain the different types of excitation systems employed for alternators. Draw a block schematic diagram or a circuit diagram wherever necessary. **[15]**

b) Develop a model for tap-changing transformer. **[10]**

Q3) Write short notes on the following :

a) Load modelling. **[8]**

b) Advantages and limitations of per unit system and **[9]**

c) Modelling of 3-phase transmission line. **[8]**

P.T.O.

SECTION - II

Q4) a) Write the equations for flux linkages of a salient pole machine in p.u. form. Therefrom, obtain the equivalent circuits for *d*- and *q*-axes of the machine. Draw the equivalent circuits with appropriate values inserted. **[20]**

b) Obtain an expression for the electromagnetic torque developed by a salient pole alternator in terms of ψ_d, ψ_q, i_d, i_q and number of poles of the machine. **[5]**

Q5) a) Show that the classical transfer function of the hydraulic turbine is given by

$$\frac{\Delta \overline{P}_m}{\Delta \overline{G}} = \left(\frac{1 - sT_w}{1 + 0.5\, sT_w} \right).$$ **[13]**

b) Discuss the need of modelling of power system and its components. **[12]**

Q6) Develop the models for the following :-

a) Phase shifting transformer. **[8]**

b) Static var compensator and **[8]**

c) Boiler. **[9]**

Total No. of Questions : 12]

SEAT No.:

P2228

[Total No. of Pages : 2

[4165]-594
M.E. (Electrical) (Power Systems)
POWER ELECTRONICS APPLICATIONS IN POWER SYSTEMS
(2008 Course) (Elective - III (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With suitable examples explain need for reactive power compensation in power system operation. What are conventional methods of reactive power compensation? **[8]**

b) Classify different types of static power converter topologies used. Comment on the output, harmonic control and power converter control issues of converters used for reactive compensation. **[8]**

OR

Q2) a) Classify types of Static Var compensators. Compare series and shunt compensation merits and demerits. **[8]**

b) Discuss basic topologies used as SVC. **[8]**

Q3) a) What is the most suitable location for shunt compensation placement? Why? **[8]**

b) Explain FC TCR and TSC TCR with help of suitable diagrams and characteristics. **[8]**

OR

Q4) a) Explain with neat diagram Thyristor switched capacitor - Thyristor controlled reactor topology. **[8]**

b) Compare FC TCR and TSC TCR based on characteristics offered. **[8]**

P.T.O.

Q5) a) Explain TCSC with its control characteristics and merits. **[9]**

b) Draw impedance V/s delay angle characteristics of TCSC and explain its operation. **[9]**

OR

Q6) a) Explain TSSC with its V-I characteristics. Explain its voltage control and reactance control modes of operation. **[9]**

b) Draw and explain internal control scheme for TCSC based on prediction of capacitor voltage zero crossing. **[9]**

SECTION - II

Q7) a) What is UPFC? Draw diagram to explain basic principle of operation of UPFC. **[8]**

b) Compare UPFC to series compensators. **[8]**

OR

Q8) a) With the help of expressions and P-Q/δ plots, comment on range of real and reactive power control of UPFC. **[8]**

b) Explain performance of UPFC for powerflow control with operation under transmission line faults. **[8]**

Q9) a) Explain principle of working for Dynamic Voltage restorer/Regulator (DVR). **[8]**

b) Explain p - δ curves and range of control of PAR for real and reactive power transmitted using PAR. **[8]**

OR

Q10) a) What is TCPAR? Draw circuit diagram and explain its working modes. **[8]**

b) Compare operation of UPFC with series and shunt stand alone controllers. **[8]**

Q11) a) What are various control strategies used in various FACTS devices? Discuss their comparative merits. **[9]**

b) Compare ANN and Fuzzy logic controls. **[9]**

OR

Q12) a) What is Hysteresis control? Explain. **[9]**

b) Comment on importance of coordination between different FACTs controllers. **[9]**

Total No. of Questions : 8]

SEAT No.:

P2230

[Total No. of Pages : 2

[4165]-647
M.E. (E & TC) (VLSI and Embedded System)
FAULT TOLERANT SYSTEM DESIGN
(2008 Course) (Elective - III (a)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail with neat diagram, any one design procedures that simplify fault detection. **[8]**

b) Classify and explain less memory storage testing approach in detail with neat diagram. **[8]**

Q2) a) Differentiate between adhoc design and algorithmic design for testability techniques. Explain any two techniques of DFT to increase controllability, observability and predictability. **[10]**

b) Classify and explain in brief BIST techniques with neat block diagram describe generic form of BIST architecture. **[8]**

Q3) a) Explain the use of modeling techniques in testing of sequential circuit. **[8]**

b) What is mean by error masking? List out the techniques to measure masking characteristics in compression technique. **[8]**

Q4) Write a short note on : **[18]**

a) Logical fault model.

b) Redundant and Irredundant faults.

c) PLA Testing.

P.T.O.

SECTION - II

Q5) a) Explain in detail the different task involved in fault simulation. **[8]**

b) Briefly explain the masking relation among faults in multiple stuck fault model. Prove step by step with truth table, fault a $\rightarrow$ s - a - 1 masks fault c $\rightarrow$ s - a - o for the ckt shown in fig.1 below : **[10]**

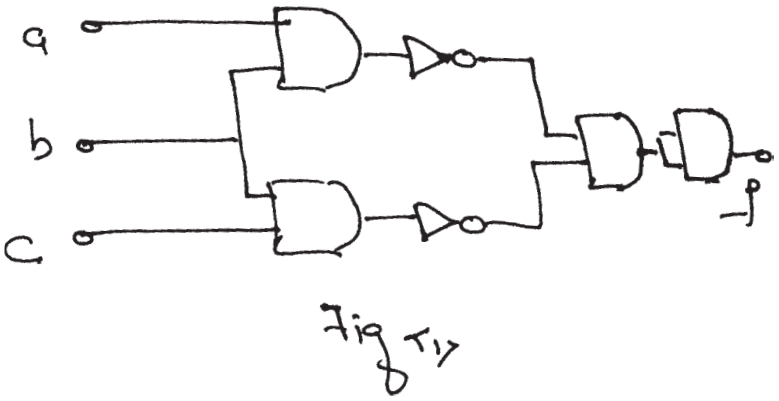


Fig Q5

Q6) a) Classify simulation. Draw neat diagram and flow chart to explain event driven simulation technique with one example. **[8]**

b) Differentiate between D-algorithm and g-v algorithm techniques. Explain in detail D-algorithm for detection of fault. **[10]**

Q7) Write short note on : **[16]**

a) Wired logic and bidirectionality.

b) Deductive fault simulation.

c) Modelling techniques for fault detection.

Q8) a) Explain the significance of unknown logic value, 6 valued logic and 8 valued logic in simulation algorithm. **[8]**

b) Explain with neat diagram test generation system of single stuck faults. Comment on the basic issues. **[8]**

Total No. of Questions : 8]

SEAT No.:

P2231

[Total No. of Pages : 2

[4165]-648
M.E. (E & TC) (VLSI Embedded System)
BIOMEDICAL SIGNALS AND SYSTEMS
(2008 Course) (Elective - III (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Analyze the various types of artifacts that corrupt biomedical signals and explore filtering techniques to remove them without degrading the signal of interest. **[12]**

b) Develop a time-domain technique to remove base-line drift in the ECG signal. **[6]**

Q2) a) Draw a typical ECG waveform over one cardiac cycle indicating the important component waves. How is the waveform affected by passage through : **[8]**

i) A low pass filter with a cutoff frequency of 40Hz?
ii) A high pass filter with a cutoff frequency of 5Hz?

b) Describe the difficulties encountered in biomedical signal acquisition and analysis. **[8]**

Q3) Propose an electromechanical model to characterize the sounds produced due to blood flow in stenosed arteries. **[16]**

Q4) a) A biomedical signal is sampled at 500Hz and subjected to AR modeling. The poles of the model are determined to be at $0.4 \pm j\ 0.5$ and $-0.7 \pm j\ 0.6$.

i) Derive the transfer function of the model.
ii) Derive the difference equation in the time domain.
iii) What are the resonance frequencies of the system that is producing the signal? **[12]**

P.T.O.

b) You are provided with a number of feature vectors with classes assigned to them. Propose techniques to characterize the boundaries that separate the classes. **[4]**

SECTION - II

Q5) a) Show how the ECG and carotid pulse signals may be used to break a PCG signal into its systolic and diastolic parts. **[8]**

b) Distinguish between ensemble averages and temporal averages. Identify potential applications of first-order and second-order averages of both types in heart sound (PCG) analysis. **[8]**

Q6) Propose a method to detect the presence of the α rhythm in an EEG channel. How would you extend the method to detect the presence of the same rhythm simultaneously in two EEG channels? **[16]**

Q7) a) Why is the ST segment of the ECG relevant in diagnosis? Recommend signal analysis techniques for the analysis of ST segment variation in clinical applications. **[10]**

b) Enlist and explain the various short-time statistical measures used to characterize a nonstationary signal. **[8]**

Q8) Write note on : **[16]**

a) Use of adaptive filter for segmentation.

b) The Pan-Tompkins algorithm for QRS detection.

Total No. of Questions : 8]

P2232

SEAT No.:

[Total No. of Pages : 2

[4165]-649
M.E. (E & TC) (VLSI and Embedded System)
ADVANCED DIGITAL SYSTEM DESIGN
(2008 Course) (Elective - III (c)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Describe the design issues of CISC and RISC processors. **[8]**

b) Draw and explain the interfacing diagram of 486 bus with microprocessor. **[8]**

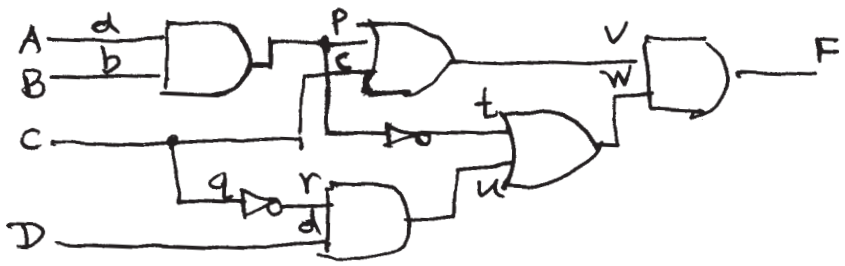
Q2) a) Write a note on Boundary scan. **[6]**

b) Draw address and data path architecture of CPU, indicate names of various blocks. Which unit of CPU sequences the data path operation? How are they implemented? **[10]**

Q3) a) i) Determine the necessary inputs to the following circuit to test for p stuck-at-0. For this set of inputs.

ii) Determine which other stuck-at faults can be tested.

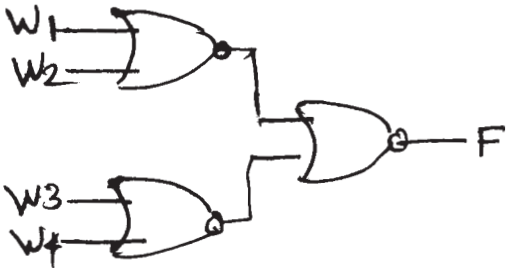
iii) Repeat steps (i and ii) for u stuck-at-1. **[8]**



Q3. a)

P.T.O.

b) Derive the truth table for following circuit to show the coverage of various stuck at '0' and stuck at '1' faults. Find minimum test set for the following circuit. **[8]**



Q 3 b)

Q4) Write notes on any three : **[18]**

a) Static and Dynamic hazards in digital system design.

b) Scan path techniques.

c) Fault tree analysis.

d) Digital system integrity.

SECTION - II

Q5) a) With neat diagram explain the ATM cell structure in detail. **[8]**

b) Describe ATM packet generator in detail with appropriate sketch. **[8]**

Q6) a) With the help of flowchart explain floating point multiplication. **[8]**

b) With block schematic explain standard serial data transmission and also describe the standard serial data format. **[8]**

Q7) a) Model 1K × 8 Dual port RAM using VHDL. **[8]**

b) Draw the state machine for TAP controller in boundary scan. **[8]**

Q8) Write notes on : **[18]**

a) BIST.

b) Digital system reliability.

c) ATM switch.

Total No. of Questions : 8]

P2233

SEAT No. : ____

[Total No. of Pages : 2

[4165] - 650
M.E. (E&TC) (VLSI Embedded System)
EMBEDDED AUTOMOTIVE SYSTEMS
(2008 Course) (Elective - IV(a)) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, whenever necessary.***

SECTION - I

Q1) a) Explain the current trends in Automotive systems. What is Hybrid vehicle? **[10]**

b) Which are the components for Electronic engine management systems? Explain briefly. **[8]**

Q2) a) How onboard diagnostic system is achieved? **[8]**

b) How electromagnetic interference is removed? Write short note on electromagnetic compatibility. **[8]**

Q3) a) Describe different methods of vehicle motion control. Describe role of sensors in motion control. **[8]**

b) Which different types of fuel injection systems? Explain. **[8]**

Q4) a) Write short note on any two sensors : **[8]**

i) Crank angle position sensors.

ii) Temperature sensors.

iii) Vehicle speed sensors.

b) What are ECUs? Explain their significance in modern vehicles. **[8]**

P.T.O.

SECTION - II

Q5) a) Describe briefly solid state ignition system techniques. **[8]**

b) How fuel measurement is done? Which are the different techniques? **[8]**

Q6) a) Briefly explain the technique of Integrated engine control and exhaust emission control technique. **[8]**

b) How artificial intelligence plays role in modern automobiles? **[8]**

Q7) a) Explain the different Dashboard instruments and their use. **[8]**

b) Draw and explain following fields of standard format of CAN protocol.

i) Arbitration ii) Control

iii) Data iv) CRC **[8]**

Q8) a) Explain the following systems in modern vehicles.

i) Lane departure warning.

ii) Curve over speed countermeasures.

iii) Blind spot monitoring.

iv) Parallel parking assistance.

v) Lane change assistance. **[10]**

b) Discuss with block diagram, the recent trends in cruise control of car. **[8]**

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Total No. of Questions : 8]

P2234

SEAT No. : [ ]

[Total No. of Pages : 2

[4165] - 670
M.E. (E&TC) (Signal Processing)
OPERATING SYSTEMS AND OPEN SOURCE SYSTEMS
(2008 Course) (Sem. - II) (Elective - IV(b))

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to right indicate full marks.***

SECTION - I

Q1) a) What is scheduling? Differentiate between pre-emptive and nonpreemptive scheduling. Explain one method of scheduling for each. **[9]**

b) Define deadlocks. Explain banker's algorithm for deadlock detection and avoidance with suitable example. **[9]**

Q2) a) Describe paging techniques. Explain page fault handling steps in virtual memory system. **[8]**

b) Explain virtual memory using segmentation. **[8]**

Q3) a) What is device driver? Explain the functions of device driver. **[8]**

b) What are the different algorithms for Disk arm scheduling? Explain any one of them. **[8]**

Q4) a) Mention different file allocation methods. Explain any one method of file allocation. **[8]**

b) Compare contiguous and non-contiguous memory allocation. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain the various components of Linux System. **[9]**

b) Explain process scheduling in Linux. **[9]**

Q6) a) Explain memory management in Linux. **[8]**

b) What are the primary goals of the conflict resolution mechanism used by the Linux kernel for loading kernel modules? **[8]**

Q7) a) What are the advantages and disadvantages of writing an operating system in a high level language, such as C? **[8]**

b) Explain the Linux security model. **[8]**

Q8) a) Explain swapping and paging in Linux. **[8]**

b) Explain interprocess communication in Linux. **[8]**

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Total No. of Questions : 8]

SEAT No.:

P2236

[Total No. of Pages : 2

[4165]-684
M.E. (Electronics) (Digital System)
DIGITAL SYSTEMS USING PLDs
(2008 Course) (Elective - III (a)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary***

SECTION - I

Q1) a) State the various programming technologies for FPGA and compare it in detail. **[6]**

b) Compare CPLD and FPGA with respect to following terms : **[12]**

i) Architecture.

ii) Size.

iii) Cost.

iv) Memory.

v) Specification.

vi) Features.

Q2) a) With the help of a neat block diagram. Explain the CPLD cool runner. **[8]**

b) Explain in detail I/O block of FPGA. **[8]**

Q3) a) Explain the architecture of virtex device. Comment on set up time and system frequency of the device. **[8]**

b) Explain the concept of ISP and JTAG controller in CPLD. **[8]**

P.T.O.

Q4) Describe selection criteria of PLD. Design PLD based system for the following specification. **[16]**

a) LED display.

b) 8 bit DAC.

c) Keyboard.

d) LCD.

SECTION - II

Q5) a) Describe the PLD architecture for embedding soft cores. Also state the advantages of soft core processors. **[10]**

b) Explain in detail the concept of routing technique in FPGA. **[6]**

Q6) a) Describe the architecture of the CPLD XC 9500. Also state its features. **[10]**

b) Design an interfacing circuit for generating square wave and write VHDL code for it. **[8]**

Q7) a) Explain the following terms of virtex device : **[10]**

i) Block RAM.

ii) Global clocking.

iii) Slices.

b) Classify the application specific integrated circuits (ASIC). Explain each in brief. **[6]**

Q8) Write short note : **[16]**

a) Antifuse based FPGA.

b) DSP Processor.

c) SRAM based FPGA.

Total No. of Questions : 10]

SEAT No.:

P2237

[Total No. of Pages : 2

[4165]-692
M.E. (E & TC) (Communication Networks)
MODELING AND SIMULATION OF COMMUNICATION NETWORKS
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail how simulation helps in performance studies of the following types of communication systems.

i) Analytically tractable system.
ii) Analytically tedious system. **[10]**

b) Elaborate various methodologies used in mapping a problem into a simulation model. **[8]**

Q2) a) What are the aspects for selection of sampling frequency for a simulation? **[8]**

b) What are various techniques to generate uniformly distributed random numbers. Compare and contrast the following algorithms.

i) Mixed congruence algorithm.
ii) Multiplicative algorithm with prime modulus. **[8]**

Q3) a) Explain in detail rejection method (Acceptance techniques for generating random variables having desired pdf). **[8]**

b) What is effect of fixed point and floating point arithmetic on quantization error? **[8]**

P.T.O.

