[4262] – 160-C

Seat No.	

S.E. (Electronics and Telecommunication) Examination, 2012
ELECTRICAL CIRCUITS AND MACHINES
(2003 Course)

Time : 3 Hours Max. Marks : 100

N.B. : 1) *Answer* ***three*** *questions from Section* ***I*** *and* ***three*** *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) *Figures to the* ***right*** *indicate* ***full*** *marks.*
5) *Use of electronic pocket calculator is* ***allowed****.*
6) *Assume suitable data, if necessary.*

SECTION – I

1. a) Explain the difference between ideal and practical transformer. Derive step by step exact equivalent ckt of the transformer hence further derive approximate equivalent ckt. **10**

b) A single phase 40 KVA, 6600V/250V, transformer has primary and secondary resistances $R_1 = 10\ \Omega$ and $R_2 = 0.02\ \Omega$ respectively. The equivalent leakage reactance as referred to primary is 35Ω. Find the full load regulation for the load power factor of

i) unity

ii) 0.8 lagging and

iii) 0.8 leading **6**

OR

2. a) Explain open ckt and short-ckt test to be performed on transformer with neat ckt diagram. What information we are getting from the observations ? **8**

b) Write short notes on :

i) Auto Transformer

ii) Ferrite core transformer. **8**

3. a) Explain speed control methods of DC series motor above and below normal with neat ckt diagram. **8**

P.T.O.

b) A 230 V, dc series motor has an armature ckt resistance of 0.2 Ω and series field resistance of 0.1 Ω. At rated voltage, the motor draws a line current of 40 A and runs at a speed of 1000 rpm. Find the speed of the motor for a line current of 20 A at 230 V. Assume that the flux at 20 A line current is 60% of the flux at a 40 A line current. **8**

OR

4. a) Explain why starter is necessary for DC shunt motor and draw neat diagram of three point starter. What are the functions of No volt coil and over load coil ? **10**

b) Write short note on losses in a dc machine. **6**

5. a) Explain with neat ckt diagram and phasor diagram how total active power can be measured using two wattmeter method in a 3 phase balanced star connected inductive load. **8**

b) What is energy audit ? Why it is essential ? **4**

c) During the measurement of power by two wattmeter method, the total input power to a three phase, 440V motor running at a power factor of 0.8, was found to be 25 kW. Find the readings of the two wattmeters. **6**

OR

6. a) Explain with neat connection and phasor diagram how total reactive power can be measured using single wattmeter in a three phase balanced load circuit. Write down expression for wattmeter reading. **6**

b) The input power to a 1.6 kV, 50 Hz, three phase motor is measured by using two wattmeter method. The motor is running on full load with an efficiency of 86%. The readings of the two wattmeters are 255 kW and 85 kW. Determine

i) the input power

ii) the power factor

iii) the line current

iv) the output power. **8**

c) What are the advantages of using three phase system over single phase system ? **4**

SECTION – II

7. a) What is the necessity of starter for three phase Induction motor ? Sketch and explain rotor resistance starter. **8**

b) The induced emt between the slip ring terminals of a three phase induction motor, when the rotor is stand still, is 100 V. The rotor windings are star connected and have resistance and standstill reactance of 0.05 Ω and 0.1 Ω pre phase respectively. Calculate the rotor current and phase difference between the rotor voltage and rotor current at (i) 4 % slip and (ii) 100 % slip. **8**

OR

8. a) Draw power flow diagram and derive the relationship between slip, rotor copper loss and rotor input for a three phase induction motor. **8**

b) A three phase, 4 pole induction motor supplies a useful torque of 160 Nm at 5 % slip. The stator losses are 1000 W and the friction and windage losses are 500 W. Calculate (i) the rotor input (ii) the motor input and (iii) the efficiency. **8**

9. a) Compare salient pole and non salient pole construction of 3 phase alternator. **4**

b) Define voltage regulation of alternator. Explain its significance. **4**

c) A 50 KVA, 500 V, 3 phase star connected alternator has an armature resistance and synchronous reactance of 0.4 Ω and 2 Ω respectively per phase. Find the regulation when the alternator delivers its rated output at

i) 0.8 lagging power factor

ii) 0.8 leading power factor. **8**

OR

10. a) Why three phase synchronous motors are not self starting ? **4**

b) Explain any two methods used to make synchronous motor self starting. **6**

c) What is hunting ? How it is minimized ? **6**

11. a) Explain the construction, working and application of universal motor. **6**

b) Explain the construction, working and application of reluctance motor. **6**

c) Explain the construction and working of permanent magnet stepper motor. **6**

OR

12. Write short notes on (**any three**) : **18**

a) Comparision between AC and DC servo motor

b) Shaded pole induction motor

c) Hysteresis motor

d) AC series motor.

[4262] – 113A

Seat No.	

S.E. (Mechanical/Mech. S/W) Examination, 2012
FLUID MECHANICS
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*
2) Neat diagrams must be drawn ***wherever*** *necessary.*
3) Black 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

Unit – I

1. a) Explain how viscosity of liquids decreases white that of gases increases with size in temperature. **4**

b) A circular disc of diameter 'd' is slowly rotated in a liquid of large viscosity 'μ' at a small distance 'h' from a fixed surface. Derive an expression for torque 'T' necessary to maintain an angular velocity of 'ω' in the form

$$T = \frac{\pi\mu\omega d^4}{32h}.$$ **8**

c) Explain the following terms : **6**

i) Surface tension ii) Compressibility.

OR

2. a) Determine the stream function if the velocity components of a two dimensional incompressible fluid flow are given as

$$u = y^3/3 + 2x - x^2y$$

$$v = xy^2 - 2y - x^3/3$$ **8**

b) Enlist the various types of fluid flow and explain laminar flow and turbulent flow. **6**

c) What is path lines, streak lines ? **4**

P.T.O.

Unit – II

3. a) Define metacentre and metacentric height. How they are important in case of floating body ? **4**

   b) A wooden block of relative density 0.7 has width 15 cm, depth 30 cm and length 150 cm. It floats horizontally on the surface of sea water (density = 1000 kg/m^3) calculate the volume of water displaced, depth of immersion and the position of centre of buoyancy. Also find the metacentric height. **8**

   c) Write a short note on stability of submerged bodies. **4**

OR

4. a) State and explain Pascal's law. **4**

   b) A square plate 6 m $\times$ 6 m is placed in a liquid of specific gravity 0.8 at an angle of 30° with free surface. A square hole 1.5 m $\times$ 1.5 m is set exactly in the centre of the plate. Its greatest and the least depths below liquid surface are 4 m and 2 m respectively. Determine the total pressure on one of the plate and position of centre of pressure. **10**

   c) Define centre of pressure and total pressure. **2**

Unit – III

5. a) What are the different forms of energy in a flowing fluid ? Represent schematically the Bernoulli's equation for flow through a tapering pipe and show the position of total energy line and datum line. **8**

   b) Derive an equation for measurement of velocity in open channel by pitot tube. **4**

   c) Compare venturimeter and orifice meter also write an equation to calculate the discharge through it. **4**

OR

6. a) Derive an equation for discharge areas a triangular notch. **6**

   b) The inlet and throat diameters of a vertically mounted venturimeter are 30 cm and 10 cm respectively. The throat section is below the inlet section at a distance of 10 cm. The specific gravity of the liquid is 900 kg/m^3. The intensity of pressure at inlet is 140 KPa and the throat pressure is 80 KPa. Calculate the flow rate in l.p.s. Assume that 2% of the differential head is lost between inlet and throat and coefficient of discharge 0.97. **10**

SECTION – II

Unit – IV

7. a) In a flow of viscous fluid through circular pipes prove that the velocity distribution is a parabolic curve. **8**

b) Show that the power developed in a water turbine can be expressed as :

$P = \rho N^3 D^5 \ \varphi \left[D \backslash B, \rho D^2 N / \mu, ND/(gH)^{1/2}\right]$

where D and B are the diameter and width of the runner, N is the speed in revolutions per minutes, H is the operating head, μ and ρ are respectively the coefficients of dynamic viscosity and mass density of the liquid. **10**

OR

8. a) Explain in brief the Buckingham's $-\pi$ theorem as a method of dimensional analysis. **8**

b) An oil of viscosity 9 poise and specific gravity 0.9 is flowing through a horizontal pipe of 60 mm diameter. If the pressure drop in 100 m length of the pipe is 1800 kN/m^2, determine

i) the rate of flow of oil

ii) centre line velocity

iii) total frictional drag over 100 m length

iv) the velocity gradient at the pipe wall

v) velocity and shear stress at 8 mm from the wall. **10**

Unit – V

9. a) What is an equivalent pipe ? Derive an expression for maximum power transmitted through the pipe. **8**

b) Define syphon. At sudden enlargement of water line from 24 cm to 48 cm diameter pipe, the hydraulic gradient rises by 1 cm. Calculate the rate of flow. **8**

OR

10. a) What are minor losses ? Under what circumstances will they be negligible ? For sudden expansions in pipe flow work out the optimum ratio between the diameter of the pipe before expansion and the diameter of pipe after expansion so that the pressure rise is maximum. **10**

b) What do you mean by Hydraulic Gradient line and Energy Gradient line ? **6**

Unit – VI

11. a) What is boundary layer separation ? Explain the different methods to control the boundary layer. **6**

    b) What is Magnus effect ? **4**

    c) Discuss drag and lift on an aerofoil. **6**

OR

12. a) Derive an expression for the lift on a rotating cylinder placed in a uniform flow field such that the axis of the cylinder is perpendicular to the direction of flow. **6**

    b) Engine oil at 40°C flows over a 5 m long flat plate with a free stream velocity of 2 m/s. Determine the drag force acting on the plate per unit width. The density and kinematic viscosity of oil at 40°C are 876 Kg/m^3 and 2.485×10^{-4} m^2/s respectively. **4**

    c) Explain in brief about Computational Fluid dynamics with appropriate examples. **6**

Seat No.	

S.E. (Production S/W) Examination, 2012
MANUFACTURING ENGINEERING AND METROLOGY PRACTICE
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

N.B.: *i)* ***All*** *questions are* ***compulsory****.*
ii) Answer to the ***two*** *Sections should be written in* ***separate*** *answer books.*
iii) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
iv) Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam tables is ***allowed****.*
v) Assume suitable data, if ***necessary****.*

SECTION – I

1 a) A tubing of 40 mm outer diameter is turned on a lathe, at a cutting speed of 15 m/min and feed 0.2 mm/rev. Rake angle of tool is 20°. The cutting force is 800 N and feed force is 350 N. The length of continuous chip in one revolution is 80 mm. Calculate :

1) Coefficient of friction
2) Chip thickness ratio
3) Shear plane angle
4) Shear flow speed
5) Shear strain rate. **10**

b) Write short notes on (**any two**) :

i) Single point cutting tool
ii) Types of chips
iii) Tool wear. **6**

OR

a) Define Machinability. Explain effects of the following on machinability :
   i) Tool rake angle(s)
   ii) Cutting angles
   iii) Clearance angles
   iv) Nose radius. **8**

b) Draw and explain resolution of resultant cutting force developed by Emst and Merchant theory. **8**

2. Explain the difference between :
   i) Capstan and Turret lathe
   ii) Single and multispindle automat.

   Also draw operational sketch for all above. **16**

OR

With the help of neat sketch, explain principle of operation, kinematic system, types of tools and jobs, applications for :
   i) Shaping machine
   ii) Planning machine
   iii) Slotting machine. **16**

3. With respect to construction of broaching explain the following :
   i) Configuration of broaching tools (with neat sketch). **6**
   ii) Material for broach. **4**
   iii) Geometry of broaching teeth and their cutting edges. **8**

OR

a) Explain gear hobbing process with neat sketch. **6**

b) Explain broach geometry with neat sketch. **6**

c) Explain thread milling process. **6**

SECTION – II

4. a) Explain different types of coordinate systems, used in NC/CNC operations. **10**

   b) FMS introduces flexibility in every facets of manufacturing. Explain. **6**

OR

a) For machining centres explain the following :
   i) Automatic tool changers.
   ii) Automatic pallet changers. **8**

b) Explain the function of interpolator in CNC machine control and explain interpolation. **4**

c) Explain advantages of CNC over NC. **4**

5. a) Explain the following sheet metal working process (**any three**) : **6**
   i) Piercing
   ii) Notching
   iii) Forming
   iv) Coining
   v) Drawing.

   b) Explain with neat sketch **any five** with reference to press working : **10**
   i) Bed
   ii) Bloster plate
   iii) Die block
   iv) Knock out
   v) Punch plate
   vi) Pitman
   vii) Shut height
   viii) Guide posts.

OR

Show calculations of clearances, centre of pressure, different forces, press tonnage, blank size, for press tool applications. **16**

6. a) For jig design, explain the following locating devices : **12**
   i) Locating pins
   ii) Support pins
   iii) Jack pins.

   b) Explain essential features of milling fixtures. **4**

   c) Define fool-proofing for jig-fixtures. **2**

OR

Explain general guidelines and procedure for design of fixtures. **18**

Seat No.	

S.E. (Electrical) Examination, 2012
INSTRUMENTATION
(2003 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) Compare analog and digital instruments. **6**
   b) Define instrumentation. What are its objectives ? **6**
   c) Describe open loop and closed loop strategies. State merits and demerits of each. **6**

OR

2. a) Compare feed back and feed forward control system. **6**
   b) Describe null type and deflection type instruments. **6**
   c) For process control, explain time response of first order and second order process. **6**

3. a) With a block diagram explain working of dual trace CRO. **8**
   b) Give detail classification of transducers. **8**

OR

4. a) Explain measurement of current, frequency, voltage with Lissajous pattern using CRO. **8**
   b) Explain the principle of working of inductive and capacitive transducers. Give types of inductive and capacitive transducers. **8**

5. a) With a neat diagram explain construction and working of total radiation type pyrometer. **8**
   b) Explain level measurement using Nucleonic method. **8**

OR

6. a) What are the commercial forms of thermistors ? Explain each in brief. **8**
   b) Explain in detail the use of McLeod gauge for measurement of pressure. **8**

SECTION – II

7. a) Explain construction and working of LVDT. **8**

   b) List the head type flow meters and with neat sketch explain venturimeter. **8**

OR

8. a) Give types of strain gauge and explain any one in detail. **8**

   b) Define flow. Explain two types of flow. **8**

9. a) Explain strip chart recorder with a neat sketch and state its applications. **8**

   b) State and explain desirable characteristics of valves. **8**

OR

10. a) Write a note on ultraviolet recorder. **8**

    b) What is the importance of final control element in instrumentation ? Explain the principle of operation and construction of solenoid valve. **8**

11. a) Draw basic block diagram of PLC and explain it in detail. **10**

    b) Explain applications of SCADA system in detail. **8**

OR

12. a) Explain the various configurations of SCADA system and give its applications. **10**

    b) Explain the concepts of MMI and HMI in detail. **8**

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+3**

Seat No.	

[4262]-101

S.E. (Civil) (I Sem.) EXAMINATION, 2012

ENGINEERING MATHEMATICS—III

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Attempt from Section I, Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** and from Section II, Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (A) Solve any *three* : [12]

(*i*) $\left(D^2 - 1\right)y = e^{-x}\sin\left(e^{-x}\right) + \cos\left(e^{-x}\right)$

(*ii*) $\left(D^2 - 4D + 3\right)y = x^3 e^{2x}$

(*iii*) $x^3 \dfrac{d^3y}{dx^3} + 2x^2 \dfrac{d^2y}{dx^2} + 2y = 10\left(x + \dfrac{1}{x}\right)$

(*iv*) $\left(D^2 + 4\right)y = \sec 2x$, (Use method of variation of parameters)

(B) Solve : [5]

$$\frac{dx}{x\left(2y^4 - z^4\right)} = \frac{dy}{y\left(z^4 - 2x^4\right)} = \frac{dz}{z\left(x^4 - y^4\right)}.$$

Or

2. (A) Solve any *three* : [12]

(*i*) $\left(D^2 + 2D + 1\right)y = 2\cos x + 3x + 2 + 3e^x$

(*ii*) $\left(D^2 + D + 1\right)y = x \sin x$

(*iii*) $(1 + x)^2 \dfrac{d^2y}{dx^2} + (1 + x)\dfrac{dy}{dx} + y = 2\sin \log(1 + x)$

(*iv*) $\dfrac{d^2y}{dx^2} - 2\dfrac{dy}{dx} + 2y = e^x \tan x$ (Use method of variation of parameters)

(B) Solve : [5]

$$\frac{du}{dx} + v = \sin x$$

$$\frac{dv}{dx} + u = \cos x.$$

3. (A) The differential equation satisfied by a beam, uniformly loaded with one end fixed and second subject to a tensile force P is given by : [8]

$$\mathrm{EI}\frac{d^2y}{dx^2} - \mathrm{P}y = \frac{-\mathrm{W}}{2}x^2.$$

Show that the elastic curve for the beam under conditions $y = 0, \frac{dy}{dx} = 0$ when $x = 0$, is given by :

$$y = \frac{\mathrm{W}}{2\mathrm{P}}\left[x^2 + \frac{2}{n^2} - \frac{e^{nx}}{n^2} - \frac{e^{-nx}}{n^2}\right],$$

where

$$\mathrm{EI} = \frac{\mathrm{P}}{n^2}.$$

(B) Solve : [8]

$$\frac{\partial u}{\partial t} = \mathrm{K}\frac{\partial^2 u}{\partial x^2}$$

subject to :

(*i*) $u(0, t) = 0$

(*ii*) $u_x(l, t) = 0$

(*iii*) $u(x, t)$ is bounded and

(*iv*) $u(x, 0) = \frac{u_0 x}{l}$ for $0 \leq x \leq l$.

Or

4. (A) A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a position given by : [8]

$$y(x, 0) = y_0 \sin^3\left(\frac{\pi x}{l}\right).$$

If it is released from rest from this position, find the displacement y at any distance from one end at any time t.

(B) A 1 kg weight suspended from a string stretches it 4 cm. If the weight is pulled down 8 cm below the equilibrium position and then released : [8]

(*i*) Set up a differential equation.

(*ii*) Find the position and velocity as a function of time.

(*iii*) Find the amplitude, period and frequency of motion.

5. (A) Use Gauss elimination with partial pivoting to solve the following system of linear equations : [8]

$$8x_2 + 2x_3 = -7$$
$$3x_1 + 5x_2 + 2x_3 = 8$$
$$6x_1 + 2x_2 + 8x_3 = 26.$$

(B) Use Runge-Kutta method of fourth order to solve : [9]

$$\frac{dy}{dx} = \frac{1}{x + y},$$

$x_0 = 0$, $y_0 = 1$ to find y at $x = 0.4$ taking $h = 0.2$.

Or

6. (A) Solve the following system by Cholesky's method : [9]

$$\begin{aligned} 4x_1 - 2x_2 &= 0 \\ -2x_1 + 4x_2 - x_3 &= 1 \\ -x_2 + 4x_3 &= 0. \end{aligned}$$

(B) Determine using modified Euler's method the values of y when $x = 0.1$, given that : [8]

$$\frac{dy}{dx} = x^2 + y, \quad y(0) = 1.$$

SECTION II

7. (A) Find the four moments about the mean of the following : [7]

x	f
2	10
2.5	40
3	55
3.5	82
4	60
4.5	30
5	8

Also find β_1 and β_2. Is the distribution leptokurtic ?

(B) 6000 candidates appeared in a certain paper carrying a maximum of 100 marks. It was found that marks were normally distributed with mean 39.5 and standard deviation 12.5. Determine approximately the number of candidates who secured a first class for which a minimum of 60 marks is necessary.

[Area corresponding to $z = 1.64$ is 0.4495.] [5]

(C) On an average a box containing 20 articles is likely to have 4 defectives. If we consider a consignment of 500 boxes, how many of them are expected to have at least two defectives ? [5]

Or

8. (A) An urn contains 6 white and 9 red balls. Second urn contains 8 white and 18 red balls. One ball is drawn at random from the first urn and put into the second urn without noticing its colour. A ball is then drawn at random from the second urn. What is the probability that it is white ? [5]

(B) Obtain regression lines for the following data :

x	y
2	4
3	7
5	9
7	11
9	12
10	14
12	16
15	18

Estimate y when $x = 8$. [6]

(C) Goals scored by two teams I and II in a football seasons were as follows. Determine which team is more consistent : [6]

No. of Goals	**Number of Matches**	
Scored	**Team I**	**Team II**
0	11	16
1	8	9
2	7	6
3	5	5
4	3	4

9. (A) Show that the tangent to the curve :

$$x = e^t \cos t, \ y = e^t \sin t, \ z = e^t$$

at $t = 0$ makes constant angle with z-axis. [4]

(B) Find directional derivative of $\phi = x^2yz^3$ at (1, –2, 3) along a line equally inclined to the three co-ordinate axis. [5]

(C) Prove the following (any *two*) : [8]

(*i*) $\nabla\left(\frac{\bar{a} \cdot \bar{r}}{r^2}\right) = \frac{\bar{a}}{r^2} - \frac{2(\bar{a} \cdot \bar{r})}{r^4}\bar{r}$

(*ii*) $r^4\left(\nabla \cdot \left(\frac{\bar{r}}{r^4}\right)\right) = -1$

(*iii*) $\nabla^2 f(r) = f''(r) + \frac{2}{r}f'(r)$.

Or

10. (A) Show that the vector field given by :

$$\bar{F} = \left(x^2 - yz\right)\bar{i} + \left(y^2 - zx\right)\bar{j} + \left(z^2 - yx\right)\bar{k}$$

is irrotational. Also find scalar potential ϕ such that $\bar{F} = \nabla\phi$. [5]

(B) Find the directional derivative of :

$$\phi = x^2y + xyz + z^3$$

at (1, 1, 1) in the direction normal to the surface :

$$x^2 + y^2 + z^2 = 4,$$

at (1, 2, –1). [6]

(C) Find constants a and b so that the surface :

$$4x^2y + z^3 = 9$$

will be orthogonal to the surface :

$$ax^2y + bz^3 = 4$$

at the point (1, –1, 2). [6]

11. (A) If

$$\overline{F} = 3x^2\overline{i} + (2xz - y)\overline{j} + z\overline{k}$$

then evaluate :

$$\int_C \overline{F} \cdot d\overline{r},$$

where C is the curve $x = 2t$, $y = t^2$, $z = 4t + 1$ from $t = 0$ to $t = 1$. [6]

(B) Evaluate :

$$\iint_S \left(x^3\overline{i} + y^3\overline{j} + z^3\overline{k}\right) \cdot d\overline{S}$$

where S is the surface of the sphere :

$$x^2 + y^2 + z^2 = 36.$$ [5]

(C) Evaluate :

$$\iint_{S} \nabla \times \overline{F} \cdot d\overline{S}$$

for

$$\overline{F} = (x - y)\overline{i} + \left(x^2 + yz\right)\overline{j} - 3xyz\overline{k}$$

where S is the surface of the cone :

$$z = 9 - \sqrt{x^2 + y^2}, \quad z \geq 0.$$ [5]

Or

12. (A) Evaluate :

$$\int_{C} \overline{F} \cdot d\overline{r}$$

for

$$\overline{F} = e^{2y}\overline{i} + x\left(1 + 2e^{2y}\right)\overline{j}$$

where C is the ellipse :

$$\frac{x^2}{64} + \frac{y^2}{81} = 1, \quad z = 0.$$ [6]

(B) Show that :

$$\iint\limits_{S} \frac{\overline{r} \cdot \hat{n}}{r^2}\, dS = \iiint\limits_{V} \frac{dV}{r^2}. \qquad [5]$$

(C) Apply Stokes theorem to calculate :

$$\int\limits_{C} 4y\, dx + 2z\, dy + 6y\, dz,$$

where C is the intersection of $x^2 + y^2 + z^2 = 4z$ and $z = x + 3$. [5]

Total No. of Questions—**12**]   [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-102

S.E. (Civil) (I. Sem.) EXAMINATION, 2012

BUILDING MATERIALS AND CONSTRUCTION

(2008 PATTERN)

Time : Three Hours   **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define building. Explain the functions of foundation. [6]

(*b*) Explain the following with sketches :

(*i*) Plinth

(*ii*) Throating

(*iii*) Q.C. [6]

(*c*) Write short notes on Flemish bond. [6]

Or

2. (*a*) Compare strap footing and mat foundation. [6]

(*b*) Explain the following with sketches :

(*i*) Friction pile

(*ii*) Header stone

(*iii*) Toothing. [6]

(*c*) Write short note on English bond. [6]

3. (*a*) Explain functions of cavity wall in residential building. [4]

(*b*) Compare hollow concrete blocks and solid concrete blocks. Consider size, shape and laying. [6]

(*c*) Define formwork. Draw the sketch of formwork for footing in residential building. [6]

Or

4. (*a*) Write down technical advantages of block masonry. [4]

(*b*) Write short notes on :

(*i*) Reinforced brick column

(*ii*) Cavity wall. [6]

(*c*) Write down ideal requirements of formwork used for residential building. [6]

5. (*a*) State various flooring tiles available in market. Write down their advantags only (any *four*). [6]

(*b*) Write short note on queen-post truss. [6]

(*c*) Explain the following with neat sketches :

(*i*) Ridge cover

(*ii*) Valley. [4]

Or

6. (*a*) Explain the detailed procedure of construction of marble tiles flooring. Give construction sketch also. [6]

(*b*) Explain detailed procedure of fixing A. C. Sheet with round pipes in residential building. [6]

(*c*) Explain the following with sketches :

(*i*) Hip

(*ii*) Gable. [4]

SECTION II

7. (*a*) Draw a neat labelled sketch of panelled door. Show different parts of the same with dimensions. [6]

(*b*) Enlist various types of windows and explain any *one* in detail. [6]

(*c*) Enlist types of plastering and explain any *one* in detail. [6]

Or

8. (*a*) Draw a neat labelled sketch of double-shutter window. Show different parts of the same with dimensions. [6]

(*b*) Define Arch. State types of arches and explain any *one* in detail. [6]

(*c*) Explain any *one* type of scaffolding in detail. [6]

9. (*a*) Discuss various considerations that are made in planning of staircases. Illustrate any *two* types of staircases generally used, indicating the suitability for specific use. [6]

(*b*) Explain various methods to be adopted on site for prevention of accidents. [6]

(*c*) Explain the terms strutting and shoring. [4]

Or

10. (*a*) Enlist different types of staircases. Explain any *one* in detail with an appropriate figure. [6]

(*b*) What are the limitations on different types of staircases in regard to their rise and tread ? How would you choose them for :

(*i*) House

(*ii*) School

(*iii*) Commercial complex

(*iv*) Hospital. [6]

(*c*) Explain the term 'shoring'. State important points to be observed in case of raking shores. [4]

11. (*a*) Write short notes on :

(*i*) Ceramic products used in construction

(*ii*) Use of gypsum in construction. [6]

(*b*) Explain the term 'seasoning of timber' and explain any *one* method of the same in detail. [6]

(*c*) Write short note on eco-friendly materials. [4]

Or

12. (*a*) State different types of defects in timber and explain any *one* in detail. [6]

(*b*) Write down the engineering properties of :

(*i*) Plastic

(*ii*) Ferro-crete. [6]

(*c*) Explain the importance of using eco-friendly materials in construction. Explain any *one* material in detail. [4]

Total No. of Questions—**12**]

[Total No. of Printed Pages—**8+4**

Seat No.	

[4262]-103

S.E. (Civil) (I Sem.) EXAMINATION, 2012

STRENGTH OF MATERIALS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of electronic pocket calculator is allowed.

(*v*) Assume suitable data, if necessary.

(*vi*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

SECTION I

1. (*a*) A member ABCD is subjected to point loads P_1, P_2, P_3 and P_4 as shown in the Fig. 1.1. Calculate the force P_2 necessary for equilibrium if P_1 = 45 kN, P_3 = 450 kN and P_4 = 130 kN. Determine the total elongation of the member, assuming Modulus of Elasticity to be $E = 2.1 \times 10^5$ N/mm^2. [8]

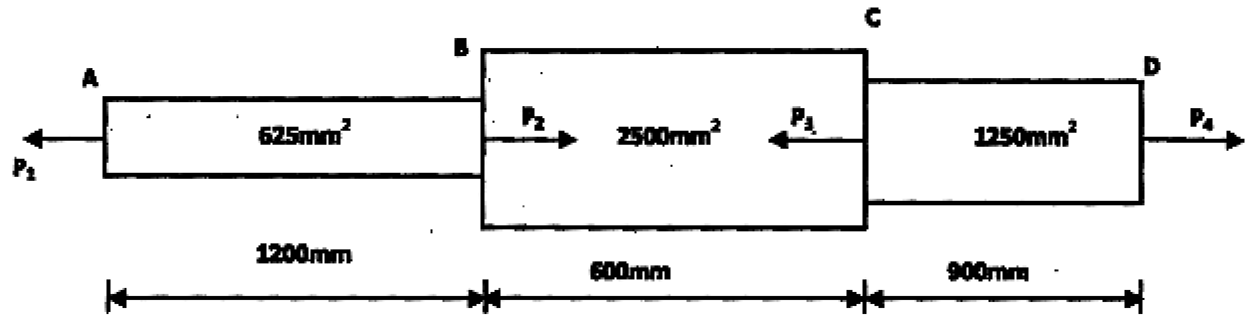


Fig. 1.1

(*b*) A load of 300 kN is applied on a short concrete column 250 mm × 250 mm. The column is reinforced by steel bars of total area 5600 mm^2. If the Modulus of Elasticity for steel is 15 times to that of concrete, find :

(*i*) The stresses in concrete and steel.

(*ii*) If the stresses in concrete should not exceed 4 N/mm^2, find the area of steel required so that the column may support a load of 600 kN. [10]

Or

2. (*a*) A bar of 25 mm diameter, is subjected to a pull of 40 kN. The measured extension on gauge length of 200 mm is 0.085 mm and the change in diameter is 0.003 mm. Calculate the Poisson's ratio and the three values of the moduli. [8]

(*b*) A composite bar made up of Aluminum bar and steel bar is firmly held between two unyielding supports as shown in Fig. 2.1. An axial load of 200 kN is applied at B at 20°C. Find the stresses in each material, when the temperature is 70°C. Take E for Aluminum and Steel as 0.7×10^5 N/mm^2 and 2×10^5 N/mm^2 respectively and coefficient of expansions for Aluminum and steel as 24×10^{-6} per °C and 12×10^{-6} per °C respectively. [10]

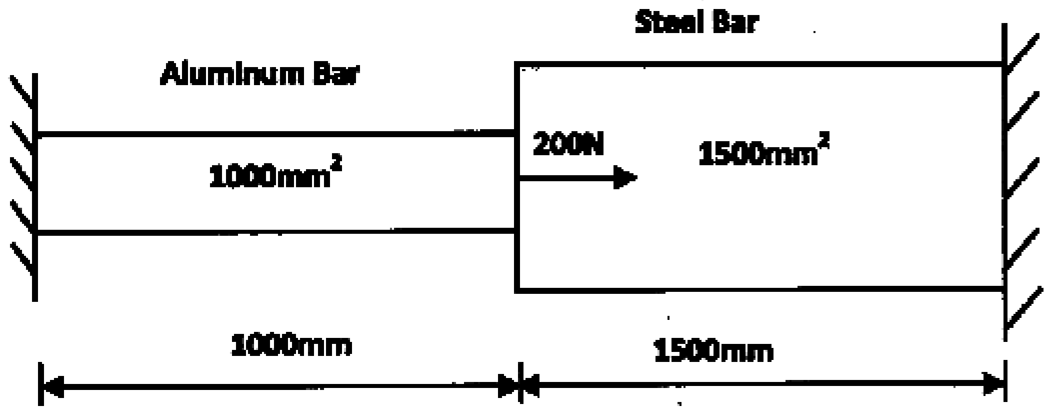


Fig. 2.1

3. (*a*) Draw shear force and bending moment diagram for a beam loaded and supported as shown in the Fig. 3.1 and locate point of contraflexure. [8]

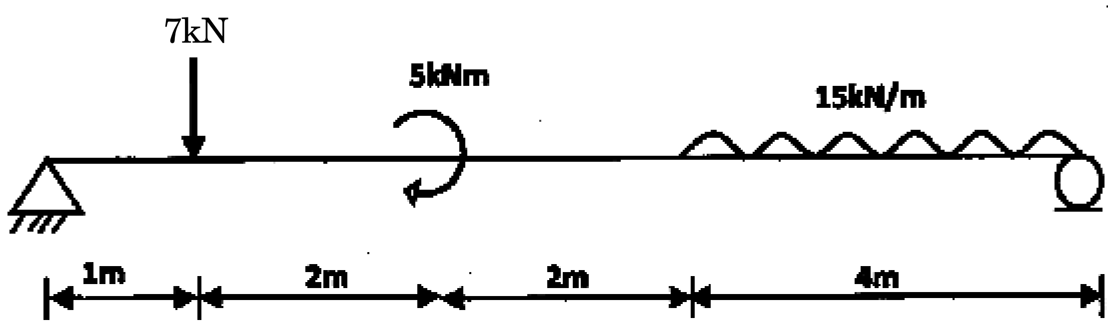


Fig. 3.1

(b) The BM diagram for a beam ABCD, supported at B and C is shown in Fig. 3.2. Draw the loading diagram and shear force diagram for the beam. [8]