Q4) a) Compare and contrast stochastic and deterministic simulations. **[8]**

b) What are correlated Gaussian numbers? Why do we need them? Explain any two techniques to generate correlated Gaussian number in details. **[8]**

Q5) a) Explain the types of simulation and compare them. **[8]**

b) Describe the simulations when one will choose one of the following estimation routines based on the data generated by simulation process.

i) Histogram.

ii) Gain, delay and signal to noise ratio. **[8]**

SECTION - II

Q6) a) What is state Markov model for discrete channel with memory? Write an algorithm for the same. **[8]**

b) Write an algorithm for simple Monte Carlo simulation for BPSK. Assuming AWGN channel, Data symbols at source are independent and equally probable and no pulse shaping performed at transmitter. **[10]**

Q7) a) What are the different techniques used to reduce run-time of the Monte Carlo method? Hence explain the importance sampling. **[8]**

b) Explain Saleh's quadrature model for nonlinearity with memory. **[8]**

Q8) a) What is semi-analytic simulation technique? Write an algorithm for semi analytic BER estimation for QPSK. **[8]**

b) Enlist the factors to be considered while simulating nonlinearities. **[8]**

Q9) a) What is tapped delay line model for LTV system? How various tap gains are generated? **[8]**

b) What are various specifications to be considered while simulating a radio channel? Elaborate multipath fading channel. **[8]**

Q10) a) Explain two state Markov model for discrete channel with memory and prepare the transition matrix. **[8]**

b) Explain the importance of Pdf Estimators. **[8]**

Total No. of Questions : 10]

SEAT No. :

P2239

[Total No. of Pages : 2

[4165] - 710
M.E. (Production Engg.)
ADVANCED MANUFACTURING PROCESSES
(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) Explain the cast structure of metals while cooling and solidification. **[10]**

b) Compare the solidification times for castings of three different shapes of same volume : cube, cylindrical (with hight equal to its diameter) and sphere. **[6]**

Q2) a) Explain the gating design process in casting. **[10]**

b) Determine the melting efficiency in the case of arc welding of steel with a potential of 22 V and current of 230V. The cross sectional area of the joint is 25 mm^2 and the travel speed is 6mm/s. Heat required to melt steel may be taken as 10J/mm^3 and the heat transfer efficiency as 86%. **[6]**

Q3) a) Discuss the importance of non-destructive testing methods in welding. **[8]**

b) What is meant by the fusion welding? Discuss the process with suitable diagram. **[8]**

Q4) a) What are the control parameters for Electro Discharge machining? Explain their effect on process output. **[8]**

b) Explain the process of ultrasonic Machining with its advantages & limitations. **[8]**

P.T.O.

Q5) Write short note on following (Any Three): **[18]**

a) Types of weld Joints.

b) Laser beam machining applications.

c) Injection Molding.

d) Hot machining.

SECTION - II

Q6) a) What is meant by plastic instability? Explain the relation of strain rate & temperature in material forming process. **[8]**

b) Explain the upper bound analysis in material forming. **[8]**

Q7) a) Explain the process of Electromagnetic forming. State the advantages of the same. **[8]**

b) How the process of high velocity extrusion is carried out? Explain in brief. **[8]**

Q8) a) Explain the process parameters in high energy rate forming. **[8]**

b) Explain the process of High speed hot forging. **[8]**

Q9) a) Explain the process of cupping in brief. **[8]**

b) Explain bending operation in sheet metal working with its controllable parameters. **[8]**

Q10) Write Short notes on (Any Three): **[18]**

a) Fine Blanking.

b) Plastic anisotropy.

c) Peen forming.

d) Redrawing process.

Total No. of Questions : 10]

SEAT No.:

P2241

[Total No. of Pages : 2

[4165]-722
M.E. (Production Engg.)
PLASTICS PROCESSING
(2008 Course) (Elective - III (a)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculators is allowed.***

SECTION - I

Q1) Explain in details polymerization techniques. Also explain weight, size and distribution of molecules. **[16]**

Q2) a) Explain with neat sketch In-line screw Injection Molding. **[8]**

b) Explain process and design considerations for direct screw transfer process. **[8]**

Q3) a) Explain the molding of general purpose polyester compounds. **[8]**

b) Derive an expression in extruder for drag flow of the melt between parallel plates assuming that in the metering zone the melt has a constant velocity and its flow is isothermal in wide shallow channel. **[8]**

Q4) a) Explain with respect to Injection Moulding functions of : **[8]**

i) Sprue bush.

ii) Cavity and cores.

b) Explain different types of ejector grid in injection molding. **[8]**

Q5) Write short notes on : **[18]**

a) Advantages of using plastics.

b) Advantages of transfer molding.

c) Reaction Moulding.

P.T.O.

SECTION - II

Q6) A small flower pot as shown in Fig.1 is to be thermoformed using negative forming from a flat plastic sheet 2.5 mm thick. If the diameter of the top of the pot is 70 mm, the diameter of the base is 45 mm and the depth is 67 mm estimated the wall thickness of the pot at a point 40 mm from the top. Calculate also the draw ration for this moulding. **[16]**

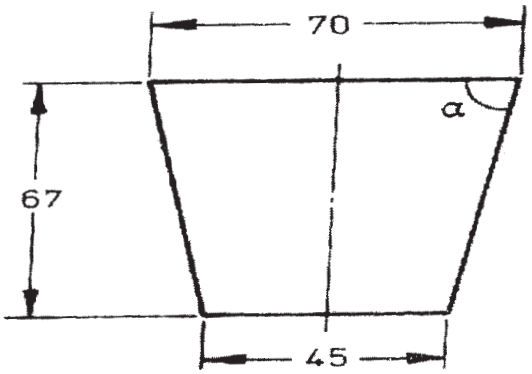

Fig. 1 Thermoformed flower pot

Q7) a) Explain how will you avoid warpage with specific reference to mold design : **[8]**

i) Gate location.

ii) Gate size.

b) Explain silicone foams. **[8]**

Q8) a) Explain ejection system and gating system. **[8]**

b) Explain different types of inserts. **[8]**

Q9) Explain various software available mold flow analysis and defect analysis. **[16]**

Q10) Write short notes on : **[18]**

a) Molds for reaction molding.

b) Filing thermoplastics.

c) Standard tolerance of ABS.

Total No. of Questions : 6]

P2242

SEAT No. : ____

[Total No. of Pages : 2

[4165] - 729
M.E. (Production)
ENERGY MANAGEMENT
(2008 Course) (Elective - IV(d)) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Use of steam tables permitted.***
3) ***Figures to the right indicates full marks.***

SECTION - I

Q1) a) With the help of suitable updated data explain the fossil fuel (coal, oil and natural gas) scenario of the world and that for India. **[9]**

b) A shopping mall decides to implement energy efficient illumination practices. They replace about 200 flouroscent tubes, each with 60W rating with equal number of energy efficient tubes of 40 W rating without sacrificing illumination. Assuming 10 h of usage per day round the year and additional investment of Rs. 300 per tube, calculate the simple payback period of this investment. Assume the commercial tariff of Rs. 5/kWh. **[9]**

Q2) a) Write a note on walkthrough audit. Explain its significance. **[8]**

b) Write a note on refractories and insulation and bring out their role in energy conservation. **[8]**

Q3) a) For a diesel fired boiler operating at 100 bar the steam generation rate is 10 Tons per hour and its efficiency on GCV basis is 85%. If the quality of steam generated is dry saturated and the enthalpy of feedwater is 100 kJ/kg, calculate the fuel consumed per hour assuming gross calorific value of diesel as 44MJ/kg. **[8]**

b) With neat labeled diagram any thermodynamic type steam trap. **[8]**

P.T.O.

SECTION - II

Q4) a) Write a note on LEDs. Compare them with compact flouroscent lamps. **[9]**

b) Discuss the losses in electrical motors. How do energy efficient motors overcome them. **[9]**

Q5) a) Why variable speed drives can save energy in pumping systems. Explain using head flow curve. **[8]**

b) Discuss the energy saving opportunities in compressed air systems. **[8]**

Q6) a) Draw the schematic of steam turbine and gas turbine based cogeneration options. Explain each of them in brief. **[10]**

b) Explain the following terms :

i) Heat to power ratio. **[3]**

ii) Cogeneration system efficiency. **[3]**

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Total No. of Questions : 8]

P2243

SEAT No. : [ ]

[Total No. of Pages : 4

[4165] - 745

M.E. (Production) (CAD/CAM)

MANUFACTURING SYSTEM DESIGN

(2008 Course) (Elective - III (c)) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the difference between hard product variety and soft product variety? What type of production does a job shop perform? Justify. **[8]**

b) What is a manufacturing system? Name the four components of a manufacturing system? What are the five material handling functions that must be provided in a manufacturing system? **[8]**

Q2) a) A stamping plant must be designed to supply an automotive engine plant with sheet metal stampings. The plant will operate one 8-hour shift for 250 days per year and must produce 15,000,000 good quality stampings annually. Batch size = 10,000 good stampings produced per batch. Scrap rate = 5%. On average it takes 3.0 sec to produce each stamping when the presses are running. Before each batch, the press must be set up, and it takes 4 hr to accomplish each setup. Presses are 90% reliable during production and 100% reliable during setup. How many stamping presses will be required to accomplish the specified production. **[10]**

b) What does the semi-automated station mean? Name three reasons why single- station manned cells are so widely used in industry? **[6]**

P.T.O.

Q3) A small electrical appliance is to be produced on a single model assembly line. The work content of assembling the product has been reduced to the work elements listed in Table 1. The line is to be balanced for an annual demand of 100,000 units per year. The line will operate 50 weeks/yr, 5 shifts/week, and 7.5 hr per shift. Manning level will be one worker per station. Previous experience suggests that the uptime efficiency for the line will be 96%, and repositioning time lost per cycle will be 0.08 min. Determine :

a) Total work content time. **[2]**

b) Required hourly production rate to achieve the annual demand. **[2]**

c) Cycle time. **[2]**

d) Theoretical minimum number of workers required on the line. **[2]**

e) Service time to which the line must be balanced. **[2]**

f) Assign all the elements by largest candidate rule and draw the physical sequence of stations with assigned work elements. **[6]**

Table 1: Work elements

Element No.	Work element description	Time (Minutes) for each element	Must be preceded by
1	Place frame in work holder and clamp	0.2	-
2	Assemble plug to power cord	0.4	-
3	Assemble brackets to frame	0.7	1
4	Wire power cord to motor	0.1	1,2
5	Wire power cord to switch	0.3	2
6	Assemble mechanism plate to bracket	0.11	3
7	Assemble blade to bracket	0.32	3
8	Assemble motor to bracket	0.6	3,4
9	Align blade and attach to motor	0.27	6,7,8
10	Assemble switch to motor bracket	0.38	5,8
11	Attach cover, inspect and test	0.5	9,10
12	Place in tote pan for packing	0.12	11

Q4) Write a short note on the following : **[18]**

a) Computer Aided Process Planning (CAPP).

b) Industrial cost estimation practices.

c) Axiomatic approach for decision making.

SECTION - II

Q5) a) A 20 station transfer line is divided into two stages of 10 stations each. The ideal cycle time for each stage is 1.2 min. All of the stations in the line have the same probability of stopping as 0.005. When a breakdown occurs, the downtime is 8.0 min. Compute the line efficiency for the following buffer capacities : **[12]**

i) b = 0

ii) b = ∞

iii) b = 10

b) What is an automated production line? Name three reasons for including a storage buffer in an automated production line? **[4]**

Q6) a) What is a part family? Explain any two methods used for solving the problem of grouping parts into part families? **[8]**

b) Apply the rank order clustering technique to the part-machine incidence matrix in the following table to identify logical part families and machine groups. Parts are identified by letters and machines are identified numerically **[8]**

Machines / Parts	A	B	C	D	E
1	1				
2		1			1
3	1			1	
4		1	1		
5				1	

Q7) a) What is the dividing line between a flexible manufacturing cell and a flexible manufacturing system, in terms of the number of workstations in the system? Explain the four tests of flexibility that a manufacturing system must satisfy in order to be classified as *flexible*? **[10]**

b) What are manufacturing support systems? Give some examples of engineering analysis software in common use on CAD systems. **[6]**

Q8) Write a short note on the following: **[18]**

a) Automatic data collection systems.

b) Database structures.

c) Characteristics of computer simulation in manufacturing

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Total No. of Questions : 10]

P2244

SEAT No. : ____

[Total No. of Pages : 3

[4165] - 748
M.E. (Production) (CAD/CAM)
TECHNOLOGY MANAGEMENT
(2008 Course) (Elective - IV(b)) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Identify a company that changed from being follower to being a leader. Discuss the success story in detail in respect to approach and actions. **[8]**

b) What is innovation's role in the competitiveness of a firm? Can a company survive without innovation? **[8]**

Q2) a) Select any company or business whose operation you are familiar with. Develop strength, weakness, opportunities, threats [SWOT] table for it. Discuss how it will be used for improving the performance of the organization. **[8]**

b) Explain Management of Technology principles for managing enterprise. **[8]**

Q3) a) i) Discuss the effects of fast pace of technology change on human resources. **[4]**

ii) "Technology contributes to the competitive levels of a country"; Comment with suitable example. **[4]**

P.T.O.

b) Explain the following concepts as emerging industrial practices with illustrations : **[8]**

i) Virtual Corporation.

ii) Supply chain management.

Q4) a) Differentiate between invention and Innovation. Explain the role of research and development activity for any product development. **[8]**

b) Discuss the model of technology transfer. How it is achieved effectively in public and private enterprises. **[8]**

Q5) Write short notes on [Any Three] : **[18]**

a) Strategies for promotion of creativity and innovation.

b) Industry institute partnership for basic research.

c) Challenges in commercializing research results.

d) Holistic model of management of technology.

e) Ishikawa diagrams.

SECTION - II

Q6) a) Explain the importance of following in intellectual property protection. **[8]**

i) Product Market actions.

ii) Continual Innovation.

iii) Legal strategies.

b) Discuss the role of following strategies in intellectual property rights.

i) Patents ii) Copyright

iii) Trade secret iv) Trademarks. **[8]**

Q7) a) i) Discuss major strategic reasons to set up a corporate research centre. **[4]**

ii) Discuss the characteristic of continuously innovative organizations. **[4]**

b) Discuss the challenges in mapping macro-level environment. **[8]**

Q8) a) Describe the procedural steps in Analytical Hierarchical Process [AHP] with a suitable example. State its advantages and limitations. **[8]**

b) Discuss the effect of following in Technology Management; **[8]**

i) Globalization

ii) Time compression

iii) Outsourcing

iv) Technology integration

v) Licensing

Q9) a) Discuss the uses and limitations of accounting methods of return on investments [ROI] and activity based costing [ABC] in regards to a technology development project. **[8]**

b) State and explain the role of WTO in international business. **[8]**

Q10)Write short notes on [Any Three] : **[18]**

a) Intellectual property strategy.

b) Collaborative mode of technology-strategy and risks.

c) Application of AHP for Technology selection.

d) Patentable and non-patentable inventions.

e) Government schemes for technology based development.

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Total No. of Questions : 8]

SEAT No. :

P2245

[Total No. of Pages : 2

[4165] - 796
M.E. (Chemical)
PROCESS OPTIMIZATION
(2008 Course) (Elective - II (b)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Minimize $f(x) = x^4 + (2/(2+x^2)) + (5/(3 + x^3))$. Use Interval halving Method. Write complete algorithm for this method and demonstrate at least 3 steps towards finding optimized solution for the above function. Do not try to solve it completely. **[17]**

Q2) Minimize $f(x) = 5x^4 - 3x^3 + 2x^2 + 40$ in the interval [-5 5]. Use Golden Search Method. Write complete algorithm for this method and demonstrate at least 3 steps towards finding optimized solution for the above function. **[17]**

Q3) A typical batch reactor is example of set of ordinary differential equations (eg. ODEs generated for molar balance, energy balance). The typical constraints on such a problem are of physical type based on dimensions of units, of system type based on the physicochemical considerations. Considering above, construct a problem around a batch reactor and identify the objective function, constraints. Also discuss the strategy to get optimized solution out of it. **[16]**

Q4) Write short notes (Any Three): **[16]**

a) Fundamentals in Gradient based methods.

b) Concave function.

c) Parameters used in distillation optimization.

d) Weighted parameters.

P.T.O

SECTION - II

Q5) *Maximize* $f(x) = (x_1 - 5)^2 + (x_2 - 2)^2$ **[17]**

Subject to linear constraints

$x_1 \geq 0, \quad x_2 \geq 0, \quad 5 - x_1 - x_2 \geq 0, \quad -2.5 + x_1 - x_2 \leq 0$.

Q6) State various conditions of definiteness of a function using Hessian matrix. Find whether the following function is strictly convex / strictly concave

$f(x) = 6x^2_1 + 8x_1x_2 + 10x_1 - 3x_2 - 9x^2_2 + 5.$ **[17]**

Q7) A refinery has available two crude oils that have the yields shown in the table. Because of equipment and storage limitations, production of gasoline, kerosene and fuel oil must be limited as shown in the table. The profit on processing crude no. 1 is Rs. 50/bbl and on crude no.2 it is Rs. 70/bbl. Find the approximate optimum daily feed rates of the two crudes to the plant. **[16]**

	Volume percent yield		Maximum allowable rate, bbl/day
	Crude no. 1	Crude no.2	
Gasoline	70	31	6000
Kerosine	06	09	2400
Fuel Oil	24	60	12000

Q8) Write short notes (Any Three): **[16]**

a) Local Optima.

b) Necessary Conditions.

c) Langrange's Multipliers.

d) Types of constraints.

Total No. of Questions : 8]

SEAT No. :

P2246

[Total No. of Pages : 2

[4165] - 851

M.E. (Information Technology)

ADVANCED OPERATING SYSTEMS

(2008 Course) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Describe four distributed computing system models with the help of neat diagrams. **[8]**

b) Explain the design issues for distributed operating system in detail. **[8]**

Q2) a) Explain the four types of buffering strategies in a message passing system. **[8]**

b) Explain the failure handling in a message passing system. **[8]**

Q3) a) What is a stub? How are stubs generated? Explain how the use of stubs helps in making an RPC mechanism transparent. **[8]**

b) With respect RPC explain the following: **[8]**

i) Port mapper.

ii) Dynamic binding.

iii) RPC implementation issues.

Q4) a) With respect to DSM, explain any three consistency models. **[9]**

b) Explain the implementation of logical clocks. **[4]**

c) Explain the bully election algorithm with example. **[5]**

P.T.O

SECTION - II

Q5) a) State the desirable features of a good global scheduling algorithm. **[8]**

b) Discuss the desirable features of a good process migration mechanism. **[8]**

Q6) a) Explain design issues for the distributed file systems. **[8]**

b) Explain the following with respect to the NFS: **[8]**

i) File - Sharing Semantics.

ii) Caching.

iii) Transparency.

Q7) a) Explain any one distributed deadlock detection algorithm in detail. **[8]**

b) Explain any one mutual exclusion algorithm in distributed operating system. **[8]**

Q8) Write short notes (Any three): **[18]**

a) RPC mechanism in Amoeba.

b) Group communication in Chorus.

c) Thread synchronization in Mach.

d) DCE.

Total No. of Questions : 8]

SEAT No. :

P2247

[Total No. of Pages : 2

[4165] - 856

M.E. (Information Technology)

NETWORK PROGRAMMING

(Sem. - I) (2008 Course) (Elective - II (b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the importance of TIME - WAIT state.

b) Explain the relationship between buffer size and datagram size.

[16]

Q2) a) Explain the Value - Result argument in detail.

b) Compare the various socket address structure of IPV4, IPV6, Unix domain and Data link.

[16]

Q3) a) Explain how reading from and writing to kernel takes place through socket.

b) Explain the Interface name and Index function in detail.

[16]

Q4) Write short notes (Any Three): **[18]**

a) TCP Connect function.

b) Resolver.

c) Domain name system.

d) Structure of Data Link Address.

P.T.O

SECTION - II

Q5) a) Signify the source and code portability of IPV4 and IPV6.

b) How IPV6 server on dual stack host serving IPV4 and IPV6 clients.

[16]

Q6) a) Explain Race Condition for shared data accession in detail.

b) List and explain different types of broadcast address.

[16]

Q7) a) Explain TCP Echo Server using threads in detail.

b) Explain Thread functions for creating and Termination.

[16]

Q8) Write short notes (Any Three): **[18]**

a) IPV6 address testing Macros.

b) Fork Implementation.

c) Design of Concurrent connections in Web Server.

d) Strength and weakness of client design.