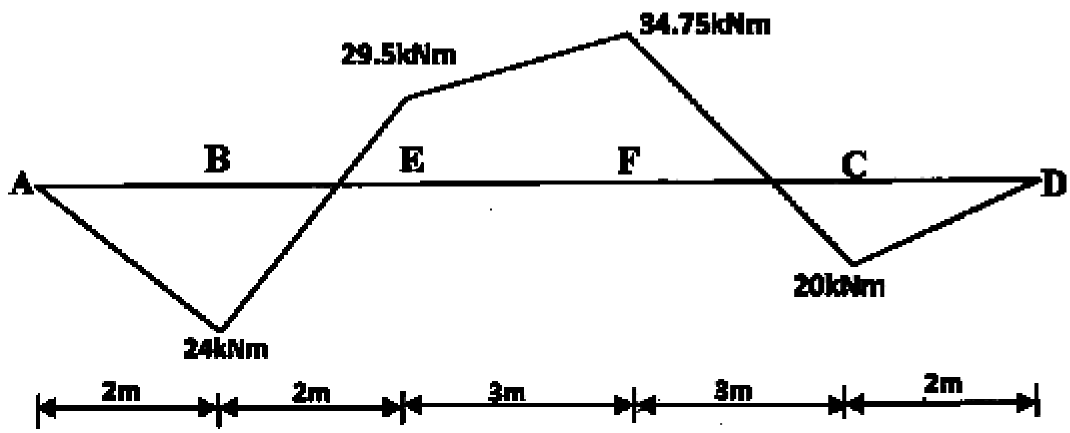


Fig. 3.2

Or

4. (a) A beam ABCD has an internal hinge at B and is loaded as shown in the Fig. 4.1. Determine the reactions at A, C and D. Also plot Shear force and Bending moment diagrams indicating principal values. [8]

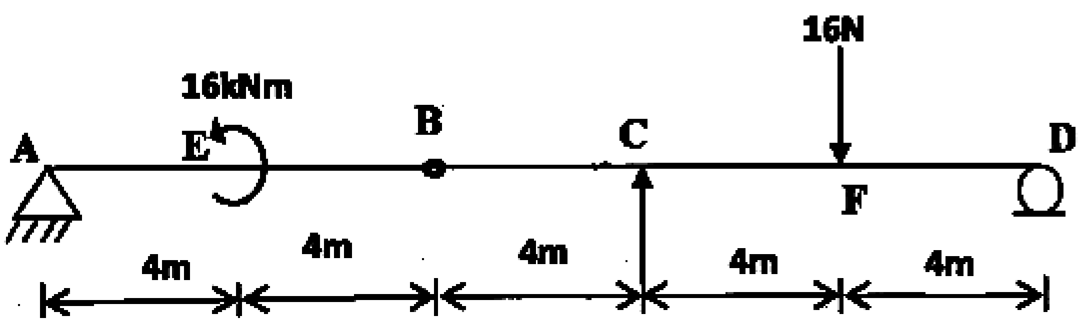


Fig. 4.1

(*b*) A horizontal beam AD, 10 m long carries a uniformly distributed load of 160 N/m together with a concentrated load of 400 N at the left end A. The beam is supported at a point B which is 1 m from A and at C which is on the right hand half ED of the beam and X meters from the end D as shown in the Fig. 4.2. Determine the value of X', if the midpoint of the beam is a point of contraflexure and also draw SFD and BMD for the beam. [8]

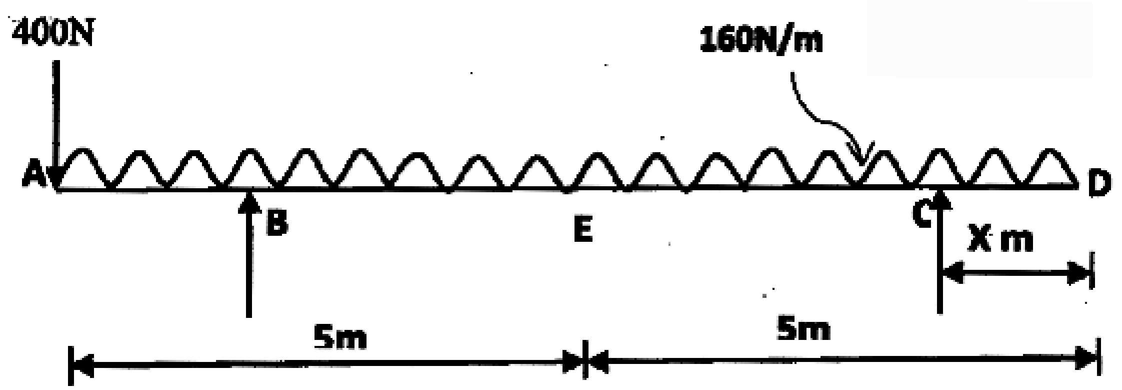


Fig. 4.2

5. (*a*) A cast iron beam 2.75 m long has one support at left end A and other support at B which is at 0.75 m from end C as shown in Fig. 5.1. The beam is of T section consisting of a top flange 150 mm × 20 mm and a web of 20 mm wide and 80 mm deep. If the tensile and compressive stresses are not to exceed 40 N/mm^2 and 70 N/mm^2 respectively, find the safe concentrated load W that can be applied at the right end of the beam. [8]

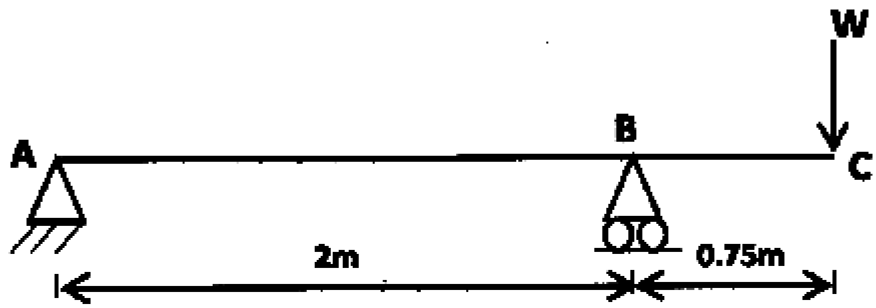


Fig. 5.1

(*b*) A steel beam of I section, 200 mm deep and 160 mm wide has 16 mm thick flanges and 10 mm thick web. The beam is subjected to a shear force of 200 kN. Determine the stress distribution over the beam section if the web of the beam is kept horizontal as shown in Fig. 5.2. [8]

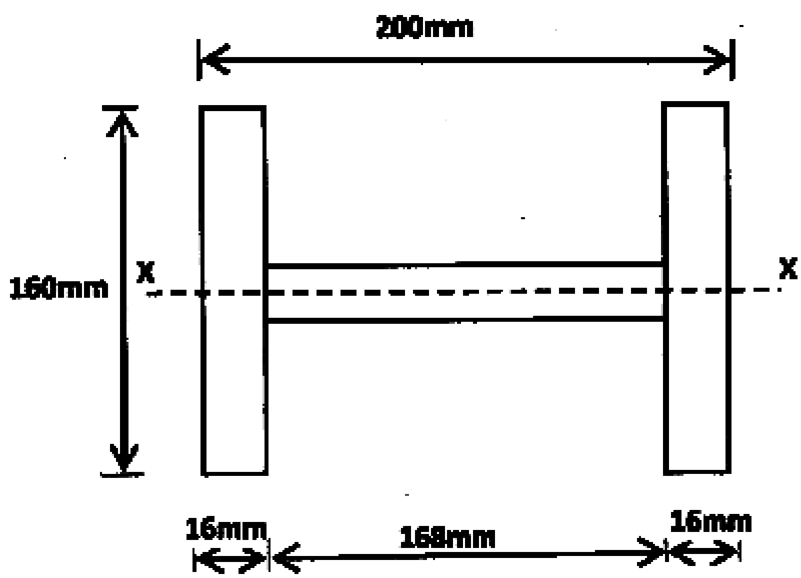


Fig. 5.2

Or

6. (*a*) A timber beam 150 mm wide and 200 mm deep is reinforced by fixing two flitches each 150 mm wide × 12.5 mm. Find the moment of resistance when :

(*i*) The flitches are attached symmetrically at the top and bottom.

(*ii*) The flitches are attached symmetrically at the sides.

Take allowable stress in timber as 6 N/mm^2. What is the maximum stress in steel in each case ? Take $E_s = 20\ E_w$. [8]

(*b*) The beam section shown in the Fig. 6.1 is subjected to the shear force of 35 kN. Determine the magnitude of shear stress at important points and plot the same. Also determine average shear stress. [8]

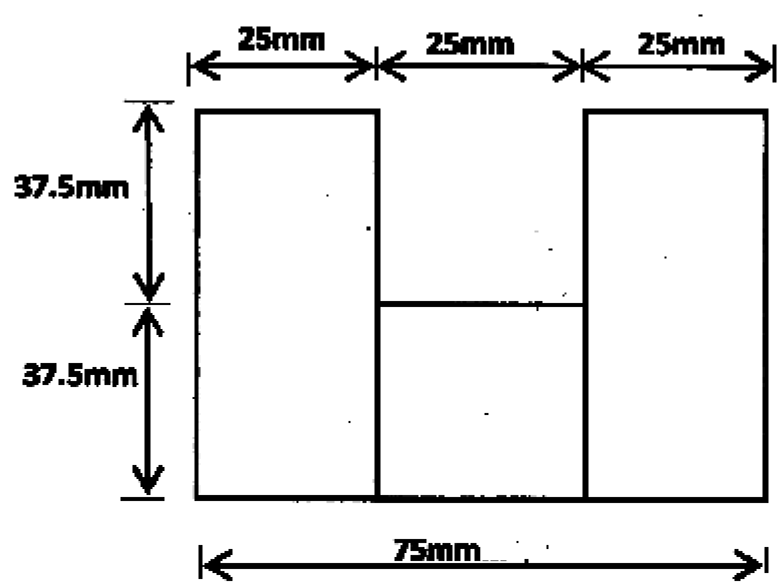


Fig. 6.1

SECTION II

7. (*a*) A hollow shaft with ratio of internal diameter to external diameter, 3/5 is required to transmit 450 kW at 120 rpm with a uniform twisting moment. The shearing stress in the shaft must not exceed 60 N/mm^2 and the twist in a length of 2.5 m must not exceed 1°. Calculate the minimum external diameter of the shaft satisfying these conditions. Take the modulus of rigidity $G = 8 \times 10^4$ N/mm^2. [9]

(*b*) A solid vertical prismatic steel bar of equilateral triangular section of side 20 mm is firmly fixed at the top. A rigid collar is attached at the lower end at a distance of 600 mm from the top. Calculate the strain energy stored in each of the following cases :

(*i*) When a pull of 10 kN is applied gradually.

(*ii*) When a weight of 4 kN falls through 120 mm before it strikes the collar. Take E = 200 GPa.

(*iii*) When a force of 8 kN is suddenly applied. [9]

Or

8. (*a*) A hollow steel shaft ABCD having external diameter 50 mm and internal diameter 35 mm is subjected to torques as shown in Fig. 8.1. Determine :

(*i*) Reactive torques at fixed ends.

(*ii*) Find the maximum shear stress and angle of twist.

Assuming G = 85 GPa. [9]

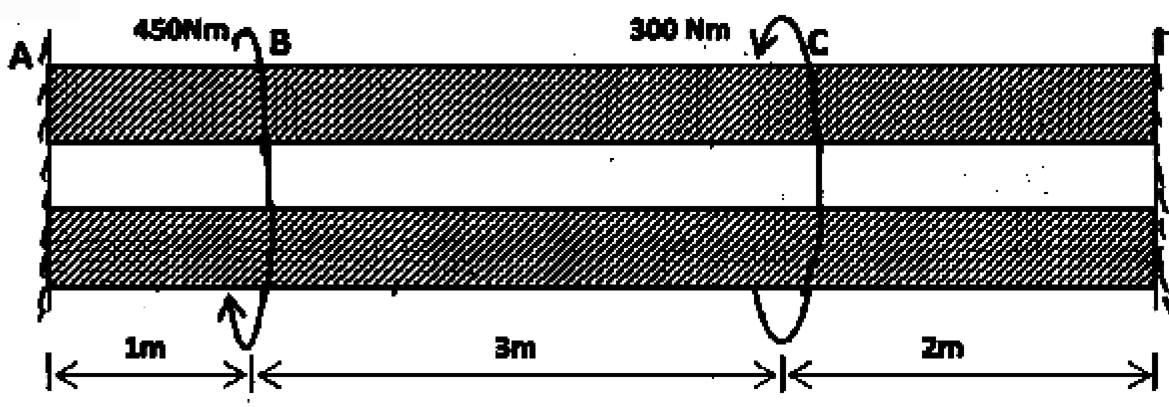


Fig. 8.1

(*b*) A vertical tie fixed rigidly at the top end consists of a steel rod 2.5 m long and 20 mm diameter encased throughout in a brass tube 20 mm internal diameter and 30 mm external diameter. The rod and the casing are fixed together at both ends. The compound rod is suddenly loaded in tension by a weight of 10 kN falling freely through

3 mm before being arrested by the tie. Calculate the maximum stress in steel and brass. Take $E_s = 2 \times 10^5$ N/mm^2 and $E_b = 1 \times 10^5$ N/mm^2. [9]

9. (*a*) An element in a two-dimensional stress system is subjected to normal stress intensity of $\sigma_x = 150$ MPa tensile along X-direction and $\sigma_y = 100$ MPa compressive along Y-axis and shear intensity $\tau_{xy} = \tau_{yx} = 50$ MPa. Determine the planes of zero shear and maximum shear. Also find the normal and shear stress intensity on these planes. [8]

(*b*) A solid circular shaft is required to transmit 120 kW at 400 rpm. It is also subjected to a bending moment of 4×10^6 Nmm. Find the suitable minimum diameter of the shaft if the maximum principal stress is limited to 100 N/mm^2. What will be the maximum shear stress produced in the shaft ? [8]

Or

10. (*a*) The intensity of the resultant stress, on a plane AB at a point in a material under stress is 80 N/mm^2 and is inclined at 30° to the normal to that plane. The normal components of stress on another plane BC, at right angles to the plane

AB is 60 N/mm^2 as shown in the Fig. 10.1. Determine the following :

(*i*) The resultant stress on the plane BC.

(*ii*) The principal stresses and their directions.

(*iii*) The maximum shear stresses and their planes. [8]

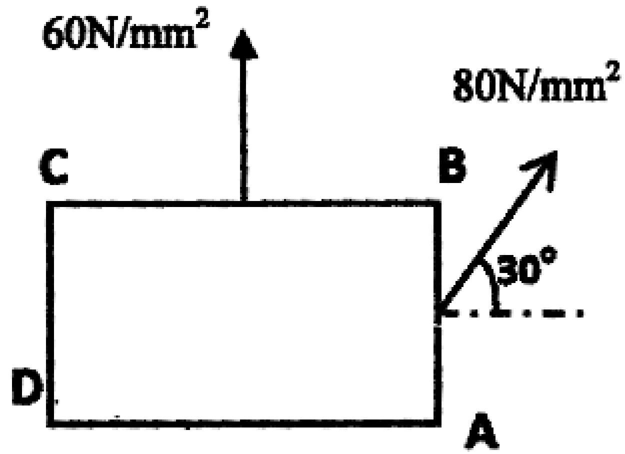


Fig. 10.1

(*b*) A shaft section 100 mm in diameter is subjected to a BM of 4000 Nm and a torque of 6000 Nm. Find the maximum direct stress induced on the section and specifies the position of the plane on which it acts. Find also, what stress acting alone can produce the same maximum strain. Take Poisson's ratio as 0.25. [8]

11. (*a*) State assumptions of Euler's theory for long columns and derive expression for buckling load for column with both ends hinged. [8]

(*b*) A masonry pier 3 m × 4 m supports a vertical load of 600 kN at a point shown in the Fig. 11.1. Find the stresses at the corners of the piers. [8]

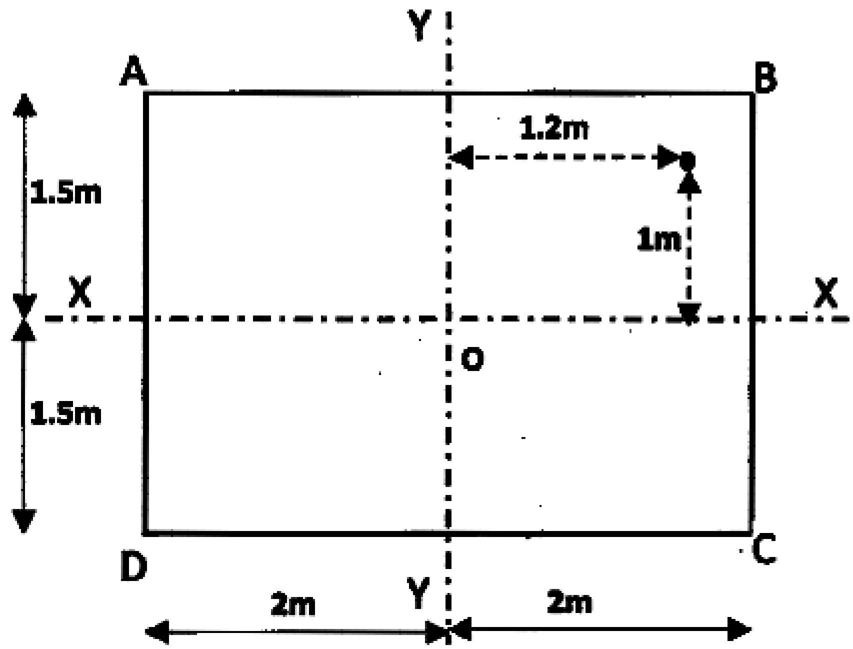


Fig. 11.1

Or

12. (*a*) A hollow cast iron column 5 m long is fixed at both ends and has an external diameter of 300 mm. The column supports an axial load of 1200 kN. Find the internal diameter of the column, adopting factor of safety of 5. Take $\alpha = 1/1600$. [8]

(*b*) A tapering chimney of hollow circular section 25 mtrs high. Its external diameter at the base is 3 mtr and at the top it is 2 mtr. If the weight of chimney is 1800 kN. Find the uniform horizontal wind pressure that may act per unit projected area of the chimney in order tension at the base may just be avoided. [8]

Total No. of Questions—**6**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-104

S.E. (Civil Engineering) (First Semester) EXAMINATION, 2012

ENGINEERING GEOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Neat diagrams must be drawn wherever necessary.