Total No. of Questions : 8]

P2248

SEAT No. : [ ]

[Total No. of Pages : 2

[4165] - 866
M.E. (IT)
ADVANCED NETWORK PROGRAMMING
(2008 Course) (Elective - IV(b)) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw and explain the allocation of port number scheme.

b) Explain with neat diagram how concurrent server has child handle client. **[16]**

Q2) a) Explain simple echo client server along with the functions used for input and output.

b) Explain Value-Result argument in detail. **[16]**

Q3) a) Explain the structure of Data Link address.

b) Explain how reading from and writing to kernel takes place through socket. **[16]**

Q4) Write short notes (any three) : **[18]**

a) Byte Manipulation function.

b) Get AddInfo function.

c) TIME_WAIT state.

d) Concurrent Servers.

P.T.O.

SECTION - II

Q5) a) Explain how efficient IPV4 and IPV6 are code and source portable.

b) Explain the steps that allow an IPV4 TCP Client to communicate with an IPV6 Server.

[16]

Q6) a) Explain the differences between Unicast, Broadcast and Multicast with proper examples.

b) Explain different forms of addressing supported by IPV4 and IPV6 along with TCP and UDP.

[16]

Q7) a) How simultaneous connections will be served by Web Server.

b) What is Fork? What are problems faced by fork for implementation?

[16]

Q8) Write short notes (any three) : **[18]**

a) TCP echo Server.

b) TCP iterative Server.

c) TCP concurrent Server.

d) Pre fork process.

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Total No. of Questions : 8]

P2249

SEAT No. : ____

[Total No. of Pages : 2

[4165] - 867
M.E. (Information Technology)
HIGH PERFORMANCE COMPUTER NETWORKS
(2008 Course) (Elective - IV(c)) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various delays in communication links. **[8]**

b) Explain quality of service in HPCN. **[8]**

Q2) a) Explain the architecture of Gigabit Ethernet. **[8]**

b) Discuss various Gigabit Ethernet cabling. Also explain various encoding rules used in it. **[8]**

Q3) a) Explain functional architecture and protocol architecture of B-ISDN. **[12]**

b) Explain ATM cell format. **[6]**

Q4) Give short notes (any 3) : **[18]**

a) ATM Services.

b) M/M/I Queueing system.

c) SONET.

d) Architecture of ISDN.

e) Comparision of X.25 and frame relay.

P.T.O.

SECTION - II

Q5) a) What is DSL technology? What are the services provided by telephone companies using DSL? **[8]**

b) Compare different DSL technologies. **[8]**

Q6) a) Explain advantages and disadvantages of WLAN. **[8]**

b) Compare 802.11 w.r.t. 802.16. **[8]**

Q7) a) Explain the architecture of storage area network. **[8]**

b) Explain in detail architecture of GSM. Also explain security in GSM. **[10]**

Q8) Write short notes on (any 3) : **[18]**

a) DWDM

b) UMTS system architecture

c) Applications of ISDN

d) EDGE Technology

e) CDMA

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Total No. of Questions : 8]

SEAT No. :

P2250

[Total No. of Pages : 2

[4165]-898

M.E. (Instrumentation & Control) (Process Instru.& Biomedical Instru.)

BIOMEDICAL INSTRUMENTATION

FUNDAMENTALS OF BIOMEDICAL INSTRUMENTATION

(2008 Course) (Elective - I (a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the indirect type of blood pressure measurement using sphygmomanometer. Why it is clinically popular method? Elaborate how hearing threshold plays important role in accessing indirect blood pressure measurement. **[10]**

b) Explain the basic types of bio electrodes with their materials. What is importance of Electrolytic Jelly in the biopotential measurement? **[8]**

Q2) a) Explain the following terms with respect to lung volume capacities. **[10]**

i) RV.
ii) ERV.
iii) TLC.
iv) TV.

b) What is Evoked response? State any one application of it. **[6]**

Q3) a) Draw and explain the structure of Human Cell. **[8]**

b) Discuss Coulter counter method for counting of various blood cells associated with blood. **[8]**

Q4) a) Explain in detail preamplifier stage in ECG machine. **[8]**

b) What is fibrillation state of Heart? Draw and explain circuit diagram of DC defibrillator. Also list out various electrodes used with it. **[8]**

P.T.O.

SECTION - II

Q5) a) Explain electromagnetic blood flow measurement with neat diagram and mathematical representation of output. How the transformer voltage problem is tackled in the same? **[10]**

b) Enlist various electrodes for EEG. Explain the EEG 10-20 montage system. **[8]**

Q6) a) What is EEG? Enlist various electrodes for EEG. **[8]**

b) Explain the EEG 10-20 montage system. Discuss various waveforms in EEG with their significance and frequency. **[8]**

Q7) a) What is intraocular pressure (IOP). Explain the instrument used for measurement of IOP? **[6]**

b) What part of the Human auditory system perform audio frequency discrimination task? Name the instrument use to diagnose auditory system performance. Name the two basic meters used for the same. **[4]**

c) Explain the various vision errors in human vision system and also explain the way of elimination of the same. **[6]**

Q8) a) Draw structure of nephron and explain its function in detail. **[8]**

b) Explain the various methods of accident prevention in medical equipments. **[8]**

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Total No. of Questions : 8]

P2251

SEAT No. :

[Total No. of Pages : 2

[4165] - 912
M.E. (Instrumentation, Process & Biomedical)
(Biomedical Instrumentation)
BIO-IMAGING MODALITY
(2008 Course) (Sem. - II) (Elective - III (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the use of Bucky Diaphragm. Why aluminum filter is used in x-ray tube. Explain the function of x-ray collimators. Why collimator is best restrictor in x-ray system. **[10]**

b) Draw and explain two types of x-ray tubes. And specify the materials used for anode, cathode, target and motor rotor. Specify the factors deciding the quality of x-rays. **[8]**

Q2) a) Explain the operation of x-ray fluoroscopic system that is used for real time imaging. List out its application. **[8]**

b) What are collimators? Enlist various collimators used in radionuclide imaging with their specific clinical applications. **[8]**

Q3) a) Explain the principle of CT-scanning. Explain various gantries in CT scanning and also mentioned how time is reduced with advancement in gantries. **[8]**

b) Write short note on “Hounsfield Numbers” in CT scanning. Why window selection switch is available on CT scanning machine. **[8]**

P.T.O.

Q4) a) How digital mammography does differ from standard mammography? What are benefits over standard mammography equipments? **[8]**

b) What is mammography? What Can Diagnostic Mammography Show? **[8]**

SECTION - II

Q5) a) Explain the relationship of resolution, depth of penetration and frequency in connection with ultrasound image. Explain the advantages and biological effects of ultrasound imaging. **[10]**

b) Explain Pulse echo-ultrasound A-scan Mode system with block diagram. List out its applications. **[8]**

Q6) a) Why artificial radio nuclides are preferred over natural radionuclide in nuclear imaging? Explain the principle of PET imaging. What is the main advantage offered by PET over other medical imaging modality? Why the PET is costlier imaging system? **[10]**

b) Enlist clinical applications of SPECT and give the reason why SPECT is accepted instead of conventional nuclear medical imaging. **[6]**

Q7) a) Explain the basic principle of MR Imaging. Enlist advantages of MRI techniques. **[8]**

b) Discuss on magnets used in MRI? Why resistive magnets are less important? **[8]**

Q8) a) Explain Medical thermography with neat block diagram. **[8]**

b) What is angiography? Explain DSA. **[8]**

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Total No. of Questions : 10]

SEAT No. :

P2253

[Total No. of Pages : 4

[4165]-921

M.E. (Polymer Engg.)

POLYMER RHEOLOGY

(2008 Course) (Elective - II (a)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Q.No.1 from Section - I and Q.No.6 from Section - II are compulsory. Answer any other two questions from Section - I and answer any other two questions from II.***
2) ***Answers to the two sections must be written in two separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of scientific calculator and log-log graph paper is allowed.***
5) ***Assume suitable data, if required.***

SECTION - I

Q1) Write short notes on - (Any Four) : **[20]**

a) Tensile and shear viscosity.

b) Dynamic Viscosity.

c) Creep Compliance.

d) "Tom's Effect".

e) Stress relaxation and relaxation modulus.

Q2) a) For annular die used for pipe extrusion at 180ºC with an outer diameter D_0 = 0.075 m and internal diameter of D_i = 0.0635 m for HDPE for extrusion rates corresponding to the maximum wall shear stress $\tau = 10^5\ N/m^2$. Calculate the volume flow rate and pressure drop if n = 0.56 and K = 6.19×10^3 N sec^n/m^2. **[8]**

b) Explain Bagley's correction factor. How pressure losses at entry can be estimated? **[7]**

Q3) a) Discuss following viscosity models for extension viscosity - **[9]**

i) Cogswell model.
ii) Binding model.
iii) Gibson model.

P.T.O.

b) Discuss any one three parameter rheological viscosity model. **[6]**

Q4) a) With suitable examples of polymer processing, explain simple extension, biaxial extension and planer extension. **[9]**

b) Discuss the use of substitute radius by Schenkel and mean hydraulic radius. **[6]**

Q5) a) What is wall slip velocity? With rheological experimentation using capillaries of varying diameter but same L/D ratio, explain how wall slip velocity can be calculated. **[7]**

b) Melt at 200ºC has following rheological data which shows Bingham behavior.

τ N/m^2 Shear Stress	$\left(\frac{8U}{U_0}\right)$ where U = Velocity at radius r U_0 = Maximum velocity
450	0.15
500	0.78
800	5
1000	9.35
2000	33.33
10000	285.7
100000	2857

If melt flows through a 2 cm diameter pipe, calculate and plot velocity distribution at $\tau_y / \tau = 0.5$. Calculate the radius and velocity of the central core. **[8]**

SECTION - II

Q6) Write short notes on (any Four) : **[20]**

a) Melt fracture.

b) Shear rate dependence of viscosity.

c) Effect of crystallinity and branching on melt rheology.

d) Flow instabilities at the die exit.

e) Use of melt flow indexer as rheometer.

Q7) a) Discuss small amplitude oscillatory shear test used to understand the visco-elastic behavior of polymers. **[8]**

b) Write in short about advantages and limitations of cone and plate rheometers. **[7]**

Q8) a) Explain the significance of Deborah number and explain also how it can be used in equipment/die design. **[7]**

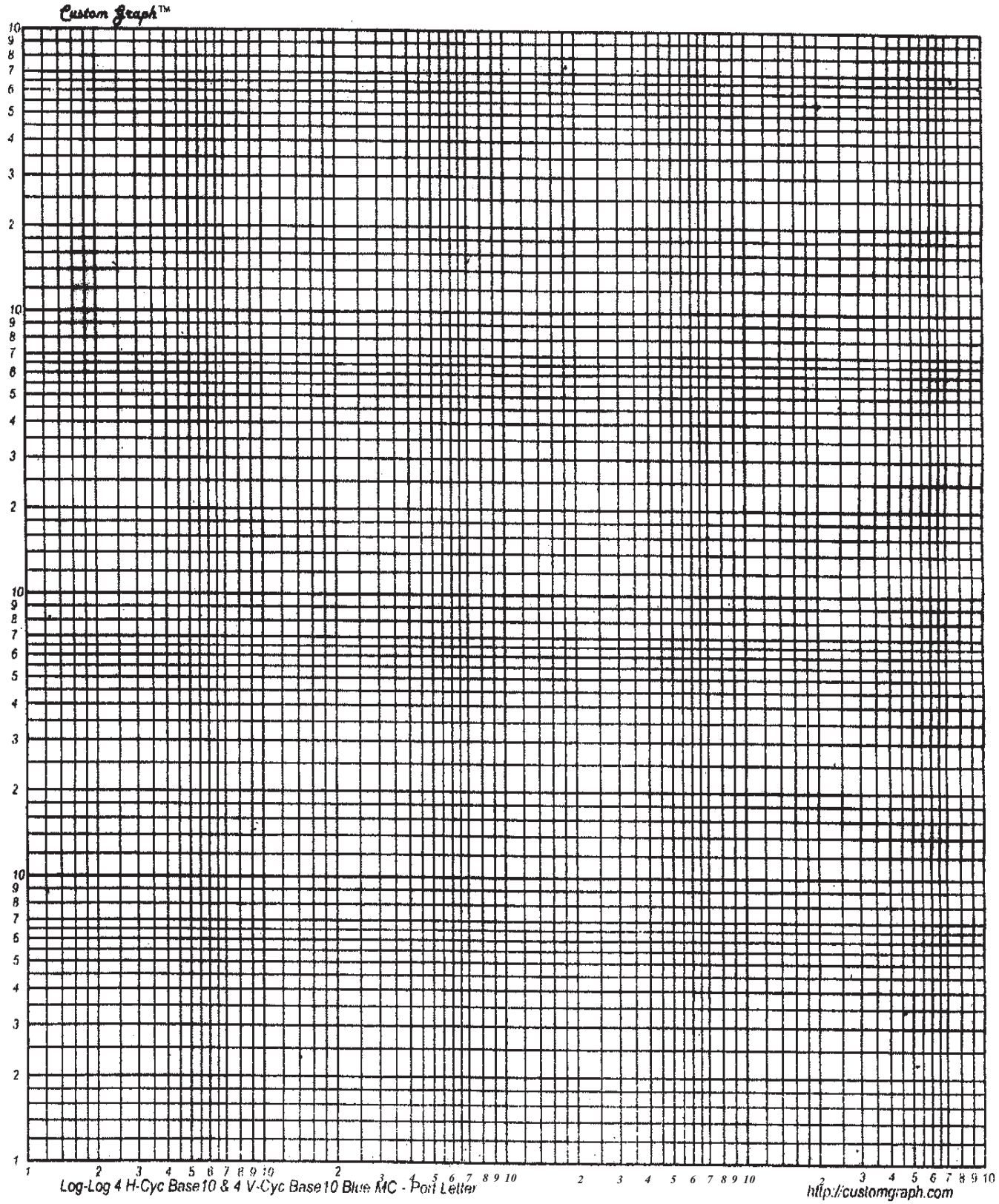
b) Write in short about rheology of miscible and immiscible blends. **[8]**

Q9) a) Barrel of an extruder has 20 mm diameter and is used for monofilament extrusion. Volume flow rate of polymer is 10^{-7} m^3/sec. The die exit radius is 1 mm. Take elongational viscosity as 9×10^4 N sec/m^2 and rupture stress as 6×10^5 N/m^2. Find half angle of convergence of the die and the length of the die. Comment on the result. If design is unacceptable, redesign the die. **[8]**

b) Explain the rheological effects or responses of physical entanglements in high molecular weight polymeric melts. **[7]**

Q10) The rheological data for a polymer melt is given below. Using WLF equation, find glass transition temperature. **[15]**

Shear rate sec^{-1}	Temperature in °C/Shear stress in $\tau \times 10^4$ N/m^2			
	170°C	180°C	190°C	200°C
3.06	95	25.6	10.8	8
6.12	124	34.8	14	11
12.33	162	64	35.6	17
30.58	237	110	56	33
61.17	325	165	95	59
122.34	438	240	150.5	102
305.85	650	390	263	200
611.70	825	540	392	320
1223.4	1040	782	570	490
3058.5	1350	1200	856	780


Custom Graph™
Log-Log 4 H-Cyc Base10 & 4 V-Cyc Base10 Blue MC - Port Letter
http://customgraph.com

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Total No. of Questions : 10]

P2254

SEAT No. : ____

[Total No. of Pages : 4

[4165] - 926
M.E. (Polymer Engineering)
PROCESSING AND MACHANICS OF COMPOSITES
(2008 Course) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Q.No. 1 from Section - I and Q.No. 6 from Section - II are compulsory. Answer any other two questions from Section - I and answer any other two questions from Section - II.***
2) ***Answers to the two sections should be written in two separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of scientific calculator and graph paper is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Answer any four : **[20]**

a) Prove that strain energy release rate per unit crack extension, G can be given by,

$$G = \frac{1}{2} P^2 \frac{\partial(\frac{1}{k})}{\partial C}$$

Where

P = Load at crack initiation

C = crack length

$k = \frac{P}{\delta}$ and

δ = Elongation between the load points in tension test.

b) In a unidirectional composite, fibers are packed in a square array. Find maximum possible fiber volume fraction.

c) Define shear-shear coupling coefficients (Chentsov coefficients).

d) Discuss basic processing steps, tooling and advantages of spray up process.

e) Discuss any two thermoplastic fibers used in composite structures and give merits of the same.

P.T.O.

Q2) a) Find off-axis shear strength at 45° for unidirectional lamina considering positive as well as negative sign of applied shear stress using Tsai-Hill criteria. Various strengths of the lamina are- **[8]**

σ_{LU} = 500 MPa σ'_{LU} = 350 MPa σ'_{TU} = 75 MPa σ_{TU} = 5 MPa

τ_{LTU} = 35 MPa L = Logitudinal T = Transverse

b) For a unidirectional lamina engineering constants are

E_1 = 181GPa E_2 = 10.3GPa G_{12} = 7.17GPa υ_{12} = 0.25

Find compliance matrix, minor Poisson's ratio and reduced stiffness matrix if loading is as shown in fig. 1 **[7]**

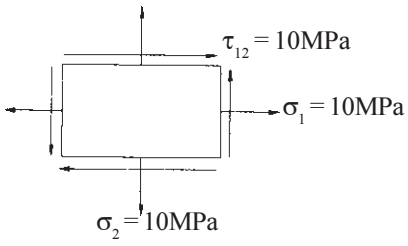

Fig1

Q3) a) Discuss basic processing steps, tooling requirement and applications of resin transfer moulding. **[7]**

b) Prove that for an orthotropic lamina $[\overline{Q}]$ = [T]$^{-1}$ [Q] [T]$^{-T}$ where

$[\overline{Q}]$ = Reduced transformed stiffness matrix

[Q] = Reduced stiffness matrix

[T] = Transformation matrix **[8]**

Q4) a) State Halpin-Tsai equations and show that they reduce to upper bound and lower bound of a composite modulus. **[7]**

b) Using elasticity approach, obtain an expression for lower bound on the apparent Young's modulus of the composite material in terms of moduli and volume fractions of the constituent material. **[8]**

Q5) a) State various factors which are important for fiber wet out in with reference to pultrusion and filament winding process. **[7]**

b) For a unidirectional Lamina, prove that **[8]**

$$\frac{1}{E_x} = \frac{\cos^2\theta}{E_1}(\cos^2\theta - \sin^2\theta \times \upsilon_{12}) + \frac{\sin^2\theta}{E_2}(\sin^2\theta - \cos^2\theta \times \upsilon_{21}) \times + \frac{\cos^2\theta \times \sin^2\theta}{G_{12}}$$

SECTION - II

Q6) Answer any four : **[20]**

a) Code for laminate is given below. Write sequence of Laminate in the laminate

i) $[(45/0/90)_4]$ ii) $[(0_B/\pm 45_{Gr}/90_{Gr})]_s$

Where B = Boron; Gr = graphite

b) What are hybrid Laminated composites? Explain merits of the same.

c) Explain quasi-isotropic laminate.

d) For a simply supported beam made up of symmetric laminate, following information is known.

L = 500 mm

ρ = mass per unit volume = 1200 kg/m^3

A = cross sectional area = 2.5×10^{-3} m^2

D_{11} = 1st element in bending stiffness matrix = 0.5 GPa – mm^3

b = width of the beam = 50 mm

Find fundamental frequency of free vibration or lowest natural frequency.

e) Give basic assumptions of laminated plate theory.

Q7) a) Discuss principle modes of failures of bolted joints in laminates and suggest remedies. **[7]**

b) In a laminate having four plies, $[\pm 45]_s$ each ply has thickness of 3 mm. If reduced transformed stiffness matrix for +45 lamina and –45 lamina is given below, calculate [A], [B] and [D] matrices for the laminate.

$$[\overline{Q}]_{+45} = \begin{bmatrix} 6.55 & 5.15 & 4.50 \\ 5.15 & 6.55 & 4.50 \\ 4.50 & 4.50 & 5.15 \end{bmatrix} GPa$$

$$[\overline{Q}]_{-45} = \begin{bmatrix} 6.55 & 5.15 & -4.50 \\ 5.15 & 6.55 & -4.50 \\ -4.50 & -4.50 & 5.15 \end{bmatrix} GPa$$

[8]

Q8) a) What is antisymetric cross ply laminate? Give force and moment resultants with an example. Explain also regular antisymetric cross ply laminate. **[8]**

b) Obtain equations for extensional stiffness matrix, bending stiffness matrix and coupling stiffness matrix for a laminate using classical lamination theory. **[7]**

Q9) a) Explain the concept of effective engineering properties of the laminate. For a symmetric balanced laminate, total laminate thickness is 10 mm. The extensional stiffness matrix is given by **[8]**

$$[A] = \begin{bmatrix} 44.25 & 34.25 & 0 \\ 34.25 & 44.25 & 0 \\ 0 & 0 & 36.25 \end{bmatrix} GPa - mm$$

Find effective engineering properties for the laminate - $\overline{E}_x\ \overline{E}_y\ \overline{G}_{xy}\ \overline{\upsilon}_{xy}\ \overline{\upsilon}_{yx}$

b) Write in short about free thermal strains and stress-strain relationship of a lamina when free thermal strains are included. **[7]**

Q10)a) A uniformly loaded beam is shown in fig 2(a) and 2(b). Find the maximum deflection of the beam for the clamping situation if the beam has symmetric lay up. Width of the beam is 100 mm. The first element of bending stiffness matrix of the laminate is D_{11} = 0.5 GPa – mm^3. **[6]**

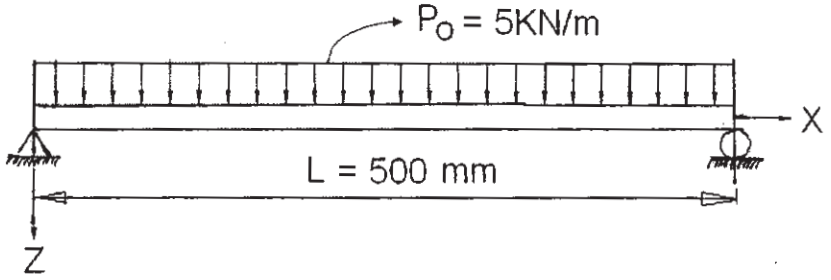

Fig2 (a)

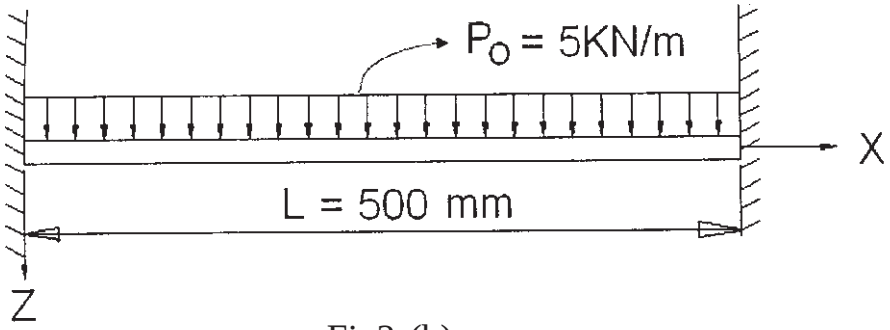

Fig2 (b)

b) Write stress and moment resultants for a symmetric laminate with multiple isotropic layers. The reduced stiffness matrix for an isotropic lamina is given below.

$$[Q] = \begin{bmatrix} 106.6 & 26.6 & 0 \\ 26.6 & 106.6 & 0 \\ 0 & 0 & 40 \end{bmatrix} KN/mm^2$$

Laminate having 5 layers is made from above lamina, each having thickness of 1 mm. If force per unit width of 10KN/mm and moment per unit width of 20KN-mm/mm is applied to the laminate, find the resultant strains and curvatures in the laminate. **[9]**

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Total No. of Questions : 6]

SEAT No. :

P2256

[Total No. of Pages : 2

[4165]-941

M.E. (Printing Engineering and Graphic Communication)

QUALITY CONTROL SYSTEMS AND PRODUCTIVITY

(2008 Course) (Elective - II (c)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the workflow from pre-press to post-press of Offset process. **[8]**

b) Explain the workflow from pre-press to post-press of Gravure process. **[10]**

c) Explain the process variables of a Conventional process. **[7]**

Q2) a) Write note on press standardization and printability. **[10]**

b) Explain different standards followed in printing industry and how these standards are implemented. **[15]**

Q3) a) Explain in detail Quality Control aids for printability. **[9]**

b) Write notes on : (Any Four) **[16]**

i) Trakatron Line
ii) Auto Registration Marks.
iii) CIE LAB.
iv) Trap.
v) Contrast.

SECTION - II

Q4) a) Explain the concept of Six Sigma with respect to printing industry. **[15]**

b) Explain the implementation of Quality Management System for a Press. **[10]**

P.T.O.

Q5) a) Write notes on : (Any Three) **[9]**

i) Types of Variation.
ii) Benefits of SPC.
iii) X bar-R Chart.
iv) Zone Chart.

b) Create an X bar-R Chart for the following data : **[16]**

10.2	10.5	10.8	9.88	9.92	10.2	10.7	10.1	10.3	10.1
10.3	10.1	10.5	10.3	9.94	10.9	10.3	10.8	10.2	10.2
10.4	10.6	10.1	10.3	9.39	10.1	9.79	10.3	10.2	10.3

Aggregate the data in groups of 3 and assume d_2 as 1.693, A_2 as 1.023, D_3 as 0 and D_4 as 2.575.

Q6) a) Write notes on : (Any Three) **[9]**

i) Process Capability.
ii) Process Performance.
iii) Uses of Process Capability Analysis.
iv) Capability Indices.

b) Aggregate the data in groups of 5 and calculate Standard Deviation, Process Centeredness and Capability indices for the following data :**[16]**

1.20	1.21	1.20	1.18	1.21
1.20	1.19	1.21	1.22	1.20
1.20	1.21	1.20	1.24	1.22
1.20	1.21	1.21	1.23	1.22
1.20	1.21	1.21	1.23	1.22
1.19	1.21	1.21	1.23	1.20

Assume the target specification as 1.2 and d_2 as 2.326.

Total No. of Questions : 6]

P2257

SEAT No. : ____

[Total No. of Pages : 2

[4165] - 944

M.E. (Printing Engineering & Graphic Communication)

SUBSTRATE AND INKS

(2008 Course) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written on separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Figures on right indicate full marks.***

SECTION - I

Q1) a) Describe paper manufacturing key points step by step with adequate diagrams. **[15]**

b) Write detailed note on Hydrogen bonding. **[10]**

Q2) a) Discuss various properties of substrate and printability. **[16]**

b) State the factors to be considered for selecting substrate for a package. **[9]**

Q3) a) Explain the various ingredients and their role in ink formulation. **[15]**

b) Give typical formulation of water based flexographic printing ink for paper. **[10]**

SECTION - II

Q4) a) Write notes on (any four) : **[16]**

i) Metallic inks.

ii) Electrographic inks

iii) Fluorescent inks

iv) Scented inks

v) Inkjet inks

b) Explain in detail end-use application tests for a package. **[9]**

P.T.O.

Q5) a) What is costing? State and explain various elements of costing with appropriate examples. **[10]**

b) Calculate the total quantity of paper required in the size 45.5 × 58.5 cms for printing monthly magazine 500 copies in the size 210 mm × 297 mm assuming the magazine contains 32 pages. **[15]**

Q6) a) What do you mean by going green? **[9]**

b) What is FSC? **[8]**

c) Comment on VOC and its significance in printing inks. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P2258

[Total No. of Pages : 1

[4165] - 947

M.E. (Printing Engg. & Graphic Communication)

PRESS FINGER PRINTING

(2008 Course) (Elective - III (c)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures to the right indicates marks.***

SECTION - I

Q1) What are the requirements of Pre-Press Conditions in Finger Printing? **[25]**

Q2) a) Explain in details Cylinder Cell structure and Stylus Angles. **[15]**

b) What is press Optimisation Procedure. **[10]**

Q3) Explain Importance of following: **[25]**

a) Registration Mark.
b) Tracker line.
c) Vignette.
d) Gray Scale.
e) Auto Registration Control.

SECTION - II

Q4) a) What is I.C.C. profiling? **[10]**

b) What are the plan and run standardisation? **[15]**

Q5) Explain in details post. Fingerprinting. **[25]**

Q6) a) Explain process stability and process capability. **[10]**

b) What is short-term and long-term variation. **[15]**

Total No. of Questions : 6]

P2259

SEAT No. :

[Total No. of Pages : 1

[4165] - 950

M.E. (Printing Engineering & Graphic Communication)

ANALYSIS OF SPOT AND PROCESS INKS

(2008 Course) (Elective - IV(c)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data wherever necessary.***
5) ***Figures on right indicates marks.***

SECTION - I

Q1) Explain purpose & classification of Inks. **[25]**

Q2) Explain different types of Resins used for spot and process ink and vehicles used in printing Industry. **[25]**

Q3) a) What is thixotrophy? How it is controlled by using additives? **[15]**

b) What is selection Criteria of Resins. **[10]**

SECTION - II

Q4) a) Explain different types of Inks used in offset printing. **[10]**

b) What is composition of off set Ink of black colour. **[15]**

Q5) a) Explain different types of test-carried out on inks. **[15]**

b) Explain Rub Test and Scuff Test. **[10]**

Q6) a) What is visual Analysis? **[10]**

b) How to identify ink variation and deviation. **[15]**

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Total No. of Questions : 8]

P2261

SEAT No. : ____

[Total No. of Pages : 2

[4165] - 949

M.E. (Printing and Graphic Communication)

ADVANCES IN CONVERTING & PACKAGING

(2008 Course) (Sem. - II) (Elective - IV(b))

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve Section - I and Section - II in separate answer books.***
2) ***Solve any three questions from each section.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain in brief any one printing and converting machines with its application. **[8]**

b) What are basic principles of Converting and packaging? Explain. **[8]**

Q2) a) Explain in brief the advancement in loose leaf and adhesive binding. **[10]**

b) Explain the basic principle and working of integrated machines for finishing and packaging. **[6]**

Q3) a) What is lamination? What are different lamination techniques? Explain solvent less lamination. **[8]**

b) What is surface treatment in printing and packaging? Explain its importance in printing and packaging. **[8]**

Q4) Write short note on any three of the following : **[18]**

a) Holograms

b) Finishing technique

c) Converting Technique

d) Faults in lamination and its Remedies

P.T.O.

SECTION - II

Q5) a) What are various converting processes? Explain in brief the Shrink and Stretch Wrapping. **[8]**

b) Explain the Computer aided Design for Packaging. **[8]**

Q6) a) What are various forms of pouches? Explain Bag in Box for solid and liquids. **[8]**

b) Explain the Stand-up pouches and packages for food products. **[8]**

Q7) a) What are latest developments in barrier technology? Explain Retort Packaging. **[10]**

b) Explain in brief the automatic pouching machines. **[6]**

Q8) Write short note on any three of the following: **[18]**

a) Extrusion process and Co-extrusion techniques.

b) Microwave packaging.

c) Selection criteria for packaging.

d) Aseptic technique and packaging.

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Total No. of Questions : 10]

SEAT No. :

P2262

[Total No. of Pages : 2

[4165]-73

M.E. (Mechanical) (Design Engineering)

TRIBOLOGY

(2002 Course) (Elective - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss any four Tribological properties of Lubricants in detail. **[8]**

b) Explain theory of Adhesive friction. **[8]**

Q2) a) List and discuss common methods for controlling friction. **[8]**

b) Elaborate theory of abrasive wear. **[8]**

Q3) a) Derive an equation for power lost in friction in lightly loaded bearings. (Petroff's solution). **[8]**

b) Explain mechanism of pressure development in an oil film with appropriate sketches. **[8]**

Q4) a) Derive Reynold's Equation in 2 dimensions for flow in a journal bearing. Give assumptions for the equation. **[10]**

b) Give limitations of Reynold's equation. Give the Sommerfeld substitution and explain the subsequent solution obtained. **[8]**

Q5) a) Obtain an expression for load carrying capacity of Hydrostatic circular step bearing. **[8]**

b) Sketch an arrangement of a typical hydrostatic lubrication system and list merits and demerits of the hydrostatic bearings. **[8]**

P.T.O.

SECTION - II

Q6) a) Explain hydrostatic Squeeze film principal by giving four practical examples. **[8]**

b) Derive an expression for load carrying capacity over a rectangular plate approaching a plane. **[8]**

Q7) a) Give analysis of the hydrostatic squeeze film lubrication applied to piston pin by obtaining an equation for its load carrying capacity. **[8]**

b) A circular plate of 150 mm diameter is approaching a plane at a velocity of 12.5 cm/s. At the instant, oil film thickness is 0.25 mm. the viscosity of the oil is 0.035 Pa.s **[8]**

Evaluate for Squeeze film action.

i) The maximum pressure.
ii) Average Pressure.
iii) Load carrying capacity.
iv) Time required squeezing the oil film from 0.25 mm to 0.005 mm.

Q8) a) Explain Ertel-Grubin equation applied to the analysis of Elastohydrodynamic Lubrication. **[8]**

b) Discuss important points in lubrication of spheres, gear teeth and rolling element bearing. **[8]**

Q9) a) Explain Tribological aspects of wheel on Rail contact. **[8]**

b) Explain Tribological aspects of metal working processes. **[8]**

Q10) Write a short note on any three of the following : **[18]**

a) Porous bearings.

b) Thrust bearings with Air lubrication.

c) Methods of wear prevention.

d) Tribological properties of Bearing Materials.

Total No. of Questions : 8]

SEAT No.:

P2263

[Total No. of Pages : 2

[4165]-145
M.E. (Electronics) (Digital Systems and Computer)
D.S.P. AND APPLICATIONS
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables and electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and prove the following properties of Z-transform. **[8]**

i) Time shifting.

ii) Derivative in Z-domain.

b) Using Z-Transform perform convolution of the following two sequences. **[8]**

$$h(n)=\begin{cases}\left(\frac{1}{2}\right)^n & 0\le n\le 3\\ 0 & \text{else}\end{cases}$$

$x(n) = \delta(n) + \delta(n-1) + \delta(n-2) + \delta(n-3)$.

Q2) a) Define correlation? Find out cross-correlation of following finite length sequences. **[8]**

$x(n) = \{1\ 2\ 3\ 4\ 5\}$
$\uparrow$

$y(n) = \{-1\ 2\ 3\ 4\}$
$\uparrow$

P.T.O.

b) Determine the Inverse Z-transform of $X(z)=\frac{z}{(4z^2-2z+1)}$ if the regions of convergence are : **[8]**

i) $|z|>|$

ii) $|z|<\frac{1}{4}$

Q3) a) Given $x(n) = \{1, 2, 1, 2, 1, 2, 1, 2\}$. Find $X(k)$ using decimation in Time FFT algorithm? Give the steps and show the flowgraph? **[8]**

b) Explain forward linear prediction for predicting a future value of a stationary random process? **[8]**

Q4) Write notes on : **[18]**

a) Power spectrum Estimation.

b) Sub band coding of speech signal.

c) DTMF signal analysis.

SECTION - II

Q5) a) Explain the least squares inverse filter design method. **[8]**

b) Explain the use of adaptive filter for noise cancellation. **[8]**

Q6) a) What do you mean by "System Identification"? Explain system Identification based on an all pole (AR) system model? **[8]**

b) Explain how ARMA model is used for power spectrum estimation? **[8]**

Q7) a) Draw the architecture of ADSP - 21 series of DSP processor and explain. **[8]**

b) Draw the basic structure of two channel quadrature mirror filter (QMF) bank and explain synthesis of subband coding using QMF? **[8]**

Q8) Write short notes on : **[18]**

a) DSP processor for RADAR application.

b) Finite Word Length Effect.

c) Image compression using wavelet transform.

Total No. of Questions : 8]

SEAT No. :

P2264

[Total No. of Pages : 2

[4165]-144
M.E. (Electronics) (Digital Systems)
MULTIMEDIA TECHNIQUES
(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) How does multimedia computing differ from any other computing? What are the hardware & software components of multimedia platform? With suitable block diagram explain the functions of multimedia developing systems? **[10]**

b) What is MM authoring tool? List the different functions of MM authoring softwares? **[8]**

Q2) a) What are the different types of data blocks of VOC file format? Compare VOC with WAV? **[8]**

b) What is the need of defining different file format to store voice or audio? Explain any one file format in detail? **[8]**

Q3) a) Explain the following terms related to 'MPEG standards'? **[8]**

i) Search Region.
ii) Local Smoothness Constraint.
iii) Motion Vector.
iv) Cost Function.

b) Explain the progressive modes of JPEG? How does the quality of decoded image is improved by using JPEG? **[8]**

P.T.O.

Q4) a) Write short note on : **[8]**

i) Text Compression.
ii) Multimedia applications.

b) Explain the criteria for selection of file format for storing still images. **[8]**

SECTION - II

Q5) a) Justify why G-Y is not transmitted for colour TV Transmission Mathematically prove the same. **[8]**

b) Compare NTSC PAL & SECAM systems. **[8]**

Q6) a) How are the documents on the web interconnected by hyperlink? With proper syntax elaborate the procedure for creating hyperlinks? How is the user interactivity enabled in HTML document? **[8]**

b) What are the block level elements in an HTML documents? Using neat diagram explain attributes of block level elements? **[8]**

Q7) a) What is 3-D sound? How does a human determine a position of a sound source? Does ITD's provide any information for locating a sound source directly in front of behind? Justify. **[8]**

b) Differentiate between optical & magnetic storage media for MM data? State the selection of criteria for storage media with typical application. **[8]**

Q8) a) Write short note on (any 2) : **[8]**

i) HDTV.
ii) OS support to MM.
iii) Digital Video Camera.

b) List the various devices which can be used for MM in WINDOWS & comment on how to configure? **[10]**

Total No. of Questions : 8]

SEAT No.:

P2265

[Total No. of Pages : 2

[4165]-902

M.E. (Instrumentation & Control) (Process Instru. Biomedical Instru.)

ORGANISATIONAL BEHAVIOUR AND MANAGEMENT

(2008 Course) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) State and explain the definitions and functions of management. Analyse critically the role played by managers in an emerging market line India. **[16]**

Q2) Define Organisational Behaviour (OB) with its various key concepts. Explain various models of OB and its relevance to face the challenges and oppertunities of ever changing business. **[16]**

Q3) a) Define personality. "Personality is a complex and multidimentional construct", describe with reference to determinants of personality. **[10]**

b) State and explain the concept of perception and the factors in fluencing it. Explain how perception is a key factor in managerial effectiveness?**[8]**

Q4) Explain the following theories of motivation : **[16]**

a) Theory X and Theory Y.

b) Victor Vroom's Expectancy Theory.