SECTION I

1. (A) Define Mineral. Explain various rock forming mineral families in detail. [7]

(B) Write a note on agents of metamorphism. [4]

(C) Modes of weathering. [5]

Or

(A) Explain grain size classification of secondary rocks in detail. [8]

(B) Distinguish between plutonic, volcanic rocks and describe any *two* rocks from each category. [8]

2. (A) Explain any *two* features formed due to river erosion. [6]

(B) Geological time scale. [5]

(C) Importance of Remote sensing in Civil Engineering Projects. [5]

Or

Write notes on :

(A) Eparchaean Interval [4]

(B) Rock types in Deccan trap area [4]

(C) Stages of rivers [4]

(D) Gondwana coal [4]

3. (A) Describe various types of unconformities in detail with sketches. [6]

(B) Symmetrical and Asymmetrical folds. [4]

(C) Faults and Civil Engineering Projects. [8]

Or

(A) Any *two* modes of igneous intrusion. [4]

(B) Which geological feature is formed due to tensional type of tectonic forces ? Describe in detail. [10]

(C) Recumbent and Isoclinal types of folds. [4]

SECTION II

4. (A) What is the Engineering significance of geological features : [10]

(*i*) Stratification

(*ii*) Dipping Beds.

(B) What is Remote Sensing ? Write in brief application of Remote Sensing in Engineering Geology. [6]

Or

(A) What are the limitations of Drilling ? [8]

(B) Describe Engineering significance of fount in the field. [8]

5. (A) Write a note on stability of hill slopes. [8]

(B) Describe (with neat sketches) geological conditions leading to ARTESIAN wells. [8]

Or

(A) Describe importance of structures and textures in the movement of storage of groundwater. [8]

(B) What are the requirements of good building stone ? Give suitable examples. [8]

6. (A) What are the requirements at the foundation of Dam ? Give suitable examples. [9]

(B) Describe feasibility of tunnel which is passing through :

(*i*) Compact Basalt

(*ii*) Amygdaloidal Basalt. [9]

Or

(A) Discuss feasibility of Dam site on Dipping Beds. [9]

(B) Write a note on suitability of common rocks for tunnelling. [9]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-105

S.E. (Civil) (First Semester) EXAMINATION, 2012

GEOTECHNICAL ENGINEERING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of logarithmic tables, slide rule, electronic calculator is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) A soil sample in its natural state has, when fully saturated, a water content of 32.5%. Determine the void ratio, dry and saturated unit weights. Assume G = 2.69. [6]

(*b*) State the meaning of the following symbols used in IS classification of soils : [6]

(*i*) CH

(*ii*) ML

(*iii*) I

(*iv*) MH-OH

(*v*) P

(*vi*) GW.

(*c*) What do you understand by 'Index properties' ? Which of these properties are relevant to : [6]

(*i*) Sandy soils

(*ii*) Clayey soils.

Or

2. (*a*) Derive with usual notations : [6]

$$\mathrm{r} = \frac{(1+w)\, G_{\mathrm{r}\,w}}{(1+e)}.$$

(*b*) What is density index ? What does it express and explain the terms involved in the expression ? State the range of its values. For which type of soil this term is applicable ? [6]

(*c*) Write a short note on Plasticity Chart used for classification of fine grained soil. [6]

3. (*a*) List out the various factors affecting permeability of soil. Explain any *two* factors. [6]

(*b*) Draw and explain flow net construction for seepage below an earthen dam. [6]

(*c*) What is the critical gradient of a sand deposit of specific gravity = 2.65 and void ratio = 0.5 ? [4]

Or

4. (*a*) A sample in a variable head permeameter is 8 cm in diameter and 10 cm high. The permeability of the sample is estimated to be 10×10^{-4} cm/s. If it is desired that the head in the standpipe should fall from 24 cm to 12 cm in 3 min., determine the size of the standpipe which should be used. [6]

(*b*) State the field tests for determination of permeability and derive the relation in case of a confined acquifer. [6]

(*c*) State Laplace 2-D flow equation and the assumptions to derive the same. [4]

5. (*a*) A concentrated load of 40 kN is applied vertically on a horizontal ground surface. Determine the vertical stress intensities at the following points : [6]

(*i*) At a depth of 3 m below the point of application of the load.

(*ii*) At a depth of 1 m and at a radial distance of 3 m from the line of action of the load.

(*b*) What is Zero Air Voids line ? Derive its relation. [6]

(*c*) Differentiate between Standard and Modified Proctor test. [4]

Or

6. (*a*) A light compaction test gives MDD = 1550 kg/m^3 and OMC = 25.5%. What is the degree of saturation and void ratio at MDD, if specific gravity is known as 2.7 ? [6]

(*b*) Explain briefly the field compaction methods and placement water content. [6]

(*c*) Prove that vertical stress due to self weight of soil is given by, $s_v = gz$. [4]

SECTION II

7. (*a*) What are the *three* standard triaxial tests with respect to the drainage condition ? Explain with reasons the situation for which these tests are to be performed. [6]

(*b*) An unconfined compression test yielded strength of 0.1 N/mm^2. If the failure of plane is inclined at 50° to the horizontal, what are the values of the shear strength parameters ? [6]

(*c*) Explain the procedure for vane shear test and also state the equation for shear stress of vane shear test. [6]

Or

8. (*a*) State the factors affecting shear strength of soil and explain the terms sensitivity and thixotropy. [6]

(*b*) Explain unconfined compression test procedure with neat sketches. [6]

(*c*) In a drained triaxial compression test conducted on dry sand, failure occurred when the deviator stress was 218 kN/m^2 at a confining pressure of 61 kN/m^2. What is the effective angle of shearing resistance and the inclination of failure plane to major principal plane ? [6]

9. (*a*) Discuss Culmann's graphical method for the determination of active earth pressure. [6]

(*b*) What is stability number ? What is its utility in the analysis of stability of slopes ? [6]

(*c*) Compute the active earth pressure at a depth of 4.5 m in a sand whose angle of friction is 37°, and density of 15.60 kN/m^2 in dry state. [4]

Or

10. (*a*) Derive an expression for Rankine's active earth pressure on retaining walls due to a cohesive backfill. [6]

(*b*) Explain the assumptions made in theory of earth pressure due to Rankine's. [4]

(*c*) Explain Coulomb's Wedge theory for determination of earth pressure. [6]

11. (*a*) Discuss geological classification of rocks. Give example of each type of rock. [8]

(*b*) What are the different modes of failures of rocks ? Give examples of each. [8]

Or

12. (*a*) List out various index properties of rocks. What is their significance ? [8]

(*b*) Write short notes on causes and remedial measures of Landslides. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-106

S.E. (Civil) (II Sem.) EXAMINATION, 2012

FLUID MECHANICS I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q. No. **5** or Q. No. **6** from Section I, Q. No. **7** or Q. No. **8**, Q. No. **9** or Q. No. **10**, Q. No. **11** or Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

SECTION I

1. (*a*) The dynamic viscosity of an oil used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4 m and rotates at 190 rpm. Calculate the power lost in the bearing for a sleeve length of 90 mm. The thickness of the oil film is 1.5 mm. [8]

(*b*) Write short notes on the following : [10]

(*i*) Mass density

(*ii*) Specific gravity

(*iii*) Reynolds number

(*iv*) Froude number

(*v*) Compressibility.

Or

2. (*a*) Using Buckingham's π-theorem, show that the velocity through a circular orifice is given by : [8]

$$v = \sqrt{2gH}\; f\left[D/H, \frac{\mu}{\rho VH}\right]$$

where H is the head causing flow, D is the diameter of the orifice, μ is coefficient of viscosity, ρ is mass density and '*g*' is the acceleration due to gravity.

(*b*) Write short notes on the following : [10]

(*i*) Viscosity

(*ii*) Surface tension

(*iii*) Advantages of model analysis

(*iv*) Capillarity

(*v*) Weight density.

3. (*a*) Derive an expression for total pressure and depth of centre of pressure from free surface of liquid, at inclined plane surface submerged in the liquid. [8]

(*b*) A rectangular pontoon is 5 m long, 3 m wide and 1.20 m high. The depth of immersion of the pontoon is 0.80 m in sea water. If the centre of gravity is 0.6 m above the bottom of the pontoon, determine the metacentric height. The density for sea water = 1025 kg/m^3. [8]

Or

4. (*a*) Explain the procedure of computing the resultant hydrostatic force on a curved surface. [8]

(*b*) What is meant by stability of floating body ? Explain the stability of floating body with respect to metacentric height. Give neat sketches. [8]

5. (*a*) Explain types of fluid flow. [8]

(*b*) If for a two-dimensional flow, the velocity potential □ = $x\,[2y - 1]$, determine the velocity at the point P (4, 5). Determine also the value of stream function □ at the point P. [8]

Or

6. (*a*) Explain any *one* method of drawing flownet. Show that the streamlines and equipotential lines intersect each other orthogonally. What are the uses of flownet ? [8]

(*b*) Derive the continuity equation for one-dimensional flow, clearly stating the assumptions made in it. [8]

SECTION II

7. (*a*) A horizontal venturimeter with inlet and throat diameters 300 mm and 100 mm respectively is used to measure the rate of flow of water. The pressure intensity at inlet is 125 kN/m^2 while vacuum pressure head at the throat is 30 cm of mercury. Assuming that 3% of head is lost in between inlet and throat, find the value of coefficient of discharge for the venturimeter and rate of flow. [8]

(*b*) What is an orifice ? How are the orifices classified ? [6]

(*c*) Starting from Euler's equation along a streamline, integrate it to the Bernoulli's equation. Also list the limitations of Bernoulli's equation. [4]

Or

8. (*a*) In an experiment on determination of hydraulic coefficients of sharp edged orifice, 2.5 cm of diameter, it was found that the jet issuing horizontally under a head of 1 m travelled a horizontal distance of 1.4 m from vena contracta in a course of vertical drop of 0.53 m from the same point. Further if a flat plate held normal to the jet at vena contracta, the force of 5.6 N would be exerted on the plate. Determine C_c, C_v and C_d for the orifice. [8]

(*b*) What is 'Vena contracta' ? Why is it taken as an ideal position for applying Bernoulli's Theorem ? [4]

(*c*) Write a short note on cavitation. [6]

9. (*a*) For the velocity profile

$$\frac{u}{U} = \left(\frac{y}{\delta}\right)^{n},$$

calculate the shape factor $H = \frac{\delta^*}{\theta}$ as well as energy thickness δ^{**}. [10]

(*b*) Establish relation between Daecy-Weisbach friction factor and Reynolds Number for laminar flows in pipe. [6]

Or

10. (*a*) Oil of relative density 0.92 and dynamic viscosity 1.05 poise flows between two fixed parallel plates 12 mm apart. If the mean velocity is 1.4 m/s, calculate the maximum velocity of flow, velocity and shear stress at a distance of 2 mm from one of the plates and loss of head over a distance of 25 m. [10]

(*b*) What is boundary layer ? Explain with neat sketch the development of boundary layer over a smooth flat plate. [6]

11. (*a*) A pipeline of 0.3 diameter carries liquid at the rate of 0.540 m^3/s. If the sp. gravity of the liquid is 0.80 and its kinematic viscosity is 0.023×10^{-4} m^2/s, determine the maximum permissible height of the protrusions upto which the pipe acts as smooth pipe and the height of the protrusions beyond which the pipe would become rough. [10]

(*b*) State what are the minor losses in pipe flow and derive the equation for loss of head due to sudden contraction. [6]

Or

12. (*a*) Three pipes 300 m, 150 m, 200 m long having diameters 300 mm, 200 mm and 250 mm respectively are connected in a series in the same order. Pipe having 300 mm diameter is connected to the reservoir. Water level in the reservoir is 15 m above the pipe axis which is horizontal. The respective friction factor for the three pipes are 0.018, 0.02 and 0.019. Determine the flow rate, magnitude of loss in each pipe section, and the diameter when the three pipes are replaced by a single pipe (f = 0.016) to give the same discharge. Neglect the minor losses. [10]

(*b*) Explain the use of Moody's Diagram. [6]

Total No. of Questions—9]   [Total No. of Printed Pages—4+2

Seat No.	

[4262]-107

S.E. (Civil) (Second Semester) EXAMINATION, 2012

BUILDING PLANNING

(2008 PATTERN)

Time : Four Hours   **Maximum Marks : 100**

N.B. **:—** (*i*) *All* questions are compulsory.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Draw neat sketches wherever necessary.

(*iv*) Section II should be drawn on drawing sheet only.

(*v*) Figures to the right indicate full marks.

(*vi*) There will be no internal option for questions in Section II.

(*vii*) Assume suitable data, if required.

SECTION I

1. (*a*) What do you understand by 'Master Plan' ? Explain in brief the importance of Master Plan. [6]

(*b*) What is Green Building ? State the factors considered in green building design. [5]

(*c*) Explain in brief the importance of infrastructure services for a rapidly developed town. [5]

Or

2. (*a*) What are the requirements of 'Industrial Zone' in Town planning ? [5]

(*b*) Explain with neat sketch the importance of rain water harvesting. [5]

(*c*) Why is it necessary to study the principles of Architectural designs ? Explain 'Form' as one of the important principles of Architectural design. [6]

3. (*a*) Define the following : [6]

(*i*) Plinth area.

(*ii*) Built up area.

(*b*) Discuss in brief 'Transferable Development Right'. [5]

(*c*) State three major climatic divisions in India. Explain any *one* in brief. [5]

Or

4. (*a*) What are the general principles governing the design of building water supply ? [5]

(*b*) Explain with neat sketch, 'Solar Energy System' for lighting. [6]

(*c*) What are the rules of open spaces around of Building ? [5]

5. (*a*) Write short notes on : [6]

(*i*) Sound absorption.

(*ii*) Sound foci.

(*b*) Explain in brief the fire resistance construction of load bearing structure. [6]

(*c*) Explain 'One Pipe' plumbing system. [6]

Or

6. (*a*) Draw a house drainage plan for a '3 BHK' bungalow. [6]

(*b*) What are the constructional requirements of 'Lift' ? [6]

(*c*) What is 'Trap' ? Draw a neat sketch of interseptic sewer trap. [6]

SECTION II

7. A line plan for a residential building is shown in Fig. 1. Use the following data :

(*a*) All external walls are of 230 mm thick.

(*b*) All partition walls are of 115 mm thick.

(*c*) Size of W.C. = 1.2 × 0.9.

(*d*) Size of bath = 2.1 × 1.2.

(*e*) RCC frame structure.

(*f*) Beam sizes = 0.23 × 0.375.

(*g*) Column sizes = 0.23 × 0.375.

(*h*) Floor to floor height = 3.0.

(*i*) Plinth height = 0.45.

(*j*) Depth of foundation = 1.5.

(*k*) All dimensions are in meters.

(*i*) Draw to scale 1 : 50 detailed plan. [10]

(*ii*) Draw to scale 1 : 50 detailed section XX. [10]

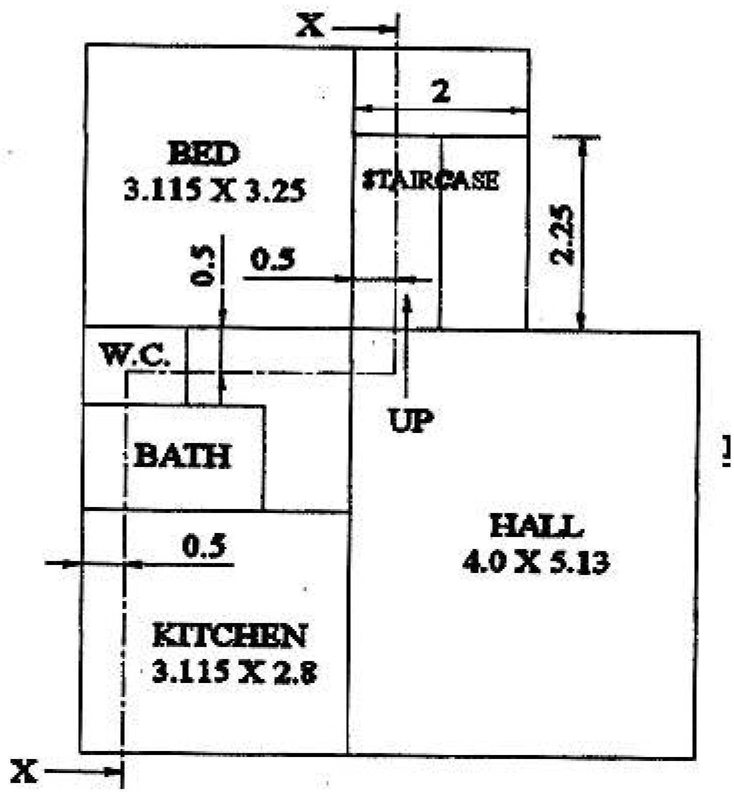


Fig. 1 Plan

8. A boy's hostel is to be planned for an engineering college in a city. Consider various principles of planning carefully. Use standard norms and rules to finalize the dimensions of the various units. Use the following data and draw a suitable line plan : [20]

(1) Capacity : 200 students.