SECTION - II

Q5) State and explain the stages of group development, group structure and group processes. Explain how group dynamic is realised by combining formal and inform group? **[16]**

Q6) a) List out various leadership skills required to excell in business. **[6]**

b) Describe the concept of "Managerial Grid and its application to business. **[6]**

c) Critically examine Fiedler's continges theory of leadership. **[6]**

P.T.O.

Q7) Describe organisational system with its various components. Critically examine design, technology and human factor influencing the structure of an organisation. **[16]**

Q8) What is conflict management? What are the various causes of conflict? How contingency approach to conflict management helpful in this context? **[16]**

Total No. of Questions : 10]

SEAT No. :

P2266

[Total No. of Pages : 3

[4165] - 68

M.E. (Mechanical) (Design Engineering)

MACHINE TOOL DESIGN

(2002 Course) (Elective - I (a))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable electronic calculators is allowed.***

SECTION - I

Q1) a) What is a modular design? How does it help in simplifying the design process of the machine tools? **[6]**

b) Make a brief comparison of general purpose machine tools and special purpose machine tools, based on following points: **[10]**

i) Speed range.
ii) Type of drive.
iii) Power requirements.
iv) Controls.

Q2) a) Derive the expression for Speed ratio (Φ) used in machine tool drives to bring loss in productivity to a minimum. **[4]**

b) It is required to design a gear box to drive a spindle of a lathe from 100 rpm to 1200 rpm in eight (8) steps, using geometric progression. **[12]**

Prepare the initial data for preliminary information for gear box design.

i) Speed diagram.
ii) Layout of the gear box.
iii) Ratio of Vee Pulleys from motor to gear box input shaft, for the motor of 10 kW at 1450 rpm, and

Q3) a) Give the classification of different step less regulation used for machine tool drives. State the advantages and disadvantages of it. **[4]**

b) Discuss, in brief, design considerations of variator. **[6]**

c) Explain the principle and working of PIV drive. State its applications. **[6]**

P.T.O

Q4) a) Prepare a brief note on the following points, in connection with the machine tool slide ways: **[10]**

i) Functional requirements.

ii) Design considerations.

iii) Wear compensation.

b) A lathe has an inverted 90º Vee guide ways at the front and a flat guide ways at the rear to support the guide the carriage. Calculate the maximum value of front face angle α° of Vee guide to avoid overturning of the carriage. **[6]**

Take (FT / FR = 4) and (H / B = 0.6), where –

FT and FR – tangential and radial cutting force components on tool during turning

H – Height of work piece center from top surface of flat slide and,

B – Center to center distance of the two slide ways.

Q5) Write short notes (any three): **[18]**

a) Norton feed gear box.

b) Devices for intermittent motion.

c) Selection of electric motors for machine tools.

d) Self locking of cone variator.

e) Reliability based design.

SECTION - II

Q6) a) With the help of a sketch, show the cutting forces in grinding operation. How the power consumption in grinding is computed? **[8]**

b) Describe the suitable power pack for supporting the spindle on hydrostatic lubrication with the help of neat sketch. **[8]**

Q7) a) Discuss the steps followed in design of power screw of machine tools. Why 'pitch error' restriction is much important in the lead screw design? **[8]**

b) Discuss merits and demerits of re-circulating ball screws. Show any typical method of preloading of the same. **[8]**

Q8) a) With a neat sketch of a electrical control diagram show any one of the following: **[8]**

i) Push button control for starting and stopping of the motor.

ii) Method for obtaining electrical braking to reduce the inertia during stopping the motor.

b) Discuss briefly the major static testing of the machine tool, as originally developed by Schlesinger. Explain at least two major items and degree of accuracy one should aim at. **[8]**

Q9) a) What do you mean by Stick Slip vibration in machine tool? Enumerate commonly adopted methods in reducing positional error due to stick slip vibrations. **[8]**

b) Describe three different types of transducers or encoders commonly used in CNC machines. **[8]**

Q10) Write short notes on (any three): **[18]**

a) Acceptance tests for Machine Tools.

b) Aesthetic and ergonomic considerations in machine tool design.

c) Flexible Manufacturing Systems (FMS).

d) Retrofitting general purpose lathe into CNC lathe.

e) Machining center.

Total No. of Questions : 8]

P2267

SEAT No. : ____

[Total No. of Pages : 2

[4165] - 148
M.E. (Electronics) (Digital Systems/Computer)
COMPUTER NETWORKS
(2002 Course)

Time : 3 Hours] ***[Max. Marks : 100***

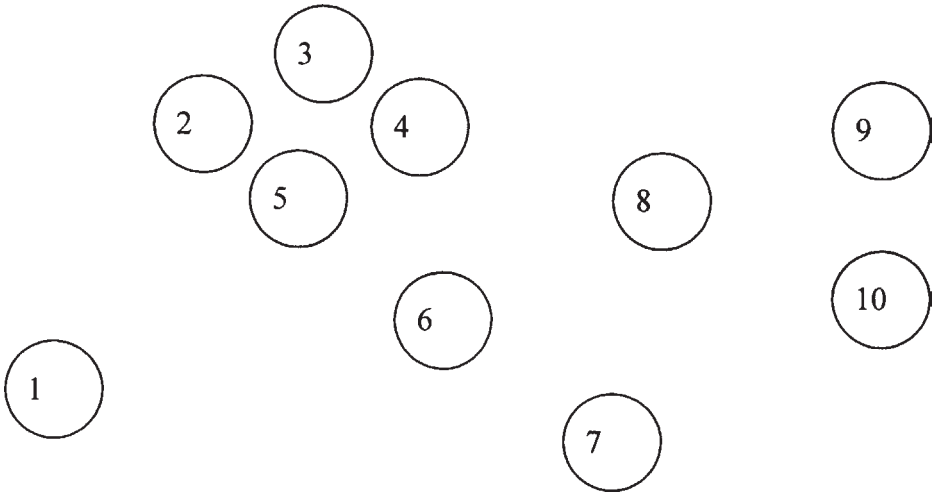
Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the Network design issues in brief. **[9]**

b) For the terminals shown in figure apply the Dysart-Georganas algorithm for k = 3, to determine concentrator location list. **[9]**



Q2) a) Explain M/M/1 system and derive necessary equations. **[8]**

b) Differentiate between centralized and distributed approaches for the network design. **[8]**

P.T.O.

Q3) a) Describe the network performance parameters and explain how they can be estimated? **[8]**

b) What are the services offered by TCP to an Application Layer? Explain TCP/IP socket programming in brief. **[8]**

Q4) a) What are the advantages and the disadvantages of Adaptive Routing and Explicit Routing. **[8]**

b) Explain the Flow deviation algorithm for routing. **[8]**

SECTION - II

Q5) a) What are the different classes of IP Addresses? A Class B network on the Internet has a subnet mask 255.255.252.0. What is the maximum number of hosts per subnet? **[8]**

b) Suppose traffic with intensity 2 Erlangs is offered to 3 lines. What is the probability of loss predicted by the Erlang-B, Erlang-C and Poisson formulas? **[8]**

Q6) a) Explain the principle of firewall and explain all the functions of firewall. What are its limitations? **[8]**

b) Describe IPv6 and highlight important features of it. **[8]**

Q7) a) What are the principle elements of a public key cryptosystem? Describe Encryption and Authentication process in public key cryptosystem. **[8]**

b) Perform Encryption and Decryption using the RSA algorithm for the following : **[8]**

i) p = 3, q = 11, e = 7, M = 5

ii) p = 5, q = 11, e = 3, M= 9

Q8) Write short notes on (any three) : **[18]**

a) VoIP.

b) SNMP.

c) ATM Layers.

d) Bluetooth.

❖ ❖ ❖ ❖

Total No. of Questions : 8]

SEAT No.:

P2268

[Total No. of Pages : 2

[4165]-461
M.E. (Civil) (Hydraulic)
COASTAL ENGINEERING
(2008 Course) (Elective - III (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answer to the two sections should be written in separate answer booklet.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of electronic pocket calculator is allowed.***
7) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) What are the various kinds of waves? What is the basic difference between transverse wave and longitudinal waves? What are the parameters on which the amplitude of a transverse wave depends? Write in detail about the mechanism of formulation of waves in detail. **[9]**

b) What do you mean by wave front and what are the essential characteristics of waves? What is the role of medium in the formation of waves? **[9]**

Q2) a) What do you mean by of wave tables? Give two separate examples and discuss in brief. **[8]**

b) What are the different kinds of waves related in coastal engineering? ***'Far from the coast wave heights are much less'***. Is this statement correct? If yes, then justify it. **[8]**

Q3) a) Discuss at length about Wave Energy Density Spectrum. **[8]**

b) What are the special characteristics of 'TSUNAMI' waves? Discuss them in brief. **[8]**

Q4) a) Describe in detail about the method of construction of wave refraction diagram. **[8]**

b) What is the meaning of storm surge? Write about frequency plotting of the storm surge. **[8]**

P.T.O.

SECTION - II

Q5) a) What do you mean by linear theory and where it is used? What are the various wave characteristics formulae and discuss about their applications and uses. **[9]**

b) There are several models in Coastal Engineering. Discuss about two of them. **[9]**

Q6) a) What do you mean by Statistical wave and what is the importance of Rayleigh's Distribution for Statistical waves. **[8]**

b) Discuss in detail about the method of calculation of long shore energy flux factor. **[8]**

Q7) a) Explain Dunes and Antidunes along with neat sketches. How they are formed in the sea bed? Explain the complete mechanism of the formation of Dunes. **[8]**

b) Write in detail about Beach sand gradation analysis. **[8]**

Q8) a) Write in brief about Environmental Impact Assessment related to Coastal Engineering. **[8]**

b) What is Shoreline Protection Study? What are the methods to protect a shore line? **[8]**

Total No. of Questions : 8]

P2269

SEAT No. : ____

[Total No. of Pages : 4

[4165] - 496
M.E. (Mechanical) (Heat Power Engg.)
REFRIGERATION TECHNOLOGY
(2008 Course) (Elective - I(b)) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, Mollier charts, electronic pocket calculator is allowed.***
6) ***Use of different charts and data tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) In a R22 based refrigeration system, a liquid-to-suction heat exchanger (LSHX) with an effectiveness of 0.65 is used. The evaporating and condensing temperatures are -10°C and 45°C respectively. Assuming the compression process to be isentropic, **[16]**

find :

a) Specific refrigeration effect.

b) Volumic refrigeration effect.

c) Specific work of compression.

d) COP of the system.

e) Temperature of vapour at the exit of the compressor

Comment on the use of LSHX by comparing the performance of the system with a Simple Saturated VC cycle operating between the same evaporator and condensing temperatures.

A) From saturation table

T(°C)	Ps	v_g	h_f	h_g	s_g
-10	3.55	0.0654	34.25	247.37	0.9473
45	17.209	0.0133	101.76	261.95	0.8697

P.T.O.

B) From superheated table

Superheat	20°C	30°C	40°C
v	0.0152	0.0161	0.0169
h	280.95	289.87	298.66
s	0.9270	0.9530	0.9781

Q2) a) What do you understand by "Thermodynamic Irreversibility"? Discuss the effect of irreversibility on the vapour compression cycle of refrigeration with the help of T-s diagram. **[10]**

b) Explain eutectic point & typical applications for secondary refrigerants. **[6]**

Q3) a) Explain in brief, the guidelines for refrigerant piping design **[6]**

b) Explain Selection of motors for various applications **[6]**

c) Explain design & selection criteria for condensers. **[6]**

Q4) A multi-evaporator, pressure regulating valve and single compressor vapour compression refrigeration system working with ammonia. The refrigeration capacity of high temperature evaporator operating at -6.7°C is 5 TR, while it is 10 TR for the low temperature evaporator operating at -34.4°C. The condenser pressure is 10.8 bar. Assuming saturated conditions at the exit of evaporator and condenser, ammonia vapour to behave as an ideal gas with gas constant of 0.4882 kJ/kg K and isentropic index of 1.29 and isentropic compression. **[16]**

a) Find the required power input to compressor in kW.

b) Find the required power input in kW if instead of using a single compressor and pressure regulating valve, individual compressors are used for the low and high temperature evaporators.

c) Draw schematic diagram and P-h chart for (a) and (b).

d) Comment on results with reference to power input, maximum compressor discharge temperature & volumetric efficiency for (a) & (b).

Use the following data for ammonia :

T,°C	P_{sat}, (kPa)	h_f, (kJ/kg)	h_g, (kJ/kg)
-34.4	95.98	44.0	1417
-6.7	331.8	169.1	1455
27.7	1080.0	330.4	1485

SECTION - II

Q5) a) List the heat sources available for driving the absorption units. Explain the working of single effect and double effect systems for cooling with neat sketches. **[8]**

b) A R-22 compressor with bore of 0.1 m and stroke of 0.08 m runs at 750 rpm. The clearance volume ratio is 0.04. It runs between the evaporator and condenser temperatures of –10°C and 45°C respectively. The isentropic index k of compression is 1.1163. **[8]**

i) Determine the mass flow rate, refrigerating capacity and the work requirement if the mechanical efficiency is 90%. Compare the results of isentropic work requirement determined using the superheat table.

ii) If the isentropic efficiency of the compressor is 80%, determine the index of compression and compare the results for work requirement and discharge temperature.

Use following data for R-22

a) From saturation table

T(°C)	Ps	v_g	h_f	h_g	s_g
-10	3.55	0.0654	34.25	247.37	0.9473
45	17.209	0.0133	101.76	261.95	0.8697

b) From superheated table

Superheat	20°C	30°C	40°C
v	0.0152	0.0161	0.0169
h	280.95	289.87	298.66
s	0.9270	0.9530	0.9781

Q6) In an aqua-ammonia absorption refrigeration system the vapour leaving the dephlegmator may be assumed to be 100% rich saturated ammonia at 40°C. The condenser and evaporator temperatures are 40°C and -20°C respectively. The absorber and generator temperatures are 30°C and 170°C respectively. The weak solution leaving the generator cools down to 50°C in the preheating heat exchanger. Determine the mass flow rates and heat transfer rates on one TR basis and the COP. Draw the schematic diagram of the system. **[16]**

Q7) a) Find the end states of isentropic compression between the saturation pressure at -20°C evaporator temperature, statel, to saturation pressure at 35°C condenser temperature, state 2 for refrigerant $CHC1F_2$. **[8]**

b) Describe the working principle of thermostatic expansion valve with the help of neat sketch. **[8]**

Q8) Write short notes on (any three) (with the help of neat sketches) : **[18]**

a) Multistage Thermo electric refrigerator.

b) Electrolux refrigerator.

c) Steam Jet Refrigerator.

d) Working of Scroll compressor and its applications.

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Total No. of Questions : 8]

SEAT No.:

P2270

[Total No. of Pages : 3

[4165]-500
M.E. (Mechanical) (Heat Power)
ADVANCED AIR CONDITIONING & HEATING & VENTILATION
(2008 Course) (Elective - II (b)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written separate answer books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Mollier charts, psychometric chart and electronic pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) What is standard psychrometric chart? Under what conditions it is applicable. **[4]**

b) Define the terms - Draft, Drop, Throw and Spread. **[4]**

c) 2 × 4 × 2 m room contains air at 35ºC DBT and 25ºC WBT. The pressure inside the room is 2 bar. Determine - **[10]**

i) Specific humidity,
ii) DPT,
iii) RH,
iv) Mass of dry air,
v) Mass of water vapour.

Q2) An air conditioned room maintained at 25ºC DBT and 50% RH has sensible load of 25kW and latent load of 5kW. The ventilation air requirement is 20% by mass. The bypass factor of cooling coil is 0.20 and ambient conditions are 40ºC. DBT and 50% RH. Determine - **[16]**

a) Mass of supply air,
b) Outside air heat load,
c) Grand total load,
d) ESHF,
e) GSHF.

P.T.O.

Q3) a) Explain the VAV system concept. List the special characteristics of VAV systems. Discuss the different VAV systems. **[10]**

b) Discuss the various types of fans and their operating characteristics used in Air Conditioning. **[6]**

Q4) Write short notes on (any four) : **[16]**

a) Humidifiers.

b) Air washer.

c) Thermal lag.

d) Year round air conditioning system.

e) Chemical dehumidification process.

SECTION - II

Q5) a) Differentiate clearly between direct and indirect evaporative cooling systems. Show the processes on chart. Explain the working of a two stage evaporative cooling system using cooling tower. **[10]**

b) Explain the procedure of duct sizing by equal friction method. Give suitable examples. **[6]**

Q6) A building has to be maintained at 21ºC (DBT) and 50% RH when the outside conditions are – 30ºC (DBT) and 100% relative humidity. The inner and outer surface heat transfer coefficients are 8.3 W/m^2. K and 34.4 W/m^2. K, respectively. A designer chooses an insulated wall that has a thermal resistance (R-value) of 0.3 m^2.K/W. Find whether the wall insulation is sufficient to prevent condensation of moisture on the surface. If the chosen R-value of the wall can lead to condensation, what is the minimum thickness of additional insulation (thermal conductivity 0.036 W/m.K) required to prevent condensation. Take the barometric pressure as 101 kPa. **[16]**

Q7) a) 900 m^3/min of recirculated air at 23ºC DBT and 12ºC DPT is adiabatically mixed with 340 m^3/min of fresh air at 30ºC DBT and 50% RH. Evaluate the enthalpy, specific volume, humidity ratio, final DBT and RH of the mixture. Draw the process on psychrometric chart. **[6]**

b) Desert air cooler is used to cool air from 47ºC DBT, 22% RH to 25ºC by evaporative cooling. Estimate the volume flow rate of air in m^3/hr and the quantity of water required per hr for cooling capacity of 3 TR. **[6]**

c) A building has a U-value of 0.5 W/m^2.K and a total exposed surface area of 384m^2. The building is subjected to an external load (only sensible) of 2 kW and an internal load of 1.2 kW (sensible). If the required internal temperature is 25ºC, state whether a cooling system is required or a heating system is required when the external temperature is 3ºC. How the results will change, if the U-value of the building is reduced to 0.36 W/m.K. **[6]**

Q8) Write short notes on (any four) : **[16]**

a) Cycling and sequence controls.

b) Solar heat gain.

c) Infiltration load.

d) Laminar flow clean rooms.

e) Static Regain method.

Total No. of Questions : 9]

SEAT No.:

P2271

[Total No. of Pages : 2

[4165]-501
M.E. (Mechanical) (Heat Power Engg.)
CONVENTIONAL POWER PLANTS
(2008 Course) (Elective - II (c)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with a neat sketch combined gas turbine and steam power plant. **[8]**

b) Discuss nozzle control governing in steam turbine. **[8]**

Q2) a) Write notes on : **[8]**

i) Moderators in a nuclear power plant.

ii) Control rods.

b) Describe the working of a nuclear power plant of BWR-type. **[8]**

Q3) a) A steam power plant operating on an ideal regenerative cycle with one open feed water heater. Steam enters the turbine at 150 bar and 600ºC and is condensed at a pressure of 10 kPa. Steam is bled at 12 bar for feed water heater. Determine the steam fraction extracted from the turbine. Also find thermal efficiency and specific steam consumption. **[10]**

b) Explain modern steam power plant. **[6]**

Q4) a) Differentiate between dry and wet cooling tower. State also the merits and demerits of each. **[8]**

b) Explain fluidised bed combustion with a suitable diagram. **[8]**

P.T.O.

Q5) Write short notes on (any three) : **[18]**

a) Diesel engine power plants.

b) Steam condensers.

c) Enrichment of nuclear fuels.

d) Losses in steam turbines.

SECTION - II

Q6) a) Discuss the present status and potential of mini and micro hydal power plants. **[8]**

b) What type of air and water pollution caused by thermal power plants. **[8]**

Q7) a) What is the need of energy storage system? Explain the various energy storage systems used. **[8]**

b) Write a note on fuel-cell. **[8]**

Q8) a) What do you mean by power plant economics? Explain fixed costs and operating costs. **[8]**

b) The incremental fuel cost for two generating units A and B of a power plant are given by the following relations.

$$\frac{dF_A}{dP_A} = 0.06 P_A + 11.4$$

$$\frac{dF_B}{dP_B} = 0.07 P_B + 10$$, where P is power in MW and F is the fuel cost in Rs/hr. Determine the economic loading of two units when the total load on the plant is 150 MW. **[8]**

Q9) Write short notes on (any three) : **[18]**

a) Load factor; diversity factor and capacity factor.

b) Instrumentation systems for thermal power plants.

c) Role of NHPC and NTPC.

d) Clean energy technology.

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Total No. of Questions : 8]

SEAT No.:

P2272

[Total No. of Pages : 2

[4165]-507
M.E. (Mechanical) (Heat Power Engg.)
CRYOGENIC ENGINEERING
(2008 Course) (Elective - III (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, Mollier charts, electronic pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) Draw a schematic diagram of Claude Cycle. Explain its operation using T-s diagram. Develop expressions for yield, work and efficiency. What is the condition of smallest work requirement per unit mass liquefied? **[16]**

Q2) a) Explain the working of Gifford McMahon Cryorefrigerator with neat diagram. **[8]**

b) Determine the ideal work requirement for liquefaction of helium beginning at 1 atm. and 300 K. Also determine the heat rejected in the ideal isothermal compressor in kJ/kg. **[8]**

Properties if Helium			
Pressure (atm)	Temperature (K)	Enthalpy (kJ/kg)	Entropy (kJ/kg.K)
1.00	4.224 (Sat. Liq)	9.711	3.454
	4.224 (Sat. Vap.)	30.13	8.287
1.00	300	1573.0	31.41

P.T.O.

Q3) a) Explain the working of Gifford McMahon Cryorefrigerator with neat diagram. **[8]**

b) Explain in detail, what is meant by J-T effect and Inversion Curve. **[8]**

Q4) Write short notes on (any three) : **[18]**

a) Magnetic Cooling.

b) Vacuum shielded vessels.

c) Collins Heat Exchanger.

d) Stirring Cycle Refrigerator.

SECTION - II

Q5) a) What is the necessity of cryogenic liquid storage? What do you understand by high performance and low performance vessels? Discuss design considerations of inner and outer vessels. **[8]**

b) Explain, briefly the variation of thermal properties of solids in cryogenic range of temperature with the help of neat sketch. **[8]**

Q6) Discuss the problems and scope of cryogenic instrumentation. Explain with neat sketches the instruments used for cryogenic measurements of **[16]**

a) Strain,

b) Flow

c) Liquid level

d) Temperature

Q7) a) Explain with neat sketches the working of different compressors and expanders used in cryogenic practice. **[12]**

b) Discuss the effect of compressor and expander efficiency on system performance. **[4]**

Q8) Write short note on (any three) : **[18]**

a) Superconducting devices.

b) Cryogenics in space technology.

c) Cryogenic applications in Medicine.

d) Dilution Refrigerator.

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Total No. of Questions : 9]

SEAT No. :

P2273

[Total No. of Pages : 2

[4165]-528

M.E. (Mechanical) (Design Engineering)

INDUSTRIAL TRIBOLOGY

(2008 Course) (Elective - IV (b)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain the mechanism of adhesive wear. Derive equation for the law of adhesive wear as proposed by Archad. Explain Rowe's modification of Archad equation. **[16]**

Q2) Derive an expression for coefficient of friction using theory proposed by Bowden and Tabor and compare it with expression obtained by modified Adhesion theory. **[16]**

Q3) Write the generalized Reynold's equation and explain the physical significance of the following terms involved in it. **[16]**

a) Physical wedge term.

b) Density wedge term.

c) Strech term.

d) Normal squeeze term.

e) Translational sequeeze term.

f) Local expansion term.

Q4) A fixed inclined slider bearing has maximum to minimum film thickness ratio as '2'. It operates under hydrodynamic condition. Derive following expression for its load carrying capacity. **[16]**

$$W = 0.156 \frac{\eta . U . L . B^2}{h_o^2}$$

P.T.O.

Where η - Viscosity of oil.
U - Sliding velocity.
L - Length of bearing.
B - Width.
h_o - Minimum oil film thickness.

Q5) Write notes on : **[18]**

a) Stick-slip vibration resulting from trictional relaxation. Its causes and remedies.

b) Piston - pin lubrication.

c) Foil bearings.

SECTION - II

Q6) Using modified Reynold's equation for elastohydrodynamic lubrication derive Ertel-Grubin equation as **[16]**

$$\frac{h_o}{R} = 1.19\left(\frac{ELR}{W}\right)^{1/11}\left(\frac{\mu_o U\alpha}{R}\right)^{8/11}$$

and state the limitations of this equation.

Q7) A circular plate of radius '*r*' is approaching an oily plane surface with a velocity 'V' at the instant the film thickness is 'h_1'. Derive an expression for the time '*t*' taken to reduce the film thickness from 'h_1', to 'h_2'. The viscosity of lubricant is 'μ'.

The plates radius is 150 mm and separated by an oil-film of 0.2 mm thickness. The viscosity of oil is 40 CP. Calculate the time taken to reduce the film thickness to 0.02 mm. If the plate carry a load of 15 kN. **[16]**

Q8) Explain tribological aspects in core of : **[16]**

a) Metal rolling.

b) Drawing operation.

c) Extrusion.

Q9) Write notes on : **[18]**

a) Gas lubricated bearings.

b) Power losses in Hydrostatic step bearing.

c) Bearing material properties.

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Total No. of Questions : 6]

SEAT No. :

P2274

[Total No. of Pages : 2

[4165]-573

M.E. (Electrical) (Control Systems)

SCADA SYSTEM & APPLICATIONS

(2008 Course) (Elective - II (c)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***All questions carry equal marks.***
3) ***Your answers will be valued as a whole.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw block diagram of SCADA system and explain its each block w.r.t. suitable example. **[15]**

b) Explain any one process control example with its ladder diagram. **[10]**

Q2) a) Draw block diagram of RTU & explain. Also state its important functions. **[15]**

b) Define Intelligent Electronic Devices (IED). State & explain IED's present in SCADA system. **[10]**

Q3) a) Compare Monolithic, Distributed & Networked SCADA Architectures. **[15]**

b) Explain various SCADA communication protocols. **[10]**

SECTION - II

Q4) a) Compare different wired and wireless communication used in SCADA. **[15]**

b) Draw seven layers of OSI model & explain in brief. **[10]**

P.T.O.

Q5) a) Explain in detail SCADA in Energy management system. **[15]**

b) Explain communication protocols used in SCADA. **[10]**

Q6) a) Explain the use of SCADA in Distribution Sector. **[15]**

b) Explain the use of SCADA in water industry. **[10]**

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Total No. of Questions : 8]

SEAT No. :

P2275

[Total No. of Pages : 2

[4165]-643
M.E. (E & TC) (VLSI Embedded Systems)
VLSI EDA TOOLS
(2008 Course) (Elective - II (c)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is Timing Analysis? Explain the details of Dynamic Timing Analysis w.r.to. a VLSI EDA Tool? **[8]**

b) What is placement and Rating? How the placement and Routing is performed? Also, give the constraints involved in it? **[8]**

Q2) a) Explain the synthesis process in detail in an EDA tool? **[8]**

b) Explain the high frequency design and the care to be taken in high frequency design? **[8]**

Q3) a) Explain the design flow in Actel Libero? **[8]**

b) Explain the design entries in VLSI Design tools? **[8]**

Q4) Write short notes on any Three : **[18]**

a) IP cores in Xilinx.

b) Stick diagrams.

c) SRC.

d) Power Estimation.

SECTION - II

Q5) a) What is Cross compiler? What are the different cross compilers available? Explain any one? **[8]**

b) What are the different Antenna design rules in VLSI design? Explain? **[8]**

P.T.O.

Q6) a) Explain different layout techniques in Magic tool? **[8]**

b) Explain different types of simulations available in various tools? **[8]**

Q7) a) What are Manufacturing tests? Explain in detail? **[8]**

b) What is cell based design? Explain with suitable example? **[8]**

Q8) Write short notes on any Three : **[18]**

a) Microwind tool.

b) GDS Files.

c) Timing Verification.

d) Leonardo Spectrum.

Total No. of Questions : 8]

P2276

SEAT No. : ____

[Total No. of Pages : 2

[4165] - 713
M.E. (Production)
(Manufacturing Engg. & Automation)
SUPPLY CHAIN MANAGEMENT
(2008 Course) (Elective - I(c)) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Define the types of distribution channel intermediaries. Describe their functions and activities. **[8]**

b) Explain Push- versus Pull-Based Supply Chain Models. **[8]**

Q2) a) "Customer service is the output of logistic and supply chain management and It is key indicator for each of the major drivers of supply chain performance" Justify. **[8]**

b) What are the problems that can arises when each stage of supply chain focuses solely on its own profits when making decisions? **[8]**

Q3) a) What are different Logistics Functions? Explain the role of each function in detail. **[8]**

b) Explain with examples the various factors that influence network design decisions. **[8]**

Q4) Write short notes on (any three) : **[18]**

a) Efficient versus responsive supply chains.

b) Customer relationship management.

c) The Bullwhip Effect.

d) Just-in-time strategy.

P.T.O.

SECTION - II

Q5) a) What are major considerations in material handling system design for warehouse? **[8]**

b) What is a transportation management system? Explain planning and optimization activities involved in transportation management system. **[8]**

Q6) a) Explain with example the impact of quantity discount on lot size and cycle inventory. **[8]**

b) How P and Q system of inventory control works? Explain with example. **[8]**

Q7) a) Explain Enterprise System Architecture in detail. **[8]**

b) Are manufactures better candidates for IT enablement than service organization? Why or Why not? **[8]**

Q8) Write short notes on (any three) : **[18]**

a) Economic order quantity.

b) Hub and Spoke model of distribution.

c) Warehouse operating principles.

d) Milk Round System (MRS).

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Total No. of Questions : 8]

SEAT No. :

P2278

[Total No. of Pages : 2

[4165] - 757
M.E. (Computer Engg.)
MOBILE COMPUTING
(2008 Course) (Elective - I (d)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II .***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the functions of an SMS Gateway.
b) Describe how a wireless PCI adopter is installed in a system (Either Linux or Windows).

[16]

Q2) a) State the particulars of a mobile which are kept in the VLR database.
b) Which are the logical channels in GSM?
c) Narrate the distinction between the following service areas:
i) GSM.
ii) PLNM.
iii) MSC.
iv) LA and
v) CELLS.

[16]

Q3) Write short notes on the following: **[18]**
a) Echo Cancellor.
b) Time organization of Control Channels.
c) Base Station System (BSS).

Q4) a) Draw a diagram showing the expanse of frame, multiframe, superframe and hyperframe for a GSM network. Show the links expanding one unit of a bigger frame into constituent parts of the next superframe in the hierarchy of frames.

P.T.O

b) State what are the following types of logical control channels intended for:

i) BCCH.

ii) CCCH and

iii) DCCH.

[16]

SECTION - II

Q5) Explain the functioning of the following: **[18]**

a) MAC Management in IEEE 802.11 Wireless LAN.

b) Mobile IP.

c) Access Router.

Q6) a) State what is meant by star, chain and multihop configurations of BTS's.

b) Why do mobile units require two IDs viz. MS - ISDN and IMSI?

c) State the logical channels in GSM.

[16]

Q7) a) What are the steps in the establishment of a MS (Mobile Station) to MS call within the same BSC (Base Station Controller). Explain the call set up drawing a suitable signal and response diagram.

b) Define the functions performed within the following procedures:

i) IMSI attach IMSI detach.

ii) Location Update.

[16]

Q8) Draw the basic reference architecture of 3GPP-R 99 network. Show the architecture of the core network in it. Give a concise meaning of 3GPP - R99 and discuss the basic network architecture and the key network elements and interfaces. Particularly state in short the functions of Um interface to access GSM Bcc and Un interface to access UTRAN. State functions of Authentication Center, Equipment Identity Register, SGSN, GMSC, GGSN and MSC. **[16]**

Total No. of Questions : 8]

SEAT No. :

P2279

[Total No. of Pages : 2

[4165] - 768

M.E. (Computer Engg.)

ADVANCED INTERNET PROGRAMMING

(Sem. - II) (2008 Course) (Elective - III (d))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II .***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Write suitable code skeleton for the following:

a) Access LDAP server using JNDI from Java.

b) Populate the LDAP server with suitable data. Highlight important clauses, interfaces, constructors, methods and packages.

[16]

Q2) Write short notes on the following: **[18]**

a) MVC Design pattern.

b) IBM servlet API.

c) JDBC.

Q3) a) With reference to the JMS API architecture, state the functions of the following:

i) JMS provider.

ii) JMS Client.

iii) Messages.

iv) Administered object.

v) Native Clients.

b) Draw a diagram showing the way the parts in (a) above interact in a JMS application.

[16]

P.T.O

Q4) a) State the sequence of steps that are needed to go through to create a bean.

b) What is meant by a manifest file?

c) How is a ready bean packed in a jar file?

d) Develop a suitable IDE for beans development.

[16]

SECTION - II

Q5) Write short notes on the following: **[18]**

a) SOAP.

b) JSR 168 API.

c) JSTL.

Q6) Draw and explain the schematic diagrams showing the layout of the following:

a) Architecture of public access provider.

b) Firewall screened internet connection.

c) Processing payments using encrypted credit cards.

[16]

Q7) a) What is the basic objective of the servlet API?

b) Show the life cycle of a servlet showing the servlet and servlet engine.

c) Write suitable code skeleton to demonstrate the use of a simple servlet which calculates the sum of two given numbers.

[16]

Q8) Write a suitable pseudo code or skeleton program to illustrate the action of a mail client to send new messages, read the messages, and search for a message. Make use of Enterprise Java Beans. (EJB s). **[16]**

Total No. of Questions : 6]

SEAT No. :

P2280

[Total No. of Pages : 2

[4165] - 438

M.E. (Civil) (Structures)

DESIGN OF FOUNDATIONS

(2008 Course) (Elective - I (d)) (Sem. - I)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any Two questions from each section.***
2) ***Use separate answerbooks for each section.***
3) ***Use of non programmable calculator is allowed***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a note on factors influencing the depth of soil exploration. State the criteria for deciding the depth of soil exploration for different types of structures. **[10]**

b) Proportion a square footing to carry a load of 1471.5kN from a column. The depth of foundation is to be kept at 2m below ground surface. Maximum permissible settlement of the footing is 40mm and a factor of safety of 3 is required against shear failure. The subsoil is sand with an average corrected N value as 18 as established from borings. Water table is at a large depth. Use Teng's correlations. **[15]**

Q2) a) Explain with an example, differences in design criteria between a flat slab raft foundation and a beam with slab raft foundation. **[20]**

b) Discuss the conditions favouring the design of shallow foundation as a raft foundation. **[5]**

Q3) a) Following are details for a testing machine with pulsator. Design a suitable foundation assuming additional data, if required. **[15]**

i) Weight of machine complex = 81.42kN

ii) Permissible bearing capacity of = 147.15kN/m^2soil (sand)

iii) Data for unbalanced forces in machine

- Moving weight of Pulsator (Wp) = 0.44kN
- Stroke length, (Sp) $\pm$ 3.5cm
- Moving weight of testing machine (Wt) = 700kg
- Stroke length (St) $\pm$ 0.5cm
- Operating frequency = 300-750 cpm

P.T.O.

iv) Permissible amplitude = 0.5mm

v) Suggested Area of base by manufacturer = 2.7m × 2.84m

vi) Height of block (assume) = 1.2m

vii) C_z corresponding to this area = 336 kN/m^2

b) Discuss the design criteria for satisfactory action of a machine foundation as per IS : 2974 (Part 1-5 : 1982) **[10]**

SECTION - II

Q4) a) A group of concrete piles is square in plan and consists of a piles each 12m long and 500mm diameter. The piles are bored piles and installed at a spacing of '3d' in a deep clay deposit having an unconfins compressive strength of 62.4 kN/m^2. At the tip of the piles and below, the undrained shear strength, Cu = 45 kN/m^2. The average unit weight of the soil and concrete are 19.2 and 22.5 kN/m^3, respectively. Estimate the total ultimate load of the pile group. **[15]**

b) Show different pile group patterns by neat sketches and determine efficiency of any two pile groups using feld Rule. Assume pile diameter 300mm and spacing of 0.8m. **[10]**

Q5) a) Design a reinforced concrete precast pile of section 300mm square, and of length 10m, fully embedded in soil having qu of 40 kN/m^2, transmitted load by end bearing, to take an axial load, the characteristic value of which is 600kN. Determine the moment of resistance of the doubly reinforced section and check its adequacy against the moment induced during handling/hoisting. Also calculate the tensile load the pile can withstand. **[20]**

b) Write a note on negative skin friction with neat sketch. **[5]**

Q6) a) Discuss the applicability of different types of shell foundations and the resulting soil structure interaction. **[10]**

b) State the design criteria for the membrane analysis for either hyper or conical RC shell. **[15]**

Total No. of Questions : 6]

SEAT No. :

P2281

[Total No. of Pages : 2

[4165]-468

M.E. (Civil) (Structure)

STRUCTURAL STABILITY

(2008 Course) (Elective - III(b)) (Sem. - II)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Your answer will be assessed as a whole.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Find the deflection of a simply supported beam subjected to a point load at distance 'c' from a end apply trigonometric series. **[18]**

b) Explain the effect of initial curvature on deflection. **[7]**

Q2) a) Using Euler's formula find the critical load in a column with one end hinged and other end fixed. **[13]**

b) Derive the relation for the deflection of beam column subjected to initial curvature. **[12]**

Q3) a) Explain : **[12]**

i) The elastica.

ii) Buckling of bar with change in cross section.

b) For a bar with continuous varying cross-section, prove $P_{cr} = mEI/L^2$ **[13]**

SECTION - II

Q4) a) Derive an expression for maximum shearing stress for a plate in pure bending. **[18]**

b) Write a note on large deflections of buckled plate. **[7]**

P.T.O.

Q5) a) Plot the numerical values of 'k' in the form of curve and table for buckling of thin plate when one side is built in and other is free. **[20]**

b) Write a note on combined bending and tension or compression of plates. **[5]**

Q6) Explain with examples : **[25]**

a) Need of dynamic stability.

b) IS codal provisions to account for elastic stability of column on elastic foundation.

c) Buckling of frames.