(2) RCC framed structure.

(3) All rooms must accommodate 2 students.

(4) Each student will be given single bed, one table, one chair, one cupboard.

(5) Use additional rooms for supporting facilities, like Rector office, common room, WC and Bath, Drinking water facility, etc. Draw line plan only. Draw separate plan for ground and first floor.

9. Draw to scale 1 : 50 or suitable, a two-point perspective for the sketch shown in Fig. 2. Select station point 6 m vertically below the plan from the point where corner in plan touches the picture plane. Select eye level at 2 m above the ground level. Retain all Construction lines. [10]

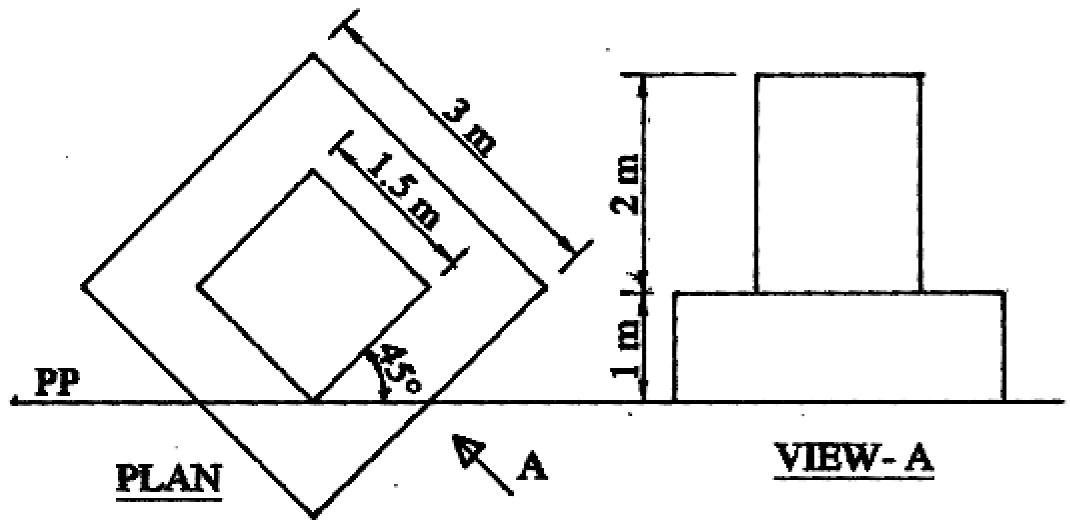


Fig. 2

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-108

S.E. (Civil) (II Sem.) EXAMINATION, 2012

SURVEYING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define the following with sketches : [6]

(*i*) Fore-bearing

(*ii*) Declination

(*iii*) W.C.B.

(*b*) Draw the sectional view of prismatic compass and show any *four* components. [6]

(*c*) Describe the errors in plane table surveying. [6]

Or

2. (*a*) The following bearings were observed on a closed compass traverse. Calculate the interior angles and correct them for observed errors, taking bearing of BC as correct. Also find corrected bearings of remaining sides of the traverse. [6]

Line	**FB**	**BB**
AB	191° 15'	10° 15'
BC	120° 45'	300° 45'
CD	349° 5'	169° 00'
DE	339° 35'	160° 40'
EA	296° 00'	115° 00'

(*b*) Explain the following accessories used in plane table surveying with sketches : [6]

(*i*) Spirit level

(*ii*) Trough compass.

(*c*) Explain the following : [6]

(*i*) Bearing

(*ii*) Dip of the needle

(*iii*) Orientation

(*iv*) Local attraction.

3. (*a*) Define the following : [6]

(*i*) Mean sea level

(*ii*) Datum

(*iii*) Elevation

(*iv*) Reduced level

(*v*) Bench mark

(*vi*) Contour interval.

(*b*) Write short notes on : [4]

(*i*) Compensator

(*ii*) V-shaped contour.

(*c*) The following consecutive readings were taken with a level and 4 m leveling staff on a continuously sloping ground at a common interval of 20 m., 0.250, on point P, 0.900, 2.000, 3.000, 0.500, 1.250 and 2.250 on Q. RL of point P was 100.00 m. Rule out a level page, apply usual check and find gradient of PQ. [6]

Or

4. (*a*) In a two peg method of a dumpy level the following readings were taken :

Level at	**Readings on**		**Remarks**
	P	Q	O is exactly midway between P and Q. Distance between P and Q is 80.00 m.
O	2.550	2.250	
A	2.435	2.010	

Find the staff readings on Q, so that the line of collimation should be horizontal, when the instrument was at P. [6]

(*b*) Define contour. Explain the uses of contour maps. [6]

(*c*) Write short notes on : [4]

(*i*) Rise and fall method

(*ii*) Auto level.

5. (*a*) Explain the following terms : [6]

(*i*) Transiting

(*ii*) Face left

(*iii*) Vertical Axis

(*iv*) Swinging the telescope.

(*b*) State different methods of measurement of horizontal angle. Explain reiteration method in detail. [6]

(*c*) Write short notes on : [4]

(*i*) Closing error

(*ii*) Bowditch's rule.

Or

6. (*a*) In a closed traverse carried out with a transit Vernier Theodolite, the following is the part of a Gale's traverse table. Compute length and reduced bearing of a linear error of closure. [6]

Line	**Length (m)**	**RB**
AB	28.20	N 15° 16' 15" E
BC	21.25	N 23° 10' 20" W
CD	29.80	N 82° 15' 41" W
DE	34.10	S 14° 16' 21" W
EA	42.90	S 65° 19' 55" W

(*b*) Explain the following technical terms : [6]

(*i*) Plunging

(*ii*) Telescope inverted

(*iii*) Latitude

(*iv*) Departure.

(*c*) Describe the Gale's traverse table. [4]

SECTION II

7. (*a*) State the advantages of Tacheometric survey. [6]

(*b*) Describe plate level test. [6]

(*c*) The following observations are made on a vertically held staff with a tacheometer fitted with an anallactic lens. The multiplying constant of the instrument was 100.

Staff station	**Vertical angle**	**Staff intercept**	**Axial hair readings**
P	$+8^{\circ}\ 36'$	2.350	2.105
Q	$+6^{\circ}\ 6'$	2.055	1.895

Compute the length of PQ and RL of Q, that of P being 321.50 m. [6]

Or

8. (*a*) State the permanent adjustment of a transit. Explain adjustment of the horizontal axis. [6]

(*b*) Determine the gradient from a point A to B from the following observations made with a tacheometer fitted with an anallactic lens. The constant of the instrument was 100 and the staff was held vertically. [6]

Inst. Station	**Staff station**	**Bearing**	**Vertical Angle**	**Staff readings**
0	P	134°	+10° 32'	1.360 1.915 2.470
	Q	224°	+5° 6'	1.065 1.885 2.705

(*c*) Write a short not on radial survey. [6]

9. (*a*) Describe compound circular curve with sketch. [4]

(*b*) Explain the following with neat sketch : [6]

(*i*) Deflection angle

(*ii*) Long chord

(*iii*) Apex distance.

(*c*) Describe the step by step procedure of setting out a simple circular curve by Rankines method of deflection angle. [6]

Or

10. (*a*) What is transition curve ? Explain superelevation. [6]

(*b*) Two straight's meet at an angle of 136°. Radius of the curve is 300 m. Calculate the elements of simple circular curve. [6]

(*c*) State linear methods of curve ranging. Draw neat and labelled sketch of transition curve. [4]

11. (*a*) Explain setting out of a building with sketch. [6]

(*b*) Explain horizontal and vertical control required in construction survey. [6]

(*c*) Explain step by step procedure of determination of horizontal distance by EDM. [4]

Or

12. (*a*) Explain step by step procedure of setting out building with total station. [6]

(*b*) Describe setting out tunnel centre line on surface. [6]

(*c*) What is ETS ? State the uses of it. [4]

Total No. of Questions—12] [Total No. of Printed Pages—4+2

Seat No.	

[4262]-109

S.E. (Civil) (II Sem.) EXAMINATION, 2012

CONCRETE TECHNOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) List the various types of cement. Explain them briefly. [6]

P.T.O.

(*b*) What is bulking of sand ? Explain the field test to determine the extent of bulking of sand. [6]

(*c*) What are the different types of mineral admixtures ? Explain any *two* mineral admixtures. [6]

Or

2. (*a*) Write flowchart for the manufacturing of cement by dry process and wet process. [6]

(*b*) Explain Alkali-Aggregate Reaction. State factors promoting it and control of the reaction. [6]

(*c*) What are the functions and types of admixtures ? [6]

3. (*a*) Explain water-cement ratio. Draw graphs giving relationship between w/c ratio and compressive strength. [6]

(*b*) Define shrinkage of concrete and give its classification. Write a short note on "Carbonation Shrinkage". [6]

(*c*) State advantages and disadvantages of pull-out test. [4]

Or

4. (*a*) Define workability. State the factors affecting workability. Describe any *one* in detail. [6]

(*b*) Write short notes on :

(*i*) Bleeding

(*ii*) Segregation. [6]

(*c*) Describe the role of aggregate in creep of concrete. [4]

5. (*a*) What do you mean by nominal mix, standard mix and design mix ? [6]

(*b*) Write in general step by step procedure for concrete mix design. [6]

(*c*) Explain the factors affecting the choice of mix design. [4]

Or

6. (*a*) State the different methods of mix design. Explain DOE method of mix design in detail. [6]

(*b*) What do you mean by :

(*i*) Mean strength

(*ii*) Variance

(*iii*) Standard deviation

(*iv*) Coefficient of variation. [4]

(*c*) Write a note on 'Absolute Volume', in respect of mix design to calculate volume of different ingredients of concrete. [6]

SECTION II

7. (*a*) Explain 'pulse velocity method' for determining concrete properties. [6]

(*b*) Write a short note on Analysis of Fresh Concrete. [6]

(*c*) Explain briefly principles of design of formwork. [6]

Or

8. (*a*) State the various types of non-destructive tests carried on hardened concrete. Explain Rebound Hammer test with its limitation. [6]

(*b*) Explain 'Marsh Cone Test' in detail. [6]

(*c*) Write short notes on :

(*i*) Inpact echo test

(*ii*) Basic members required for formwork. [6]

9. (*a*) What is self-compacting concrete ? What are advantages and disadvantages of it ? [6]

(*b*) Write short notes on :

(*i*) High density concrete

(*ii*) Polymer concrete. [6]

(*c*) What is ready-mix concrete ? [4]

Or

10. (*a*) Write a short note on Fibre Reinforced Concrete. [6]

(*b*) State the advantages of light-weight concrete. [6]

(*c*) What are the effects of hot weather on concreting ? [4]

11. (*a*) Write short notes on :

(*i*) Shotcrete

(*ii*) Sulphate attack on concrete

(*iii*) Evaluation of cracks. [6]

(*b*) Explain various reasons of cracking of hardned concrete. [6]

(*c*) Write a note on corrosion of reinforcement and its remedial measures. [4]

Or

12. (*a*) State and explain factors affecting permeability of concrete. [6]

(*b*) Write notes on :

(*i*) Chloride attack on concrete

(*ii*) Carbonation of concrete. [6]

(*c*) Explain 'Repair by Stitching'. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-110A

S.E. (Civil) EXAMINATION, 2012

ENGINEERING ECONOMICS AND MANAGEMENT

(2003 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Give the definition of Demand and Supply. Explain with the help of suitable example, how to calculate equilibrium price with the variable demand and supply. [6]

(*b*) "Economics is the study of flow of currency." Justify the statement. [6]

(*c*) Explain the terms Cost and Values with suitable examples. [6]

Or

2. (*a*) What are the factors that determine the price of any commodity ? Explain by giving assumptions, if any. [6]

   (*b*) Explain the Elasticity of Supply and Elasticity of Demand. [6]

   (*c*) Discuss the indifference curve technique. [6]

3. (*a*) Explain in detail Law of Substitution. [8]

   (*b*) What are the characteristics of imperfect competition ? Give *one* example to elaborate your points. [8]

Or

4. (*a*) Give advantages and disadvantages of Large Scale Industry. [8]

   (*b*) Explain the terms GNP and GDP. [8]

5. (*a*) Write a detailed note on Reserve Bank of India. [8]

   (*b*) Explain the inflation and deflation of currency with suitable examples. [8]

Or

6. (*a*) Explain in detail BOT system of contracting. [8]

   (*b*) Explain the term Annuity. How is it calculated ? [8]

SECTION II

7. (*a*) Write in detail the advantages and disadvantages of 'Proprietorship'. [6]

(*b*) State the qualities of a successful manager. [6]

(*c*) What is meant by Scientific Management ? [6]

Or

8. (*a*) Write down the contributions by Fayol in the development of Management. [6]

(*b*) Write a note on Deming's PDCA cycle. [6]

(*c*) Define 'Motivation'. Explain the necessity of motivation in construction industry. [6]

9. (*a*) Explain the use of Decision tree. [8]

(*b*) What is the importance of training ? Give advantages and disadvantages of the same. [8]

Or

10. (*a*) Briefly explain the objectives of 'Training'. [8]

(*b*) State various functions of leadership. [8]

11. Write short notes on any *four* : [16]

(*a*) Theory X and Y

(*b*) Industrial Disputes

(*c*) Management Information System

(*d*) Functions of Trade Union

(*e*) Importance of Management in "Construction".

Or

12. (*a*) Write a detailed note on "Human Relations in Construction". [8]

(*b*) Write a detailed note on 'Work Study'. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-111

S.E. (Mechanical) (I Sem.) EXAMINATION, 2012

APPLIED THERMODYNAMICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

UNIT I

1. (*a*) What is irreversible process ? What are the causes of irreversibility ? [8]

(*b*) A reversible heat pump is used to maintain a temperature of –5ºC in a refrigerator when it rejects heat to the surrounding at 26ºC. Determine COP of the machine and work input required to run if the heat removal rate is 25 kW. If the required input to run the pump is developed by a reversible engine which receives heat at 700 K and rejects heat to atmosphere then determine overall COP of the system. [8]

Or

2. (*a*) Prove that any reversible process can be replaced by two reversible adiabatic and one reversible isotherm between them. [4]

(*b*) Prove that entropy is the property of the system. [4]

(*c*) 5 kg of ice at –5ºC is exposed to atmosphere which is at 30ºC. The ice melts and then comes into thermal equilibrium with the surrounding. Determine entropy increase of the universe. [8]

UNIT II

3. (*a*) Derive an expression for availability of the closed system. [8]

(*b*) 500 kJ of heat from a finite temperature source at 100 K is supplied to 2 kg of gas initially at 2 bar and 350 K in a closed tank. Find the loss in available energy due to above heat transfer. C_V = 0.8 kJ/kg K, surrounding temperature = 300 K. [8]

Or

4. (*a*) 0.014 m^3 gas at a pressure of 2070 kN/m^2 expands to a pressure of 207 kN/m^2 according to the law $pV^{1.35} = C$. Determine the work done by the gas during the expansion. [4]

(*b*) Define : [4]

(*i*) Gay-Lussac Law

(*ii*) Avogadro's Law.

(*c*) Explain in detail isenthalpic process and give its applications. [8]

UNIT III

5. (*a*) What is pure substance ? Draw and explain p-V diagram for water. [8]

(*b*) 1 kg of steam at 250ºC and with enthalpy of 2500 kJ is confined in a rigid vessel. This steam is heated till it becomes dry saturated.

Determine :

(*i*) Initial pressure of steam

(*ii*) Final pressure of steam

(*iii*) Heat supplied. [10]

Or

6. (*a*) What are the reasons due to which Carnot cycle is not used as an ideal cycle for vapour power plant ? [6]

(*b*) Explain reheat cycle. Draw the same on T-s plane. Specify its advantages and disadvantages. [6]

(*c*) Steam at 20 bar and 400ºC expands in a steam turbine to 0.05 bar. It is then condensed in condenser to saturated water. Assume ideal Rankine cycle.

Determine :

(*i*) Net workdone/kg of steam

(*ii*) Rankine efficiency. [6]

SECTION II

UNIT IV

7. (*a*) Write a short note on solid fuels. [6]

(*b*) Define :

(*i*) Stoichiometric air

(*ii*) Rich mixture

(*iii*) Weak mixture

(*iv*) Mixture strength. [4]

(*c*) The dry exhaust gas from an oil engine has the following % composition by volume :

CO_2—8.85%, CO—1.2%, O_2—6.8%, N_2—83.15%

The fuel oil had a % composition by mass of :

C—84%, H_2—1.4% and O_2—2%

Determine the mass of air supplied per kg of fuel burnt. [8]

Or

8. (*a*) Explain with neat sketch Boy's gas calorimeter. [6]

(*b*) Define :

(*i*) HCV

(*ii*) LCV. [4]

(*c*) In a bomb calorimeter test the following observations were recorded :

Weight of coal tested—1.5 gm

Weight of water in calorimeter—1.3 kg

Water equivalent of calorimeter—0.9 kg

Rise in temperature of jacket water—8.925°C

Room temperature—20°C

If coal contains 3% moisture by weight, calculate HCV and LCV of the test fuel.