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Total No. of Questions : 8]

P2282

SEAT No. :

[Total No. of Pages : 2

[4165] - 639

M.E. (E&TC) (VLSI Embedded System)

NANOTECHNOLOGY

(2008 Course) (Elective - I(b)) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer to the two sections should be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Discuss the mechanical and electrical properties of nano material. **[8]**

b) Compare and contrast PVD Vs CVD. **[8]**

Q2) a) Explain different methods for producing carbon nano particles? Which is method is widely used? **[8]**

b) Define nano composite and classify nano composite. **[8]**

Q3) a) Explain why proteins called machines of biology. **[8]**

b) Consider a hard wall model of a cubical metal quantum dot having side length L = 3nm. What is the energy of transition from the (1, 1, 1) state to the (2, 2, 1) state? **[8]**

Q4) Explain :

a) Uncertainty in energy of an electron. **[6]**

b) Quantum dots. **[6]**

c) Nano crystals. **[6]**

P.T.O.

SECTION - II

Q5) a) Justify, why silicon is ideal for Micro-MEMS. **[8]**

b) Calculate the energy level of quantum dot in the form of cube 5nm on a side. Assume zero potential energy in the dot, and infinite high potential bounding the dot. Assume that $m^* = 0.045\ m_e$ in the dot material. **[8]**

Q6) a) Explain mechanical milling process for synthesis of nano particle. **[8]**

b) Explain the working of SPM. What care one need to take to achieve very high resolution using SPM? **[8]**

Q7) a) Explain working of MEMS gyroscope with neat sketch. **[8]**

b) Define the term molecular recognition and give its significance. **[8]**

Q8) a) Discuss and compare proximity contact and projection method used to pattern a substrate. **[8]**

b) What is radius of (19, 0) carbon nanotube? Repeat for (10, 10) nanotube. Consider an (n, 0) zigzag carbon nanotube that has radius 0.3523 nm. What is value of index n? **[10]**

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Total No. of Questions : 6]

SEAT No. :

P2283

[Total No. of Pages : 2

[4165] - 854
M.E. (Information Technology)
BIOINFORMATICS
(2008 Course) (Sem. - I) (Elective - I (c))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume data if required.***

SECTION - I

Q1) Answer any 2 of the following:

a) What is bioinformatics? Explain bioinformatics applications. **[9]**

b) Define secondary databases. Give an overview of the same. **[9]**

c) Explain data mining of biological databases. **[9]**

Q2) Answer any 2 of the following:

a) Explain: **[8]**

i) ORFs.

ii) Genes.

iii) Introns.

iv) Exons.

b) Discuss the central dogma of molecular biology. **[8]**

c) DNA comprises of 4 base pairs. Which code for how many codons and amino acids? Explain different types of protein structure. **[8]**

Q3) Write short notes on any 2: **[16]**

a) BLAST and FASTA. Compare.

b) Multiple sequence alignment.

c) Hidden Markov model for gene mapping.

P.T.O

SECTION - II

Q4) Answer any 2 of the following:

a) Explain 2 methods of gene prediction and give examples. **[9]**

b) What is meant by gene expression? Explain. **[9]**

c) What are the main steps in the analysis of microarray data? Discuss in detail. **[9]**

Q5) Answer any 2 of the following:

a) Why do we need protein structure visualization tools? Explain any 1 in detail. **[8]**

b) Given a gene sequence, how to find whether it is a normal gene or a diseased gene. **[8]**

c) Explain protein folding. **[8]**

Q6) Write notes on any 2: **[16]**

a) G - protein coupled receptor.

b) Cell cycle.

c) Protein structure prediction.

Total No. of Questions : 8]

SEAT No.:

P2284

[Total No. of Pages : 2

[4165]-862
M.E. (Information Technology)
ADVANCED TOPICS IN OPERATING SYSTEMS
(2008 Course) (Elective - III (b)) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Figures to the right indicate full marks.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) a) Explain the Windows architecture with neat diagram. **[8]**

b) Compare Solaris and Linux architecture. **[8]**

Q2) Explain the flow of Windows Create Process function in detail. **[18]**

Q3) a) Explain the task structure in Linux. **[8]**

b) How the light weight processes are created in Linux? Explain. **[8]**

Q4) a) Explain the Windows memory manager components. **[8]**

b) Explain segment descriptor in Linux OS. **[8]**

SECTION - II

Q5) a) Which are the different Windows file system formats? Explain. **[6]**

b) Explain the design goal and features of NTFS. **[10]**

Q6) a) Explain the concept of VFS under Linux. **[6]**

b) Explain in detail any two VFS data structures. **[10]**

Q7) a) Explain I/O system components in Windows OS. **[8]**

b) Explain the anatomy of a block device in Linux OS. **[8]**

P.T.O.

Q8) Write short notes (any three) : **[18]**

a) The bio structure.

b) PnP Manager in Windows.

c) I/O scheduler.

d) Creating device driver for Windows.

Total No. of Questions : 9]

SEAT No. :

P2285

[Total No. of Pages : 2

[4165]-520
M.E. (Mech.) (Design Engineering)
ROBOTICS
(2008 Course) (Elective - II (c)) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Question Nos.1 and 9 are compulsory. Out of the remaining attempt 2 questions from Section I and 2 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain "work volume/work space" with reference to **[9]**
i) Cylindrical co-ordinate robot.
ii) Spherical co-ordinate robot.
iii) Cartesian robot.

b) What do you understand by **[9]**
i) Point to point robot.
ii) Continuous path robot.
Explain with one application of each type.

Q2) a) For the simple Material handling robot system, the joint parameter table is as given below. Write the $[^0_5T]$ matrix in terms of the 'd' value. **[8]**

Link	$\alpha i-1$	ai–1	di	θi
1	90º	0	0	0
2	0	15	d_1	0
3	0	25	0	60º
4	45º	0	d_2	0
5	0	35	0	90º

Using Forward Kinematics Method if the end position of the gripper for this given robot is [4, 6, 10]. Determine the corresponding joint variables d_1 and d_2.

b) Discuss the term Inverse Kinematics for Manipulators in detail and explain the possibilities of arrival of alternative solutions for such type of problems. **[8]**

OR

P.T.O.

b) Derive and explain the following equation of Link Transformation Matrix as given below.
$[^{i-1}T_i] = Rot(X_{i-1}, \alpha_{i-1})\ Trans(X_{i-1}, a_{i-1})\ Rot(Z_i, \theta_i).\ Trans(Z_i, d_i)$ **[8]**

Q3) a) State Newton's equation & Euler's equation. Explain Newton-Euler dynamic formulation. **[8]**

b) Explain the Lagrangian Analysis used for understanding the dynamics of complex nature of serial link, by providing a method for easier formulation. **[8]**

Q4) a) The first joint of SCARA robot is to rotate from 30° to 60°. The initial and final angular velocities are +10 deg/sec. and -30 deg/sec. The motion is to be completed in 04 sec. Obtain the coefficients of a cubic polynomial connecting the two end positions. Obtain the cubic polynomial equation and draw the plots of position, velocity and acceleration for the given curve as a function of time. **[8]**

b) Discuss the basics of planning a trajectory in joint space and Cartesian space. **[8]**

SECTION - II

Q5) a) Explain the need for using **[7]**

i) External sensors. ii) Internal sensors.

b) Explain with neat sketch (Any three) : **[9]**

i) Potentiometer. ii) LVDT.
iii) Strain gauge. iv) Rotary encoder.
v) Microrobotics.

Q6) a) Explain low level and high level machine vision system. **[8]**

b) Explain the classification of robot controllers. **[8]**

Q7) a) Discuss various considerations in selecting actuators in a Robot. **[8]**

b) Explain illumination techniques used in machine vision system. **[8]**

Q8) a) Explain Lead Through Programming Method, used at manual mode and automatic mode for robotic systems. Also discuss the limitations of this type of programming method in detail. **[8]**

b) Give a list of commonly used Robot programming languages. Explain features of any two languages in detail. **[8]**

Q9) Write short notes on (Any 3) : **[18]**

a) Repeatibility and resolution.
b) Advantages of electric drives over other drives.
c) Considerations for evaluating suitability of a robotic application.
d) MEMS.

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Total No. of Questions : 8]

P2286

SEAT No. : ____

[Total No. of Pages : 3

[4165] - 756
M.E. (Computer Engineering)
INTERNET ROUTING DESIGN
(2008 Course) (Elective - I(c)) (Sem. - I)

Time : 3 Hours] ***[Max. Marks : 100***

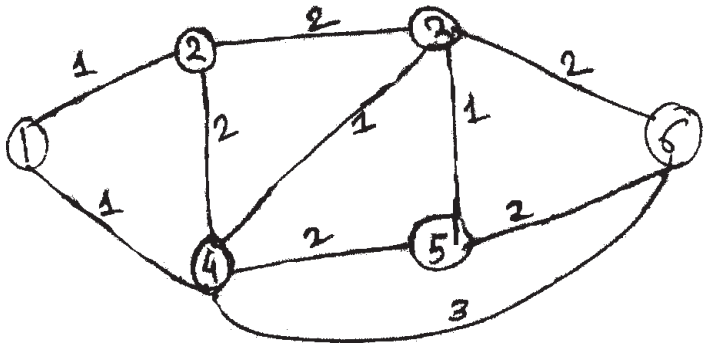
Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain in detail the IP protocol stack architecture and its relation to the OSI reference model. Discuss the protocol layering in IP architecture. **[8]**

b) Consider the topology in the following figure **[8]**



Determine the widest paths from node 6 to all other nodes using widest path algorithm (Dijkstra based). [The numbers listed next to the links are assumed to be bandwidth].

Q2) a) What are the different OSPF packet types? Explain the format for database distribution packet. Consider a five-router OSPF network. How many entries will be in the routing table at each router? How does route redistribution happen between OSPF and EIGRP. **[8]**

b) How the path selection process and aggregation and dissemination is carried out in BGP? Explain in brief. **[8]**

P.T.O.

Q3) Consider a fully connected of node network. **[16]**

a) If a distance vector protocol is used, determine how long it will take for all nodes to have the same routing information if updates are done every 10 sec.

b) If a link state protocol is used, how long will it take before every node has the identical link - state database if flooding is done every 5 sec. Determine how many link-state messages in total are flooded till the time when all nodes have the identical database.

Q4) a) Explain shared forwarding engine router architecture with neat diagram. How is it different than shared nothing architecture? **[6]**

b) Discuss the role of Ases (Autonomous systems) and BGP in routing. Describe the current architectural view of the Internet. How Ases are related to ISPs? **[8]**

c) What are the basic functions of a router? Discuss the various types of the router. **[4]**

SECTION - II

Q5) a) Construct the Lulea compressed trie data structure for the prefixes in the following table. **[8]**

Prefix label	Prefix
P1	0*
P2	00001*
P3	001*
P4	1*
P5	1000*
P6	1001*
P7	1010*
P8	1011*
P9	111*

How searching is done in Lulea compressed trie?

b) For the rules shown in the following table, construct a hierarchical trie. What is the best matching rule for a packet with F1 = 0011 and F2 = 0011? How many memory accesses are required? **[8]**

A two-field classifier

Rule	F1	F2
R1	0*	10*
R2	0*	01*
R3	0*	1*
R4	00*	1*
R5	00*	11*
R6	10*	1*
R7	11*	00*
R8	*	00*

Q6) a) Describe and compare QOSPF and PNNI routing protocols for QOS routing. **[8]**

b) What are the various QOS attributes? For QOS routing, it is more appropriate to perform a routing computation periodically than on a per-call-basis and build a routing table. Justify. **[8]**

Q7) a) Discuss where and how MPLS. based IP/MPLS traffic engineering is different from "pure" IP traffic engineering. **[8]**

b) How the network flow modeling approach is used for LSP path determination in VPN traffic engineering? Explain with suitable examples. **[8]**

Q8) Write short notes on any three of the following : **[18]**

a) PSTN call routing managed IP approach.

b) Routing/traffic engineering for voice over MPLS.

c) Network algorithms and algorithmics.

d) Network management and network topology architecture.

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Total No. of Questions : 8]

P2287

SEAT No. :

[Total No. of Pages : 2

[4165] - 149
M.E. (Electronics / E&TC)
(Common to DSD and Microwave)
MICROELECTRONICS
(2002 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is Domino Logic? Explain operation of Domino and Gate. **[8]**

b) Write VHDL code for mod-10 synchronous counter. **[8]**

Q2) With the help of suitable diagram explain the regions of CMOS Inverter discuss in detail device state in each region and corresponding VI characteristics . What is the effect of B_n/B_p ratio on transfer characteristics.**[16]**

Q3) a) What is mean by transistor sizing? Derive the relationship between width of n & p banks of MOSFET. **[8]**

b) Design a moore machine (synchronous) to detect over lapped 1101 sequence. **[8]**

Q4) Write short notes on : **[18]**

a) Different styles of VHDL modeling.

b) Programmable devices.

c) Advance tools used in VLSI.

P.T.O.

SECTION - II

Q5) a) What is transmission gate? How it works? Explain in detail applization of transmission gates. **[8]**

b) Draw and explain about FPGA. **[8]**

Q6) a) What is mean by Power, Area and bandwidth optimazation in VLSI circuit, explain the techniques in short. **[9]**

b) Draw a transistor schematic of two input NOR gate and its stick diagram. **[7]**

Q7) a) Draw and explain about the boundary scan, JTAG & their standards. **[8]**

b) What is clock skew? Explain the task of clock distribution? Give the details about the physical clocking networks. **[8]**

Q8) Write short notes on : **[18]**

a) Subsystem design principal.

b) Test Bench, their types & utility.

c) Merits of multicontext FPGA.

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Total No. of Questions : 6]

SEAT No. :

P2317

[Total No. of Pages : 2

[4165]-43
M.E. (Civil) (Structures)
STRUCTURAL STABILITY
(2002 Course) (Elective - II (b))

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer sheets.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Your answer will be assessed as a whole.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find the deflection of a simply supported beam subjected to a point load at distance 'c' from a end apply trigonometric series. **[18]**

b) Explain the effect of initial curvature on deflection. **[7]**

Q2) a) Using Euler's formula find the critical load in a column with one end hinged and other end fixed. **[13]**

b) Derive the relation for the deflection of beam column subjected to initial curvature. **[12]**

Q3) a) Explain : **[12]**

i) The elastica.

ii) Buckling of bar with change in cross section.

b) For a bar with continuous varying cross-section, prove $P_{cr} = mEI/L^2$. **[13]**

SECTION - II

Q4) a) Derive an expression for maximum shearing stress for a plate in pure bending. **[18]**

b) Write a note on large deflections of buckled plate. **[7]**

P.T.O.

Q5) a) Plot the numerical values of 'k' in the form of curve and table for buckling of thin plate when one side is built in and other is free. **[20]**

b) Write a note on combined bending and tension or compression of plates. **[5]**

Q6) Explain with examples : **[25]**

a) Need of dynamic stability.

b) IS codal provisions to account for elastic stability of column on elastic foundation.

c) Buckling of frames.

Total No. of Questions : 6]

SEAT No. :

P2318

[Total No. of Pages : 2

[4165]-247

M.E. Instrumentation (Process Control and Biomedical Instrumentation)

ADVANCED TECHNIQUES IN MODELING & OPTIMIZATION

(2002 Course)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any 2 questions from Section - I and Section - II***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator and steam table is allowed.***
6) ***Your answer will be valued as a whole.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Explain necessity of modeling. State Fundamental Laws used to develop mathematical model. Discuss the modeling of binary distillation column. Also calculate degree of freedom for the same. **[25]**

Q2) What do you mean by Empirical modeling? List different methods of empirical modeling. Explain Step Testing and ATV identification technique in detail along with their advantages and disadvantages. **[25]**

Q3) What do you mean by Simulation and validation of models. Explain importance of these terms. Explain Newton-Raphson and Euler method in detail. **[25]**

SECTION - II

Q4) What is optimization? Explain different features of optimization problem. The Labour cost data for mild-steel floating head exchangers for 0-500psig working pressure is given below. **[25]**

P.T.O.

Labour Cost (Rs.)	Area (A)	Number of Tubes (N)
310	120	550
300	130	600
275	108	520
250	110	420
220	84	400
200	90	300
190	80	230
150	55	120
140	64	190
100	50	100

Fit the data using Least square method for C = b_1 + b_2 N + b_3A. The repressors' are $x_1 = 1$, x_2 = N and x_3 = A.

Q5) Explain in details the steps used to solve a minimization problem. (with reference to any suitable method of minimization) and find the minimum value of $w = 3x_1 + 2x_2$

Subject to the constraints

$2x_1 + x_2 \geq 6$

$x_1 + x_2 \geq 4$

Where $x_1 = 0$ and $x_2 = 0$. **[25]**

Q6) a) Define Convexity, Concavity, positive definite, positive semidefinite, negative definite, negative semidefinite function. **[10]**

State whether following functions are Convex or Concave also state positive definite, positive semidefinite, negative definite, negative semidefinite

i) $F(x) = 3x^2$

ii) $F(x) = 2x$

iii) $F(x) = -5x^2$

iv) $F(x) = 2x^2 - x^3$

b) Maximize : $f = x_1 + 3x_2$ **[15]**

Subject to : $-x_1 + x_2 + x_3 = 1$

$x_1 + x_2 = 2$

$x_i \geq 0$; i = 1, ----, 4 where x_3 and x_4 are slack variable.

Total No. of Questions : 10]

SEAT No. :

P2319

[Total No. of Pages : 2

[4165] - 491

M.E. (Civil) (Environmental Engineering)

ENVIRONMENTAL SANITATION

(2008 Course) (Elective - IV(b)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the diseases communicated by the discharges of intestines & give names of microorganisms involve in it, specify also the control measure to be taken. **[8]**

b) Define the term Communicable disease, List down the communicable diseases & their mode of transmission. **[8]**

Q2) a) Explain various fly control methods & prevention of fly breeding. **[8]**

b) Explain the life cycle of mosquito & describe natural and chemical methods of mosquito control. **[8]**

Q3) a) Describe in detail methods adopted to control plague. **[8]**

b) List out various breeding sites of flies; explain how you will achieve an effective fly control in your house? **[8]**

Q4) a) What are the basic principles of Industrial sanitation. **[8]**

b) How will you achieve sanitation in case of, **[8]**

i) Railway station (Junction). ii) Restaurants

Q5) a) Explain how Rodents are affects the public health. **[9]**

b) What is mean by "Disinfectants", explain the commonly used disinfectants. **[9]**

P.T.O.

SECTION - II

Q6) a) Explain working environment & hazards related to working environment. **[8]**

b) Discuss & explain various factors are considered in detail sanitation of Industrial plants. **[8]**

Q7) a) Discuss in detail the various constraints that to be faced in achieving well sanitation in rural areas. **[8]**

b) Discuss in detail about "Rural sanitation improvement schemes" by our government. **[8]**

Q8) a) Explain how poor sanitation practices are affects water quality. **[8]**

b) Write in details about various low cost treatments of sewage used in relation with Indian conditions. **[8]**

Q9) a) Explain the measures taken to prevent poisoning by industrial poisons. **[8]**

b) Discuss sanitation of canteens in factories & its relation with workers health. **[8]**

Q10) Write note on: **[18]**

a) Low cost sanitation for low cost housing.

b) Backyard gardens in rural area.

c) National Rural Health Mission (NRHM).

Total No. of Questions : 6]

SEAT No. :

P2320

[Total No. of Pages : 2

[4165]-595

M.E. (Electrical) (Power Systems)

POWER QUALITY ASSESSMENT AND MITIGATION

(2008 Course) (Elective - IV (a)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain why power quality issues are becoming important in today's context. **[8]**

b) Explain various definitions of power quality as per IEEE Std 1159. **[9]**

c) Explain problems due to poor grounding and good grounding practices. **[8]**

Q2) a) Explain sources, effects of voltage flicker and various mitigation techniques. What are the factors which governs severity of flicker. Explain short term and long term flicker indices. **[15]**

b) Explain impulsive and oscillatory transients, their sources, effects and techniques to control oscillatory transients. **[10]**

Q3) a) Explain various sources of voltage sag, characteristics of voltage sag and their effects. **[12]**

b) Explain End user side voltage sag mitigation measures. **[13]**

SECTION - II

Q4) a) Explain in detail series and parallel resonances due to harmonic present in system and various consequences of resonances. **[9]**

P.T.O.

b) Explain principles of controlling harmonics and various harmonic filters with advantages and disadvantages. Explain step wise procedure of locating sources of harmonics. **[16]**

Q5) a) Explain in detail power quality monitoring objectives and approaches. **[8]**

b) Explain detailed stepwise procedure to monitor power quality and various equipments used for power quality monitoring. Explain selection of transducers. **[17]**

Q6) a) Explain power quality state estimation and capabilities of harmonic state estimation. **[12]**

b) Explain various power quality indices and standards for assessment of disturbances. **[13]**

Total No. of Questions : 8] **SEAT No. :**

P2321 **[Total No. of Pages : 2**

[4165] - 651

M.E. (E & TC) (VLSI & Embedded Systems)

SYSTEM ON CHIP

(2008 Course) (Elective IV(b)) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer to the two sections should be written in separate answer books.***
2) ***Answer any THREE Questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***For metal-2: $C_{metal\text{-}2,\ plate} = 0.02fF/\mu m^2$, $C_{metal\text{-}2,\ fringe} = 0.06fF/\mu m$.***

SECTION - I

Q1) a) Differentiate depletion Vs enhancement MOSFET. Which is preferred in CMOS fabrication? Why? **[8]**

b) What do you mean by glitch? Explain its effect in chain of adders? How it can be rectified? **[8]**

Q2) a) Differentiate: RC Vs RLC model for interconnect? Explain Ismile and Fredman's contribution in regard to inductive delay. **[8]**

b) Explain "dogleg" algorithm? What are advantages of this algorithm on its other counterparts. **[8]**

Q3) a) Prove that LOW to HIGH transition is ½ to ⅓ the speed of HIGH to LOW transition? **[8]**

b) Explain hierarchy of design abstraction? Draw logic diagram of full adder. Draw four bit adder from full adder. Name each component in full adder and define four bit adder as a type. Draw the component hierarchy, showing the four bit adder, the full adder and logic gates. **[8]**

Q4) Explain:

a) Why n-diffusion to p-diffusion spacing is so large? **[6]**

b) Why is metal-metal spacing is large than poly-poly spacing? **[6]**

c) Why is metal2-metal2 spacing is larger than metal1-metal1 spacing? **[6]**

P.T.O.

SECTION - II

Q5) a) What is maximum allowable skew as predicated by Hatiman and Cash constraint for the parameter values : T = 10 ns, t_{pr} = 1 ns, t_{sr} = 1 ns, t_{sl} = 1ns, t_{pl} = 5 ns, t_{pi} = 5 ns. What is minimum allowable clock period under that value of skew? **[8]**

b) List out different power estimation tools & tabulate their features. **[8]**

Q6) a) A chip core is 3000 λ X 2500 λ and required 0.8 A. It needs single input and 19 single output pads. **[8]**

i) How many V_{DD} and V_{SS} pad are required assuming 12 λ power ring?

ii) Will the total chip size be limited by the chip core or by pad ring?

b) The code fragmented is repeatedly executed: **[8]**

```
If (i1) {
        c = a – b;
        d = a + b;
          }
Else {
        c = a + e;
        }
```

i1 is one bit primary input to the system, e is an n-bit primary input and a, b, c and d are all stored in n-bit registers. Assume that e is magically available when required by hardware.

i) Design data path with one ALU which executes this code.

ii) Design a controller which executes the code on designed data path.

Q7) a) Do the two phases of a two phase, non overlapping clock have to be of equal length? **[8]**

b) Plot the Elmore delay for metal -1 wire of size 4000 λ X 4 λ using: **[8]**

i) 2-sections ii) 4-sections iii) 8-sections

Q8) a) Define layout routing? How automatic layout routing is playing important role in CMOS fabrication. **[8]**

b) A chip core is 3000 λ X 2500 λ and required 0.8A. It needs 18 single input and 19 single output pads. **[10]**

i) How many V_{DD} and V_{SS} pad are required assuming 12 λ power ring?

ii) Will the total chip size be limited by the chip core or by pad ring?

Total No. of Questions : 8]

SEAT No. :

P2322

[Total No. of Pages : 2

[4165] - 749

M.E. (Production) (CAD/CAM)

DESIGN OF EXPERIMENTS AND RESEARCH METHODOLOGY

(2008 Course) (Elective IV(c)) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve any three Questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) What is Research and Scientific enquiry? Explain in brief the types of research, scientific method, research process and steps in it. **[10]**

b) What is a research proposal? Explain. **[6]**

Q2) a) How do you define a Research Problem? Comment on Research problem solving. **[8]**

b) Explain in brief the Brain storming and Delphi method as the group problem solving technique. **[8]**

Q3) a) What is mathematical research modelling? Explain in brief the data consideration and testing of models? **[8]**

b) Explain the steps and features of simulation experiments and their validation. **[8]**

Q4) Write short note on any three of the following: **[18]**

a) Legal aspects in Research Proposals.

b) Research Design.

c) Research Problem solving approaches.

d) Heuristic methods in Research Modelling.

P.T.O.

SECTION - II

Q5) a) Explain in brief the guidelines for designing experiments. **[6]**

b) Explain 'Replication', 'Randomization' and 'Blocking' in experimentation. **[10]**

Q6) a) What is process optimization? Explain in brief the factorial design principles. **[8]**

b) Explain fitting response curves and surfaces in process optimization. **[8]**

Q7) a) What is Parametric and Non-Parametric tests in hypothesis testing? Explain. **[8]**

b) Explain pre-writing considerations and principles of thesis writing. **[8]**

Q8) Write short note on any three of the following: **[18]**

a) Design of Experiments.

b) Taguchi approach to parameter design.

c) Analysis of variance and co-variance.

d) Format of Report writing.

Total No. of Questions : 8]

SEAT No. :

P2323

[Total No. of Pages : 2

[4165] - 750

M.E. (Production) (CAD/CAM)

COMPUTATIONAL FLUID DYNAMICS

(Sem. - II) (2008 Course) (Elective IV(d))

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Solve Section I and Section II in separate answer books.***
2) ***Solve any Three Questions from each section.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the concept of CFD as the third dimension of fluid mechanics. **[6]**

b) What is numerical discretization? What are different numerical discretization methods? Explain FEM numerical discretization method. **[10]**

Q2) a) What are basic equations of fluid dynamics? Explain the Navier Stokes Equations in the context of computational fluid dynamics. **[10]**

b) Explain the terms 'Potential flow' and 'nonlinear Potential flow'. **[6]**

Q3) a) What are numerical methods for convection? What are diffusion equations? Explain. **[8]**

b) Explain Upwinding and central difference schemes for convection. **[8]**

Q4) Write short notes on any three of the following: **[18]**

a) FVM

b) Inviscid flows and viscous flows.

c) Courant number.

d) Primitive variable vs. conservation form.

P.T.O.

SECTION - II

Q5) Explain characteristic form of equations for inviscid flows. Explain how flux difference splitting works. Explain its application to 2-D flow through a nozzle. **[16]**

Q6) a) In the context of Incompressible flow, explain the continuity equation and divergence constraint. **[10]**

b) Explain Poisson equation for pressure for incompressible flows. **[6]**

Q7) a) What is a turbulence model in Computational Fluid Dynamics? Explain High and Low Reynold number models. **[8]**

b) Explain how fluid flow and heat transfer is predicted using standard codes. **[8]**

Q8) Write short note on any three of the following: **[18]**

a) Numerical methods for Inviscid flow.

b) SIMPLE Scheme due to Patankar and Spalding.

c) One equation model.

d) K-I Models.

Total No. of Questions : 8]

P2324

SEAT No. : ____

[Total No. of Pages : 2

[4165] - 807
M.E. (Chemical)
PROCESS OPTIMIZATION
(Sem. - II) (2008 Course) (Elective - IV (b))

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Minimize $f(x) = x^3 + (9/(2+x)) + (1/(3+x^2))$. Use Fibonacci Search Method. Write complete algorithm for this method and demonstrate at least 3 steps towards finding optimized solution for the above function. Do not try to solve it completely. **[17]**

Q2) Minimize $f(x) = 10x^5 - 2x^4 + 5x + 40$ in the interval [-8 8]. Use Secant Method. Write complete algorithm for this method and demonstrate at least 3 steps towards finding optimized solution for the above function. **[17]**

Q3) A typical plug flow reactor is an example of a set of ordinary and partial differential equations. The typical constraints on such a problem are of physical type based on dimensions of units, of system type based on the physicochemical considerations. Considering above, construct a problem around a plug flow reactor and identify the objective function, constraints. Also discuss the strategy to get optimized solution out of it. **[16]**

Q4) Write short notes (any Three) : **[16]**

a) Gradient based search.
b) Concavity Vs Convexity of a function.
c) Parameters used in reactor optimization.
d) Nonlinear constraints.

P.T.O.

SECTION - II

Q5) Minimize $f(x) = (x_1 - 8)^2 + x_2^2$
Subject to linear constraints
$x_1 \geq 0$, $x_2 \geq (-10)$, $7 - 2x_1 - x_2 \geq 0$, $24 - 3x_1 - 2x_2 \leq 0$ **[17]**

Q6) State various conditions of definiteness of a function using Hessian matrix. Find whether the following function is strictly convex / strictly concave.
$f(x) = 2x_1^2 + 5x_1x_2 + 12x_1 + 13x_2 - 4x_2^2 + 9$ **[17]**

Q7) A distillation column has available two feed streams that have the yields shown in the table. Because of equipment and storage limitations, production of butane, toluene and hexane must be limited as shown in the table. The profit on processing feed no. 1 is Rs. 25/ton and on feed no. 2 it is Rs. 15/ ton. Find the approximate optimum daily feed rates of the two feeds to the distillation column. **[16]**

	Volume percent yield		Maximum allowable rate, tons/day
	Feed no. 1	Feed no. 2	
Butane	55	35	3500
Toluene	25	48	2900
Hexane	20	17	8000

Q8) Write short notes (any Three) : **[16]**

a) Genetic Algorithms.
b) Sufficient Conditions.
c) Weighted parameters.
d) Langrange's Multipliers.

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Total No. of Questions : 8]

P2325

SEAT No. : ____

[Total No. of Pages : 2

[4165] - 808
M.E. (Chemical)
FUEL CELL TECHNOLOGY
(2008 Course) (Sem. - II) (Elective - IV(C))

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Solve any three questions from each section.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Derive Tafel equation relating overpotential in a fuel cell to the current generated in the external circuit, from first principles. **[17]**

Q2) Explain in details the principle on which a fuel cell is designed. Give details of general electrode reactions and emf generated in such a cell. **[17]**

Q3) a) Calculate the current in amperes required to liberate silver completely from a solution containing 7.5×10^{-3} kg of $AgNO_3$ in one hour. (E.C.E. of Ag = 1.118×10^{-3} kg/C, Atomic Mass of Ag = 108, N = 14, O = 16). **[8]**

b) Describe the construction and working of polymer electrolyte membrane fuel cell. **[8]**

Q4) Write short notes on any Three : **[16]**

a) Electrolyte conductivity.

b) Faraday's Law.

c) Helmholtz plane.

d) Application of Fick's Law in Electrochemistry.

P.T.O.

SECTION - II

Q5) Describe improvements in the fuel cell performance of present day hydrogen & oxygen based fuel cell over coal derived fuel gas based fuel cell at premature stages of development of fuel cells. **[17]**

Q6) Describe completely the mechanism of current generation around electrode by oxidation reduction reaction phenomena. Explain with the help of a proper diagram. Also write down the mathematical model equations at every step in the mechanism. **[17]**

Q7) What are various applications of fuel cells? What are the problems in commercializing them for onshore applications? **[16]**

Q8) Write short notes on any Three : **[16]**

a) Rotating Disc Electrode.

b) Ohmic Polarization.

c) Nernst Equation for single electrode potential.

d) Half Cell Potential.

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Total No. of Questions : 8]

P2326

SEAT No. : [ ]

[Total No. of Pages : 3

[4165] - 808-A
M.E. (Chemical)
INDUSTRIAL POLLUTION CONTROL
(2008 Course) (Elective - IV (d)) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Sulphur dioxide is emmitted through a stack 50m high and 2m diameter at the exit at a temperature of 120°C. With a velocity of 10 m/s. The sulphur dioxide emission rate is 200 g/s. Show how the ground level concentration at a downwind distance of 1 km varies with wind speed for stability category D when the pressure is 1000 m bar and the ambient temperature is 25°C. The constants are A = 0.13, B = 0.105, P = 0.827. **[10]**

b) Explain various types of plame behavior with neat sketches. **[8]**

Q2) a) Explain various air pollution control methods. **[8]**

b) A cylindrical electro static precipitater of 0.3m dia is used for separating pulverized coal fly ash particles from a furnace gas stream. If the volumetric flow rate of the gas is 0.05 m^3/s. What will be the length of the precipitater for obtaining collection efficiency of 99.90%. What percent change in electrode collection area is required to increase the collection efficiency from 99.90 to 99.95%. **[8]**

P.T.O.

Q3) a) A settling test was conducted in a 40 cm high cylindrical jar. The following data was obtained.

Interface height cm	40	22	14	11	10	9	8.5
Time, min	0	5	10	15	20	25	30

The initial concentration of solids was 3000 mg/lit. Determine the thickner area if an under flow concentration of 20,000 mg/lit is desired. The sludge is to be settled in a continuous flow unit operated at a rate of 0.03 m^3/s. **[10]**

b) Explain the phenomena of inversion. **[6]**

Q4) Explain in detail the environmental pollution caused by a fertilizer industry and discuss the various methods and equipments which can be used for controlling the pollution. **[16]**

SECTION - II

Q5) An activated sludge system is to be disigned for secondary treatment of 10,000 m^3/d of municipal waste water. After primary clarification the BOD is 150 mg/L and it is desired to have not more than 5 mg/L of soluble BOD in the effluent. A completely mixed reactor is to be used and pilot plant analysis has established the following kinetic values Y = 0.50 kg/kg, $K_d = 0.05\ d^{-1}$. Assuming an MLSS concentration of 3,000 mg/L and an underflow concentration of 10,000 mg/L from the secondary clarifier, determine **[16]**

a) The volume of the reactor.

b) The mass and volume of solids that must be wasted each day.

c) The recycle ratio.

Q6) a) A municipal waste having a BOD_5 of 200 mg/L is to be treated by two stage trickling filters. The desired effluent quality is 25 mg/L of BOD_5. If both the filter depths are to be 6 ft and the recirculation ratio 2:1, find the required filter diameters waste water temperature is 20°C. Flow rate of effluent is 2M gal/day. $E_1 = E_2$. **[12]**

b) Explain the phenomena of bulking in activated sludge process. **[6]**

Q7) a) Explain incineration and composting. **[8]**

b) Explain various processing techniques used in solid waste management. **[8]**

Q8) a) Write a note on waste management hierarchy. **[6]**

b) Explain various methods of land filling. **[10]**

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Total No. of Questions : 8]

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SEAT No. : ____

[Total No. of Pages : 3

[4165] - 669
M.E. (E&TC) (Signal Processing)
RADAR & SATELLITE SIGNAL PROCESSING
(2008 Course) (Elective - IV (a)) (Sem. - II)

Time : 3 Hours] ***[Max. Marks : 100***

Instructions to the candidates:

1) ***Q. 1 & Q.5 are compulsory.***
2) ***Solve any two questions from Q.2, Q.3 & Q.4 for section - I.***
3) ***Solve any two questions from Q.6, Q.7 & Q.8 for section - II.***
4) ***Answers to the two sections should be written in separate books.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Figures to the right indicate full marks.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the basic principles of a radar system with neat block diagram. Give the limitations and applications of radars. **[6]**

b) Derive the radar range equation? Explain the factors that affect the maximum range of radar. **[8]**

c) Use the radar range to determine the required transmitted power for the TRACS radar given : **[4]**
$S_{min} = 10^{-13}$ watts, G = 2000, λ = 0.23m, PRF = 524 & σ = 2.0 m^2.

Q2) a) Explain with neat block diagram the working principle of Moving Target Indicator (MTI) radar. Also explain the concept of Blind speeds. **[8]**

b) A MTI radar operates at 8 GHz with a PRF of 950 pps. Calculate the lowest three blind speeds of this radar. **[4]**

c) Explain the concept of Doppler effect associated with moving targets with mathematical relevance. **[4]**

Q3) a) With respect to Pulsed Doppler radar explain the following : **[6]**
i) Correlation ii) Convolution

b) Explain the concept of "Digital filtering". **[6]**

c) Differentiate between Continuous Wave & Pulsed radar systems. **[4]**

P.T.O.

Q4) Write short notes on : **[16]**

a) Radar antennas.

b) Radar Clutter.

c) Secondary radar system.

d) Radar tracking.

SECTION - II

Q5) a) With respect to satellite communication explain the following multiple access techniques : **[8]**

i) SDMA ii) Random Access

b) Orbital measurements for italian satellite SIRIO is as follows : **[10]**

Semimajor axis = 42, 167.911 km; Eccentricity = 0.00033;

Mean Anmaly = 28.3866°. Assume μ = 398,600.5 km^2/sec^2

Determine :

i) The orbital period in hours, mins & secs.

ii) The mean orbital angular velocity in rad/sec.

iii) The max. & min. distance of the spacecraft from the centre of the earth during each orbital revolution.

iv) The time of next perigee passage after 00:00:00.

Q6) a) Comment on various interferances and noise sources in satellite communication system. **[6]**

b) A satellite in geostationary orbit serves an elliptical zone on earth's surface. The major & minor axis of ellipse subtends angles of 3.6° and 2.4° at the satellite. The satellite has separate antennas for uplink and downlink operating at frequencies 14.1 GHz & 11.5 GHz respectively. Assume antennas are having rectangular aperatures : **[6]**

i) Estimate dimension of antenna when the 3dB points of antenna beams in the principle plane lies at the edges of the coverage zone.

ii) Estimate the gain of each antenna.

c) Enlist the advantages and limitations for the satellite communication systems. **[4]**

Q7) a) Explain with neat block diagram & relevant waveforms Minimum Shift Keying (MSK). **[8]**

b) Obtain the error probabilities for BPSK & QPSK. Comment on the results. **[8]**

Q8) Write short notes on : **[16]**

a) Satellite Orbits.

b) Quadrature Phase Shift Keying (QPSK).

c) ALOHA forms of RMA.

d) Digital transmission of Analog signals.

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