Assume h_{fg} = 2383.25 kJ/kg. [8]

UNIT V

9. (*a*) Derive an expression for minimum work of compression in two stage air compressor. [8]

(*b*) The following data relate to a performance test of a single acting reciprocating air compressor :

Suction pressure—1 bar

Discharge pressure—6 bar

Suction temperature—20ºC

Discharge temperature—180ºC

Speed of compressor—1200 rpm

Shaft power—6.25 kW

Mass of air delivered—1.7 kg/min

D = 14 cm and L = 10 cm.

Calculate :

Volumetric efficiency

Indicated power

Isothermal efficiency

Mechanical efficiency. [8]

Or

10. (*a*) Compare between reciprocating air compressor and rotary air compressor. [4]

(*b*) What are the factors which reduces the volumetric efficiency of reciprocating air compressor ? [4]

(*c*) A two-stage reciprocating air compressor takes in air at 1 bar, 300 K. Air is discharged at 10 bar. The intercooling is perfect. The index of compression is 1.3 in both the stages. If mass flow rate of air is 0.1 kg/sec.

Determine :

(*i*) Power required to drive the compressor

(*ii*) Saving in power as compared to single stage compression

(*iii*) Heat rejected in intercooler. [8]

UNIT VI

11. (*a*) Write a note on Stirling boiler. [8]

(*b*) The following observations were made in a boiler trial :

Coal used—300 kg

C.V. of coal—29,800 kJ/kg

Steam pressure—11.5 bar

Water evaporated—2000 kg

Feed water temperature—34ºC

Calculate the equivalent evaporation from and at 100ºC per kg of coal and efficiency of boiler if steam is 0.95 dry. [4]

(*c*) Write a note on fusible plug. [4]

Or

12. (*a*) The following results were obtained from boiler trial :

Feed water per hour—700 kg

Feed water temperature—27ºC

Steam pressure—8 bar

Dryness—0.97

Coal consumption—100 kg/hr

C. V. of coal—25,000 kJ

Unburnt coal collected—7.25 kg/hr

C. V. of unburnt coal—2000 kJ/kg

Flue formed per kg of fuel—17.3 kg

Flue temperature—325ºC

C_p—1.025 kJ/kg K

Room air temperature—16ºC

Draw the heat balance sheet on kJ/min basis and find boiler efficiency. [6]

(*b*) What are the limitations of natural draught over the artificial draught ? Give advantages of artificial draught over the natural draught. [4]

(*c*) Give classification of boilers. [6]

Total No. of Questions—**12**]

[Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-112

S.E. (Mech./Mech. S/W) (I Sem.) EXAMINATION, 2012

METALLURGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Assume suitable data wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Solve any *three* questions from each Section.

SECTION I

1. (*a*) Explain plastic deformation on the basis of dislocation theory. [6]

(*b*) Represent Miller's Indices for plane and directions for the following intercepts : [4]

(*i*) $(\bar{2}\ 1\ 0)$

(*ii*) $(1\ 1\ 3)$

(*iii*) $[1\ \bar{1}\ 1]$

(*iv*) $[0\ 1\ 2]$.

P.T.O.

(*c*) Define recovery and recrystallisation. Discuss factors influencing recrystallisation temp. [6]

(*d*) Define slip plane and slip direction. [2]

Or

2. (*a*) Explain effect of grain size on property of material. [4]

(*b*) Explain structure and property changes during recovery, recrystallisation and grain growth stages of annealing. [6]

(*c*) How is plastic deformation in a polycrystalline material different from single crystal. [4]

(*d*) In what respect cold-working is superior to hot working ? [4]

3. (*a*) Differentiate between Brinell and Vickers Hardness Test with reference to load, indenter, formula and application. [6]

(*b*) An aluminium plate 0.5 cm thick is to withstand a force of 50,000 N with no permanent deformation. If aluminium has a yield strength of 125 MPa, what is minimum width of plate ? [4]

(*c*) Discuss with a neat and labelled diagram the techniques of ultrasonic flaw detection. [6]

Or

4. (*a*) By which hardness test will you test the following ? Justify. (any *two*) : [4]

(*i*) Window Glass

(*ii*) High Speed Tool Steel

(*iii*) Thin Blade.

(*b*) Draw a typical creep curve. Explain the stages of creep. [4]

(*c*) Explain methods of improving fatigue life. [4]

(*d*) Define : [4]

(*i*) 0.2% proof stress

(*ii*) Impact toughness.

5. (*a*) With a neat and labelled sketch explain Fe-Fe_3C Phase Diagram. [10]

(*b*) Explain effects of the following on properties of steel : [6]

(*i*) Cr

(*ii*) V

(*iii*) W.

Or

6. (*a*) Explain free cutting steel w.r.t. composition and machinability. [4]

(*b*) What do you understand by the following. Give *one* application of each : [6]

(*i*) C40

(*ii*) OHNS

(*iii*) HCHC.

(*c*) Which type of stainless steel would you prefer for the following : [6]

(*i*) Razor blade

(*ii*) Cooking utensils.

SECTION II

7. (*a*) Draw T.T.T. curve for low carbon steel and alloy steel showing all details. (Like temperature and phases). What is CCR ? [6]

(*b*) Explain hardening heat treatment. What is HCP structure ? [4]

(*c*) Draw microstructures of the following steels. Also state their mechanical properties : [8]

(*i*) 0.15% carbon, normalised steel

(*ii*) 0.8% carbon steel

(*iii*) Fully hardened steel.

Or

8. (*a*) Give classification of surface hardening treatments, and explain any *one* process in detail with suitable example. [6]

(*b*) Differentiate between carbonitriding and flame hardening. [6]

(*c*) Define hardenability and explain the test conducted to find hardenability of a steel. [6]

9. (*a*) Give classification of cast iron and explain with proper micro-structure the production of Malleable Cast Iron. Also state its mechanical properties and applications. [6]

(*b*) Differentiate Gray C.I. and Nodular C.I. on the basis of micro-structure and mechanical properties and application. [5]

(*c*) What is sensitization with respect to Austenitic S.S. ? What is Intergranular corrosion ? [5]

Or

10. (*a*) Explain with suitable example Nano materials. [5]

(*b*) Differentiate between fibre reinforced and particle reinforced composites. [5]

(*c*) State composition, mechanical properties and application of any commonly used *two* copper base alloys. [6]

11. (*a*) What is Sintering process ? Explain in detail with continuous sintering furnace, used for large scale of production. [6]

(*b*) What is conditioning of metal powders ? How is it carried out ? What are its limitations ? [6]

(*c*) What precautions should be taken during cold compaction of metal powders ? [4]

Or

12. Write short notes on (any *four*) : [16]

(*i*) Martempering

(*ii*) Powder rolling

(*iii*) High temperature alloys

(*iv*) Isostatic pressing

(*v*) Production of tungsten carbide tools

(*vi*) Ausforming.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-113

S.E. (Mech.) (First Sem.) EXAMINATION, 2012

(Common to Mech/Sandwich)

FLUID MECHANICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Figures to the right indicate full marks.

(*iii*) Draw suitable sketches wherever necessary.

(*iv*) Assume suitable data, wherever necessary.

(*v*) Answers to the two Sections should be written in separate answer-books.

(*vi*) Use of electronic pocket calculator is allowed.

SECTION I

Unit I

1. (*a*) Develop the expression for the relation between gauge pressure P inside a droplet of liquid and the surface tension. [4]

(*b*) Explain : [6]

(*i*) Streak line

(*ii*) Streamline

(*iii*) Stream function

(*iv*) Velocity Potential.

(*c*) A vertical gap 2.2 cm wide of infinite extent contains a fluid of viscosity 2 Ns/m^2 and specific gravity 0.9. A metallic plate 1.2 m * 1.2 m * 0.2 cm is to be lifted up with a constant velocity of 0.15 m/s, through the gap. If the plate is in the middle of the gap, find force required. The weight of the plate is 40 N. [8]

Or

2. (*a*) What is flow net ? Explain any *one* method to draw the flow net. [6]

(*b*) The flow is described by the stream function $\psi = 2\sqrt{3}\ xy$. Locate the point at which the velocity vector has a magnitude of 4 units and makes an angle of 150° with the *x*-axis. [6]

(*c*) Given the velocity of fluid :

$V = (6 + 2xy + t^2)\ i - (xy^2 + 10t)\ j + 25k.$

What is an acceleration of a particle at (3, 0, 2) at time $t = 1$? [6]

Unit II

3. (*a*) Derive an analytical expression for determination of metacentric height of a partially submerged body. [8]

(*b*) A circular opening, 3 m diameter, in a vertical side of a tank is closed by a disc of 3 m diameter which can rotate about a horizontal diameter. Calculate :

(*i*) The force on the disc.

(*ii*) The torque required to maintain the disc in equilibrium in the vertical position when the head of water above the horizontal diameter is 4 m. [8]

Or

4. (*a*) State and explain Pascal's law. [4]

(*b*) Derive an expression for determination of centre of pressure of a vertically immersed plane surface. [6]

(*c*) A weight of 120 kN is moved through a distance of 6 m across the deck of a vessel of total weight 10 MN displacement floating in water. This makes a pendulum of 2.8 m length swing through a distance 12.5 cm horizontal. Calculate metacentric height of the vessel. [6]

Unit III

5. (*a*) Derive an expression for the error in discharge due to error in measurement of the head over triangular notch. [8]

(*b*) A pipe carrying water has a 30 cm* 15 cm venturimeter which is positioned inclined at 30° to the horizontal. The flow is upwards. The converging cone is 45 cm in length and the coefficient of the discharge of the meter is 0.98. A differential U tube manometer with mercury as indicating fluid is connected to the inlet and throat and shows a differential column height of 30 cm.

(*i*) Calculate the discharge in the pipe.

(*ii*) If the pressure in the inlet section is 50 kPa, determine the pressure at the throat. [8]

Or

6. (*a*) Derive an expression for Bernoulli's equation along a streamline. State the assumptions made. [8]

(*b*) A Pitot tube is inserted in pipe of 300 mm diameter. The static pressure in pipe is 100 mm of mercury (vacuum). The stagnation pressure at the center of pipe, recorded by the Pitot tube is 0.981 N/cm^2. Calculate the rate of flow of water through pipe, if the mean velocity of the flow is 0.85 times the central velocity. Take coefficient of velocity as 0.98. [8]

SECTION II

Unit IV

7. (*a*) Prove that the velocity distribution for Laminar flow between two parallel plates when both plates are fixed across a section is parabolic in nature. Also prove that maximum velocity is equal to one and half times the average velocity. [10]

(*b*) Derive the expression for the resistance 'R' to the motion of a completely submerged body depends upon the length of the body 'L' velocity of flow 'V' mass density of fluid 'ρ' and kinematic viscosity of fluid 'υ' using Buckingham's Π theorem. [8]

Or

8. (*a*) Explain the following : [8]

(*i*) Reynolds number

(*ii*) Euler's number

(*iii*) Froude's number

(*iv*) Mach's number.

(*b*) An 8 cm diameter pipe, 300 m long conveys oil of kinematic viscosity 1.5 stokes and mass density 900 kg/m^3. Assuming laminar flow :

(*i*) Find the rate of flow if it takes 5 kW of power input to a pump set of overall efficiency 60% to drive the flow.

(*ii*) Verify whether the assumption of Laminar flow is correct. [10]

Unit V

9. (*a*) Water flows through a pipeline whose diameter varies from 20 cm to 10 cm in a length of 10 cm. If the Darcy-Weisbach friction factor is 0.02 for the whole pipe, determine the head loss in friction when the pipe is flowing full with a discharge of 50 lps. [8]

(*b*) Show that the loss of head due to sudden expansion in a pipeline is a function of velocity head. [8]

Or

10. (*a*) Two pipes each of length L and diameters D_1 and D_2 are arranged in parallel; the loss of head when a total quantity of water Q flows through them being h_1. If the pipes are arranged in series and the same quantity of water, Q, flows through them, the loss of head is h_2. If $D_1 = 2 * D_2$, find the ratio of h_1 to h_2. Neglect minor losses and assume the friction factor to be constant and to have the same value for both the pipes. [8]

(*b*) Derive an expression for determination of maximum power transmission through the pipe. [8]

Unit VI

11. (*a*) Obtain expression for velocity distribution for turbulent flow in pipes. [6]

(*b*) Differentiate between : [6]

(*i*) Streamline body and bluff body

(*ii*) Friction drag and pressure drag.

(*c*) Explain in brief Computational Fluid Dynamics. [4]

Or

12. (*a*) What do you mean by boundary layer separation ? What is the effect of pressure gradient on the boundary layer separation ? [6]

(*b*) A truck having a projected area of 6.5 square meter travelling at 70 km/hr has a total resistance of 2000 N. Of this 20 per cent is due to rolling fricition and 10 per cent is due to surface friction. The rest is due to form drag. Calculate the coefficient of form drag. Take density of 1.25 kg/m^3. [6]

(*c*) Define the following : [4]

(*i*) Airfoil

(*ii*) Chord length

(*iii*) Angle of attack

(*iv*) Span of an airfoil.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+3**

Seat No.	

[4262]-114

S.E. (Mech.) (First Semester) EXAMINATION, 2012

ENGINEERING MATHEMATICS—III

(Common to Mech. S/W-Production, Prod. S/W & Industrial)

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Solve any *three* : [12]

(*i*) $\left(D^2 + 4\right)y = x^3 + x^2 + x + 1$

(*ii*) $\left(D^2 - 5D + 6\right)y = e^{-2x} \cosh 3x$

(*iii*) $\left(D^2 - 2D + 1\right)y = xe^x \cos x$

(*iv*) $\left[x^2D^2 - 2xD - 4\right]y = x^2 + 4$ where $D \equiv \dfrac{d}{dx}$.

(*b*) The equations of motion of a particle are given by :

$$\frac{dx}{dt} + my = 0,$$

$$\frac{dy}{dt} = mx,$$

where m is some constant. Find the path of the particle. [5]

Or

2. (*a*) Solve any *three* : [12]

(*i*) $\left[(2x + 1)^2 D^2 - 2(2x + 1)D - 12\right]y = x$

(*ii*) $\dfrac{dx}{3z - 4y} = \dfrac{dy}{4x - 2z} = \dfrac{dz}{2y - 3x}$

(*iii*) $\left(D^2 + 5D - 3\right)y = \cos^2(3x)$

(*iv*) $\left[D^3 - 5D^2 + 8D - 4\right]y = e^{3x} + 2^{3x} + 4$ where $D \equiv \dfrac{d}{dx}$.

(*b*) Solve by using method of variation of parameters :

$$\frac{d^2y}{dx^2} - y = \frac{2}{1 + e^x}.$$ [5]

3. (*a*) Find Laplace Transforms of any *two* of the following : [6]

(*i*) $L\left[e^{-2t}\cos^2 t\right]$

(*ii*) $L\left[t\, e^{t}\sin t\right]$

(*iii*) $L\left[\dfrac{\sin t}{t}\right]$.

(*b*) Solve the following differential equation by using Laplace Transform method :

$$\frac{dx}{dt} + 3x(t) + 2\int_0^t x(t)\, dt = t$$

where $x(0) = 0$. [6]

(*c*) Find Fourier Transform of $f(x) = e^{-|x|}$. [5]

Or

4. (*a*) Obtain inverse Laplace transforms of any *two* of the following : [8]

(*i*) $\log\left(\dfrac{s+4}{s+8}\right)$

(*ii*) $\dfrac{s+1}{(s+6)^4}$

(*iii*) $\dfrac{3s+7}{s^2-2s-3}$.

(*b*) Evaluate the following integral by using Laplace transforms :

$$\int_{0}^{\infty} e^{-2t} \cos^2 t \, dt. \qquad [4]$$

(*c*) Solve the integral equation :

$$\int_{0}^{\infty} f(x) \cos \lambda x \, dx = e^{-\lambda}, \quad \lambda > 0. \qquad [5]$$

5. (*a*) A string is stretched and fastened to two points L apart. Motion is started by displacing the string in the form :

$$u = a \sin\left(\frac{\pi x}{\mathrm{L}}\right)$$

from which it is released at time $t = 0$. Find the displacement $u(x, t)$ from one end by using wave equation :

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}. \qquad [8]$$

(*b*) An infinitely long uniform metal plate is enclosed between lines $y = 0$ and $y = \mathrm{L}$ for $x > 0$. The temperature is zero along the edges $y = 0$, $y = \mathrm{L}$ and at infinity. If the edge $x = 0$ is kept at a constant temperature u_0, find the temperature distribution $u(x, y)$. [8]

Or

6. (*a*) The temperature at any point of the insulated metal rod of one metre length is given by the differential equation :

$$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}.$$

Find $u(x, t)$ subject to the following conditions :

(*i*) $u(0, t) = 0$

(*ii*) $u(1, t) = 0$

(*iii*) $u(x, 0) = 50.$ [8]

(*b*) Use Fourier sine transform to solve the equation :

$$\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2}, \quad 0 < x < \infty, \ t > 0$$

subject to the conditions :

(*i*) $u(0, t) = 0, \quad t > 0$

(*ii*) $u(x, 0) = e^{-x}, \ x > 0$

(*iii*) $u \to 0, \ \frac{\partial u}{\partial x} \to 0$ as $x \to \infty.$ [8]

SECTION II

7. (*a*) The following are runs scored by two batsmen A and B in ten innings :

Batsman A	**Batsman B**
101	97
27	12
0	40
36	96
82	13
45	8
7	85
13	8
65	56
14	15

Who is more consistent batsman ? [5]

(*b*) The first four moments about working mean 3.5 of a distribution are 0.058, 0.452, 0.082, 0.5. Calculate the first four moments about mean, mean, β_1, β_2. [6]

(*c*) According to past record of one day internationals between India and Pakistan, India has won 15 matches and lost 10. If they decide to play a series of 6 matches now, what is the probability of India winning the series ? (Draw is ruled out.) [5]

Or

8. (*a*) Find the coefficient of correlation for the following data : [6]

x	y
10	18
14	12
18	24
22	6
26	30
30	36

(*b*) Assume that the probability of an individual coal miner being killed in a mine accident during a year is $\frac{1}{2400}$. Calculate the probability that in a mine employing 200 miners, there will be at least one fatal accident in a year. [5]

(*c*) In a sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal, find how many students score between 12 and 15.

Given : $A(z = 0.8) = 0.2881$

$A(z = 0.4) = 0.1554.$ [5]

9. (*a*) If

$$\bar{r} = \bar{a} \sinh t + \bar{b} \cosh t$$

where $\bar{a}$ and are constant vectors, then prove that :

(*i*) $\dfrac{d^2\bar{r}}{dt^2} = \bar{r}$

(*ii*) $\dfrac{d\bar{r}}{dt} \times \dfrac{d^2\bar{r}}{dt^2} = \bar{a} \times \bar{b}.$ [4]

(*b*) Find the directional derivative of $\phi = e^{2x} \cos yz$ at $(0, 0, 0)$ in the direction of tangent to the curve $x = a \sin t$, $y = a \cos t$, $z = at$ at $t = \dfrac{\pi}{4}$. [5]

(*c*) Prove the following vector identities (any *two*) : [8]

(*i*)

(*ii*) $$\nabla \cdot \left[r \, \nabla \left(\frac{1}{r^n} \right) \right] = \frac{n(n-2)}{r^{n+1}}$$

(*iii*) $$\nabla \times \left[\frac{\bar{a} \times \bar{r}}{r^n} \right] = \frac{(2-n)}{r^n} \, \bar{a} + \frac{n}{r^{n+2}} \left(\bar{a} \cdot \bar{r} \right) \bar{r}.$$

Or

10. (*a*) If directional derivative of :

$$\phi = ax^2y + by^2z + cz^2x$$

at (1, 1, 1) has maximum magnitude 15 in the direction parallel to :

$\nabla^2 \left(r^2 \log r \right) = 5 + 6 \log r$

$$\frac{x-1}{2} = \frac{y-3}{-2} = \frac{z}{1}.$$

Find the value of a, b, c. [6]

(*b*) Verify whether the vector field :

$$\bar{\mathrm{F}} = \left(2xz^3 + 6y \right) \bar{i} + (6x - 2yz) \bar{j} + \left(3x^2z^2 - y^2 \right) \bar{k}$$

is irrotational. If so, find the scalar potential ϕ such that $\bar{\mathrm{F}} = \nabla\phi$. [6]

(*c*) Show that :

$$\bar{\mathrm{F}} = \frac{\bar{a} \times \bar{r}}{r^n}$$

is solenoidal field. [5]

11. (*a*) Find work done by a force field :

in moving a particle once round the circle $x^2 + y^2 = 9$ in XY plane. [6]

(*b*) Use Stokes' theorem to evaluate :

$$\int_C \left(4y\bar{i} + 2z\bar{j} + 6y\bar{k}\right) \cdot d\bar{r}$$

where C is the curve of intersection of $x^2 + y^2 + z^2 = 2z$ and $x = z - 1$. [6]

(*c*) Evaluate :

$$\iint_S \left(x^3\bar{i} + y^3\bar{j} + z^3\bar{k}\right) \cdot d\bar{S},$$

where S is the surface of the sphere :

$$x^2 + y^2 + z^2 = 16$$ [5]

Or

12. (*a*) Evaluate $\int \bar{F} \cdot d\bar{r}$ for :

$$\bar{F} = \left(5xy - 6x^2\right)\bar{i} + \left(2y - 4x\right)\bar{j}$$

along curve C : $y = x^3$ in XY plane from point (1, 1) to (2, 8). [6]

(*b*) Evaluate :

$$\iint_S \left(\nabla \times \overline{F}\right) \cdot d\overline{S}$$

where

$$\overline{F} = (2y + x)\overline{i} + (x - y)\overline{j} + (z - x)\overline{k}$$

and S is the surface of the region bounded by $x = 0$, $y = 0$ and $x + y + z = 1$ which is not included in the XY plane. [6]

(*c*) Evaluate :

$$\iint_S \overline{r} \cdot \hat{n} \, dS$$

over the surface of a sphere of radius a with centre at origin. [5]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-115

S.E. (Mech.) (I Sem.) EXAMINATION, 2012

MANUFACTURING PROCESSES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Mention the ingradient present in the moulding sand and its effect on the properties of moulding sand. [6]

(*b*) What is Core ? Briefly discuss any *three* types with suitable sketch. [6]

(*c*) Explain the following casting defects and its remedies :

(*i*) Shrinkage cavity

(*ii*) Mismatch

(*iii*) Swell. [6]

Or

2. (*a*) What is pattern ? Briefly discuss various allowances provided on pattern. [6]

(*b*) Explain with suitable sketch the test perform to find grain fineness number. [6]

(*c*) Explain the following casting processes :

(*i*) Centrifugal casting (true)

(*ii*) Semi-centrifugal casting. [6]

3. (*a*) Explain in detail wire drawing operation. [6]

(*b*) Describe roll forging process. [5]

(*c*) What are the advantages of forging over the casting process ? [5]

Or

4. (*a*) Distinguish between hot working and cold working process. [5]

(*b*) Briefly describe open die and closed die forging. [5]

(*c*) Briefly explain the following processes :

(*i*) Shot peening

(*ii*) Swaging (Rotary). [6]

5. (*a*) Describe TIG principle, working and setup with suitable sketch. [5]

(*b*) Distinguish between brazing and braze welding. [5]

(*c*) Explain with suitable sketch seam welding with controlling parameters. [6]

Or

6. Write short notes on : [16]

(*i*) Soldering

(*ii*) FCAW

(*iii*) Spot welding.

SECTION II

7. (*a*) Explain the following terms used in lathe machine :

fool proof, feed reversing, gear train. [6]

(*b*) The workpiece of size Φ 50 mm × 90 mm length is to be reduced to Φ 42 mm × 85 mm, if the depth of cut is 0.5 mm, feed is 0.25 mm/rev and cutting speed is 45 m/min, find the time taken to complete one job and the production rate at the end of 8 hrs shift. [5]

(*c*) Why have speeds to be changed ? [5]

Or

8. (*a*) Mention the principle of thread cutting and explain the procedure of multiple start thread cutting operation. [6]

(*b*) Write down the specifications to be mentioned while purchasing lathe machine. [5]

(*c*) Explain half nut mechanism with neat sketch. [5]

9. (*a*) Explain cam milling operation with neat sketch. [7]

(*b*) Distinguish between drilling and planer machine. [4]

(*c*) Why is quick change chuck or magic chuck required ? Describe it in detail. [7]

Or

10. (*a*) Explain the procedure to cut a spur gear on milling machine. [7]

(*b*) Differential index : 97 divisions, change gears : [4]

24, 24, 28, 32, 40, 44, 48, 56, 64, 72, 86, 100

(*c*) Distinguish between round section and box section column drilling machine. [5]

(*d*) Sketch spot facing and trepanning operation. [2]

11. (*a*) List various bonds of grinding wheel and briefly describe the same. [7]

(*b*) Explain the procedure of mounting the grinding wheel with neat sketch. [5]

(*c*) What are the problems we may face while using grinding wheel ? Also give remedy to overcome it. [4]

Or

12. Write short notes on : [16]

(*i*) Honing

(*ii*) Lapping

(*iii*) Indian marking system for grinding wheel.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+2**

Seat No.	

[4262]-116

S.E. (Mechanical) (II Sem.) EXAMINATION, 2012

THEORY OF MACHINES—I

(2008 PATTERN)

Time : Four Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define the following terms : [4]

(*i*) Kinematic chain

(*ii*) Structure

(*iii*) Kinematic pair

(*iv*) Degree of freedom in Mechanism.

(*b*) Define inversion of a mechanism. Explain with the help of neat sketches inversions of double slider crank chain. Give their applications. [6]

(*c*) Calculate the number of degree of freedom of the mechanism as shown in Fig. 1 : [6]

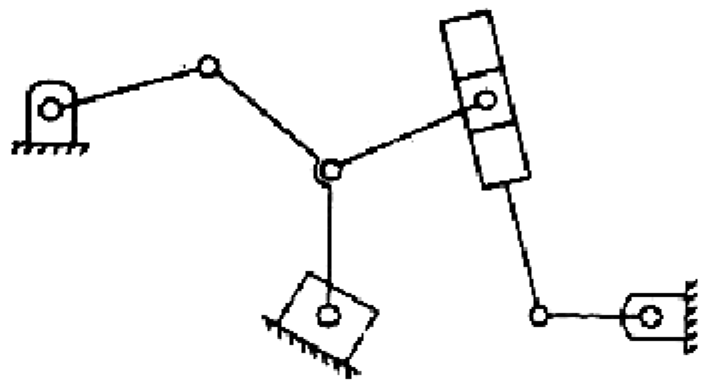


Fig. 1

Or

2. (*a*) Explain the following terms with suitable examples : [6]

(*i*) Completely constrained motion

(*ii*) Incompletely constrained motion

(*iii*) Successfully constrained motion.

(*b*) Explain with neat sketches 'Swinging and Rocking Mechanisms'. [4]

(*c*) What is the condition for correct steering ? Explain with neat sketch Ackermann steering gear mechanism. [6]

3. In a mechanism as shown in Fig. 2, link AB rotates clockwise at a speed of 240 r.p.m. At the instant shown, find velocity and acceleration of slider C as well as those of slider E. Link lengths are, AB = 50 mm, BC = 120 mm, BD = DC = 60 mm and DE = 80 mm. [16]

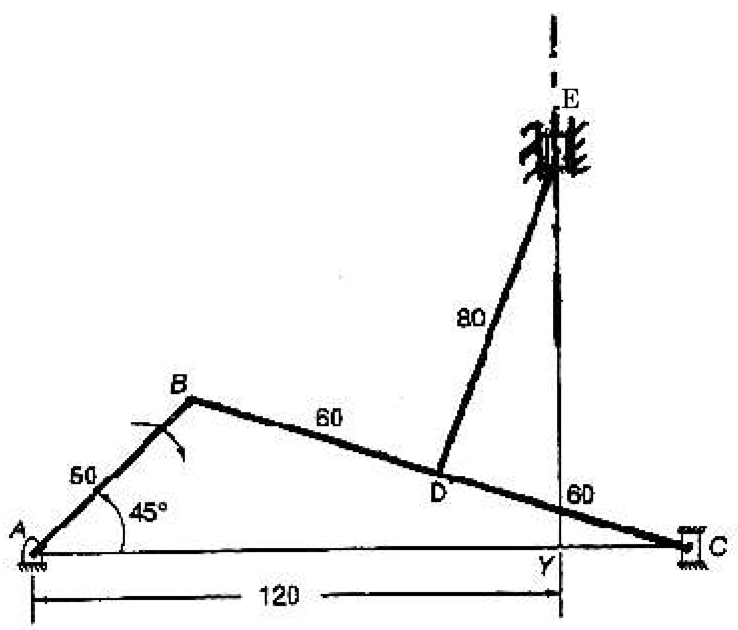


Fig. 2

Or

4. (*a*) Explain the following terms : [4]

(*i*) Instantaneous centre of rotation,

(*ii*) Space Centrode, and

(*iii*) Body Centrode.

(*b*) Fig. 3 shows a sewing machine needle box mechanism O_1ABO_2CD. Dimensions of various links are, $O_1A = 16$ mm, $\theta = 45°$, Vertical distance between O_1 and O_2 = 40 mm, Horizontal distance between O_1 and O_2 = 13 mm, $O_2B = 23$ mm, BC = 16 mm, AB = 35 mm, CD = 40 mm, angle $O_2BC = 90°$. D lies vertically below O_1 when crank O_1A rotates at 400 rpm. Find the velocity of needle D for the given configuration by instantaneous method. [12]

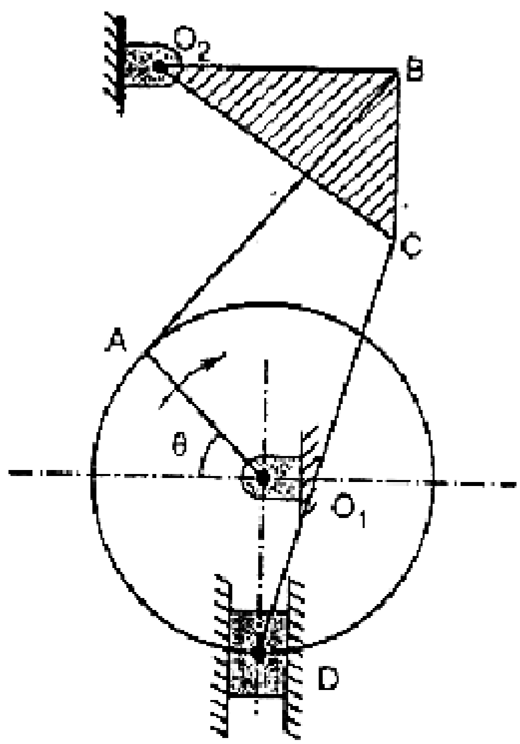


Fig. 3

5. Fig. 4 shows Whitworth quick return mechanism used in reciprocating machine tools. Dimensions of various link are, O_1O_2 = 300 mm, O_1A = 200 mm, AB = 700 mm, BC = 800 mm. The crank O_1A rotates at 120 rpm clockwise. Determine velocity and acceleration of slider C, angular velocity and angular acceleration of link AB and BC. [18]

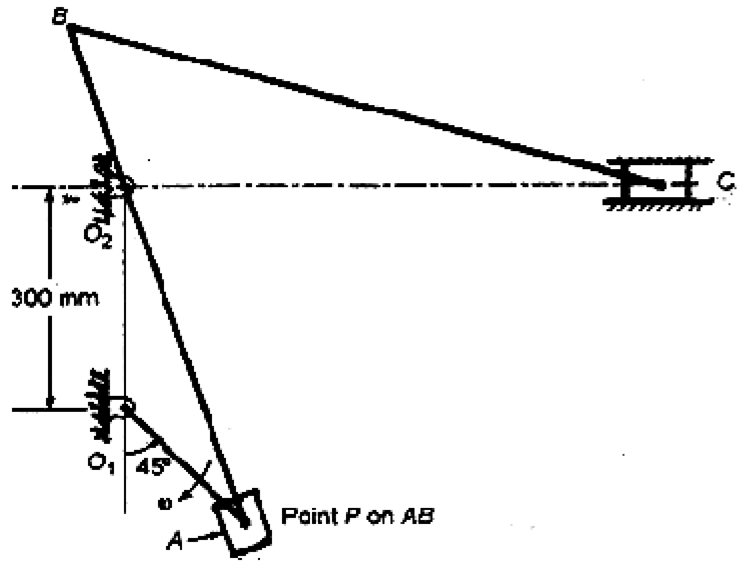


Fig. 4

Or

6. (*a*) In a slider crank mechanism, the crank is 150 mm long and connecting rod 650 mm long. Determine the following at the instant when the crank rotates at a uniform speed of 240 rpm and slider has zero acceleration : [10]

(*i*) The velocity of slider

(*ii*) The angular velocity and angular acceleration of the connecting rod.

(*iii*) The velocity and acceleration of midpoint of the connecting rod.

Use Klein's construction.

(*b*) The crank of an engine is 180 mm long and obliquity ratio is 4. Determine the acceleration of piston and the acceleration of a point X on the connecting rod located at 1/4 distances from big end, when the crank is turned through 40° from the i.d.c. position, and crank is rotating at a speed of 300 rpm and is increasing at the rate of 120 rad/sec^2. Use Klein's construction. [8]

SECTION II

7. (*a*) The four bar mechanism ABCD as shown in the Fig. 5 which is driven by link 2 at ω_2 = 45 rad/s, counterclockwise. Find the angular velocities of links 3 and 4 by using complex number method. AB = 100 mm, CD = 300 mm and AD = 250 mm. : [8]

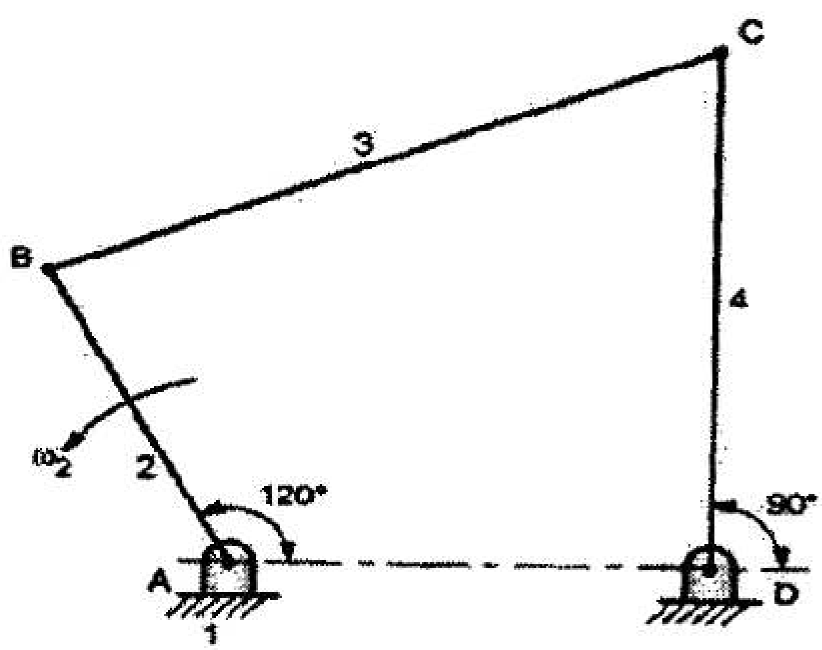


Fig. 5

(*b*) A universal coupling is used to connect two shafts whose axes intersect at 160°. The driving shaft rotates uniformly at 300 rpm. The driven shaft operates against a steady torque of 200 N-m and carries a rotor whose mass is 22 kg and a radius of gyration of 150 mm. What is the maximum value of the torque which must be exerted by the driving shaft ? [8]

Or

8. (*a*) A slider crank mechanism with zero offset has the crank and connecting rod lengths equal to 30 mm and 150 mm respectively. The crank rotates at 600 rpm in clockwise direction, using analytical method, find (*i*) Maximum velocity of slider and corresponding crank position and (*ii*) The acceleration of the slider in its extreme positions. [8]

(*b*) Angle between two shafts connected by a Hooke's joint is 25°. If the driving shaft is rotating at 1000 rpm. Find out : [6]

(*i*) Minimum speed of driven shaft in rpm.

(*ii*) Maximum speed of driven shaft in rpm.

(*iii*) The driving shaft rotation angles at which driven and driving shaft speeds are same. Also draw schematic polar diagram for the above Hooke's joint indicating all important values.

(*c*) State application of Hooke's joint. [2]

9. A four bar mechanism is to be synthesized by three precision points, to generate the function $y = 3x + 3$, for the range $0 <= x <= 4$. Assuming 30° starting position and 150° finishing position for input link and 40° starting position and 120° finishing position for the output link, find out values of x, y, θ (input angles) and ϕ (output angles) corresponding to the three precision points. [8]

If the grounded link is horizontal and its length is 100 mm, synthesize the mechanism using initial, final and precision point positions of the input link and the precision point position of the output link. Assume crank length as 45 mm, ground pivot of input link on left hand side and ground pivot of output link on right hand side. Use the method of inversion. [6]

Also mark the complete mechanism in the three precision positions. Show the incremental angles in those positions. [2]

Or

10. (*a*) Design a four bar mechanism with input link '*a*', coupler link '*b*', output link '*c*' and '*d*' grounded link. Angles θ and ϕ for three successive positions are given in the table below :

	1	2	3
θ	20	35	50
ϕ	35	45	60

Using Freudenstein's equation find out other link lengths b, c and d. Assume link length $a = 1$. Draw the mechanism in its second position and comment on the mechanism obtained. [10]

(*b*) Explain the following terms : [6]

(*i*) Structural error

(*ii*) Number and Dimensional Synthesis

(*iii*) Function generation.

11. (*a*) With the help of a neat diagram, derive the expression for the natural frequency of "Trifilar Suspension". [8]

(*b*) The connecting rod of an engine has length equal to 200 mm between centers and has mass equal to 3.5 kg. Its CG is at 80 mm from the big end centre and the radius of gyration about an axis through CG is 100 mm. Determine : [10]

(*i*) The two mass dynamically equivalent system when one mass is placed at the small end.

(*ii*) The correction couple if two masses are placed at the two ends and angular acceleration of connecting rod is 100 rad/s^2 clockwise.

Or

12. (*a*) The connecting rod of a vertical reciprocating engine is 2000 mm long between centres and its weights 250 kg. The mass centre is 800 mm from the big end centre. When it suspended as a pendulum from the small end axis, it makes 8 complete oscillations in 22 seconds. The crank is 400 mm long and rotates at 200 rpm. Determine by analytical method : [12]

(*i*) The mass moment of inertia of connecting rod about an axis through as mass centre.

(*ii*) The inertia torque exerted on the crank shaft, when the crank has turned through 40° from the top dead centre and piston is moving downwards.

(*b*) A connecting rod is suspended from a point 25 mm above the small end centre and 650 mm above its C.G. It takes 35 seconds for 20 oscillations. Find dynamically equivalent system of two masses when one mass is located at small end centre. Mass of the connecting rod is 40 kg. [6]

Total No. of Questions—**12**]

[Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-117

S.E. (Mech.) (Second Semester) EXAMINATION, 2012

I. C. ENGINES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Compare Otto and Diesel cycles for :

(*i*) Constant maximum pressure and same heat input.

(*ii*) Same compression ratio and same heat input.

(*iii*) Same maximum pressure and temperature. [9]

(*b*) An air standard diesel cycle has a compression ratio of 14. The pressure at the beginning of the compression stroke is 1 bar and temperature is 27ºC. The maximum temperature is 2500ºC. Determine thermal efficiency, stroke volume and mean effective pressure. [9]

Or

2. (*a*) What is exhaust blowdown loss ? Discuss the optimum opening position of exhaust valve to reduce this loss. [4]

(*b*) Explain with P-V diagram the loss due to variation of specific heat in Otto cycle. [6]

(*c*) Derive an expression for the mean effective pressure of the Otto cycle. [6]

(*d*) List the important reciprocating engine parts and their materials. [2]

3. (*a*) Describe the stages of combustion in S.I. engines with the help of P-Q diagram. [8]

(*b*) The throat diameter of a carburettor is 9 cm and nozzle diam is 5.5 mm. Air and fuel discharge coefficients are 0.85 and 0.7 respectively. Nozzle lip is 6 mm. Pressure difference causing flow is 0.1 bar. Find :

(*i*) A/F ratio

(*ii*) Mean velocity of air required to start the fuel injection through nozzle.

Take density of air as 1.2 kg/m^3 and density of fuel as 750 kg/m^3. [8]

Or

4. (*a*) Discuss the effect of the following engine variables on flame propagation :

    (*i*) Fuel-Air ratio

    (*ii*) Compression ratio

    (*iii*) Engine load

    (*iv*) Turbulence. [8]

   (*b*) What is abnormal combustion knock ? How can we differentiate between normal combustion knock and abnormal combustion knock. [8]

5. (*a*) Explain the phenomenon of diesel knock. Compare it with the detonation in S.I. engines. [8]

   (*b*) How are C.I. engine combustion chambers classified ? Discuss with a neat sketch 'M' combustion chamber. [8]

Or

6. (*a*) Explain the stages of combustion in C.I. engines with the help of P.Q. diagram. [8]

   (*b*) Explain how induction swirl is created. Compare induction swirl with compression swirl. [8]

SECTION II

7. (*a*) List various electronic ignition systems in use. Describe any *one* of them. State its advantages over conventional ignition system. [10]

(*b*) Define and differentiate between :

(*i*) Boundary lubrication

(*ii*) Hydrodynamic lubrication

(*iii*) Elastohydrodynamic lubrication. [8]

Or

8. (*a*) What is the advantage of pressurised cooling ? How is pressurizing accomplished ? [6]

(*b*) Explain the working of spring loaded mechanical governor with the help of neat sketch used for diesel engines. [8]

(*c*) Write a note on starting system. Explain any *one* system with a neat sketch. [4]

9. (*a*) What are the different methods used to measure brake power. Explain any *one* method with a neat sketch. [6]

(*b*) An eight cylinder, four stroke engine of 9 cm bore and 8 cm stroke with a compression ratio of 7 is tested at 4500 rpm on a dynamometer which has 54 cm arm. During a 10 minutes test the dynamometer scale beam reading was 42 kg and the engine consumed 4.4 kg of gasoline having a calorific value of 44000 kJ/kg. Air at 27ºC and 1 bar was supplied to the carburettor at the rate of 6 kg/min. Find :

(*i*) The brake power delivered

(*ii*) BMEP

(*iii*) BSFC

(*iv*) Brake thermal efficiency

(*v*) Volumetric efficiency

(*vi*) Air-fuel ratio. [10]

Or

10. (*a*) Describe the Morse Test. What is the assumption made in this test ? What is the accuracy of this test ? [6]

(*b*) Explain the methods used for the measurement of fuel consumption with neat sketch. [6]

(*c*) What are the methods used for improving engine performance ? Explain. [4]

11. (*a*) What is air pollution ? Explain the contributors to air pollution and their harmful effects on human beings. [8]

(*b*) What are the alternative fuels used for diesel engine ? Discuss the advantages of any *one* fuel over diesel. [8]

Or

12. (*a*) What are Euronorms ? Are they different from Bharat norms ? Enlist emission norms for trucks and buses. [8]

(*b*) Write short notes on :

(*i*) Catalytic converter

(*ii*) Hybrid vehicles. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-118

S.E. (Mech., Mech. S/W, Prod. Prod. S/W/Indus.)

(Second Semester) EXAMINATION, 2012

ELECTRICAL TECHNOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) You are advised to attempt not more than *three* questions.

(*vi*) Use of electronic pocket calculator is allowed.

(*vii*) Assume suitable data, if necessary.

SECTION I

1. (*a*) A three-phase, 50 Hz, 500 V a.c. motor working at certain load has 0.4 lag power factor. Two wattmeters connected to measure input power of the motor. Two wattmeter show total input power 30 kW. Find the reading on each wattmeter and total three-phase reactive power of the motor load. [6]

(*b*) Explain the following terms in connection with LT and HT tariffs :

(*i*) TOD tariff

(*ii*) Maximum demand charges

(*iii*) Delayed payment charges. [3×2=6]

(*c*) Write a short note on various types of lighting schemes used in practice. [6]

Or

2. (*a*) Explain the following terms in connection with the design of lighting scheme :

(*i*) Coefficient of utilization

(*ii*) Space to light ratio

(*iii*) Depreciation factor. [3×2=6]

(*b*) A three-phase star connected balanced load of $(4 + j3)$ ohm per phase is connected across three-phase, 50 Hz, 400 V a.c. supply. Determine :

(*i*) Power factor of the load.

(*ii*) Current drawn from the supply.

(*iii*) If two wattmeter method is used to determine input power, find each wattmeter reading.

(*iv*) Total active power of the load.

(*v*) Total reactive power of the load. [6]

(*c*) State and explain role of CT and PT in measurement of single-phase power/energy of the system. [6]

3. (*a*) Discuss various specifications mentioned on name plate of the three-phase transformer. [4]

(*b*) Draw only the approximate equivalent circuit diagram of single-phase transformer and mention all parameters on it. [4]

(*c*) The output of three-phase, 415 V induction motor running at 2% slip is 36.775 kW. Determine :

(*i*) rotor speed and slip speed

(*ii*) rotor output and rotor copper loss

(*iii*) efficiency of motor at given loading condition.

Assume motor is wound for four pole and supply frequency to be 50 Hz.

Given : Friction and windage losses are 1500 W while stator losses are 3 kW. [8]

Or

4. (*a*) State the various equipments used in pole mounted distribution transformer substation. Explain any *one* of them in brief. [4]

(*b*) Define the following terms in connection with working of transformer :

(*i*) Voltage regulation

(*ii*) Efficiency.

Also state the condition for maximum efficiency of transformer. [4]

(*c*) A 4 pole, 3-phase, 50 Hz induction motor has a full load slip of 5%. Rotor has per phase resistance of 0.3 Ω and per phase reactance of 1.2 Ω. Find for the given motor working :

(*i*) ratio of maximum torque to full load torque.

(*ii*) ratio of starting torque to maximum torque.

(*iii*) speed at which maximum torque occurs.

(*iv*) additional resistance requires in the rotor circuit so that at start motor will offer maximum torque. [8]

5. (*a*) Draw only the neat labelled diagram of a two pole single-phase shaded pole induction motor. Also state its any *two* applications. [4]

(*b*) State the constructional and operational difference between salient and non-salient type synchronous generator. [4]

(*c*) From first principle, derive the formula for emf generated in the alternator. Determine phase and line voltage generated in 3-phase, 10 pole, 50 Hz star connected alternator. Armature of alternator has 60 slots and conductor per slot 4 with flux per pole 120 mWb.

(Given : Distribution factor and coil span factor 0.966 and 0.912 respectively.) [8]

Or

6. (*a*) Write only the complete formula of emf generated per phase in alternator. State each term involve in it with its unit of measurement. [4]

(*b*) List the various specifications mentioned on the name plate of the single-phase induction motor. [4]

(*c*) A 3-phase, 50 Hz, 100 kVA, 3000 V star connected alternator has an armature resistance per phase 0.2 ohm. A field current of 50 A produces short circuit current of 200 A and open circuit emf of 1040 V (line). Calculate full load voltage regulation at :

(*i*) Unity P.F.

(*ii*) 0.8 lagging P.F.

(*iii*) 0.8 lead P.F. [8]

SECTION II

7. (*a*) With simple diagram state the difference between a.c. and d.c. servomotor. [6]

(*b*) Draw and explain electrical and mechanical characteristics of d.c. series motor only. [6]

(*c*) A 250 V d.c. shunt motor is running at 1000 rpm and drawing 8 A current at no load condition. If armature resistance is 0.2 ohm and that of shunt field winding is 250 Ω, calculate speed of the motor when it will draw 50 A current from supply.

(Assume flux remains constant throughout the operation.) [6]

Or

8. (*a*) State the names of various methods used in practice for speed control of d.c. series motor and explain any *one* method in detail. [6]

(*b*) Derive the generalised expression for torque of d.c. motor with usual notation. [6]

(*c*) A 4 pole series motor has total number of armature wave wound conductors = 944, flux per pole = 34.6 mWb, gross torque = 209 Nm, supply voltage = 500 V and motor total resistance ($R_a + R_{se}$) = 3 ohm. Calculate current drawn by the motor from supply and speed of the operation. [6]

9. (*a*) Draw and explain transfer characteristic of enhancement MOSFET. [4]

(*b*) Explain in short natural and forced commutation of SCR. [4]

(*c*) Draw V-I characteristic of SCR. Show the effect of increase in gate current on the shape of V-I characteristic. Show the following points/regions on V-I characteristic and explain :

(*i*) Latching current

(*ii*) Holding current

(*iii*) Forward blocking state

(*iv*) Forward conducting state

(*v*) Reverse blocking state. [8]

Or

10. (*a*) Explain with neat construction diagram operation of diac component. [4]

(*b*) State the *two* applications of each of the following power electronic component :

(*i*) SCR

(*ii*) MOSFET

(*iii*) Triac

(*iv*) GTO. [4]

(*c*) In connection with IGBT, explain :

(*i*) Its construction

(*ii*) Transfer characteristic

(*iii*) Output characteristic

(*iv*) Field of applications. [4×2=8]

11. (*a*) State and explain advantages of electrical drive system. [4]

(*b*) Explain concept of cycloconverter for getting frequency change for speed control of induction motor. [4]

(*c*) Explain any *one* method of three-phase converter fed d.c. drive with the help of waveform. [8]

Or

12. (*a*) Explain in short two quadrant d.c. motor chopper drive. [4]

(*b*) Explain step down chopper circuit with output voltage formula. [4]

(*c*) Clearly mention difference between individual drive and group drive from operation, applications, advantages and disadvantages point of view. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+4**

Seat No.	

[4262]-119

S.E. (Mechanical) (II Sem.) EXAMINATION, 2012

STRENGTH OF MACHINE ELEMENT

[Common to Mech. S/W of Sem. I and Mech. Branch Sem. II]

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

Unit 1

1. (*a*) Define and explain the following terms : [4]

(*i*) Modulus of rigidity

(*ii*) Lateral strain.

(*b*) Show that $E = 2G(1 + \mu)$ with usual notations. [4]

(*c*) A solid steel bar 500 mm long and 70 mm diameter is placed inside an aluminium tube having 75 mm inside diameter and 100 mm outside diameter. The aluminium tube is 0.15 mm longer than the steel bar. An axial load of 600 kN is applied to the bar and the cylinder through rigid cover plate from both ends. Find the stresses developed in the steel bar and the aluminium tube.

Use $E_s = 220$ kN/mm^2 and $E_a = 70$ kN/mm^2. [8]

Or

2. (*a*) A hollow steel tube of 30 mm in diameter and 5 mm thickness encloses centrally a solid copper bar of 15 mm diameter to which it is rigidly connected at each ends. If, at a temperature of 10°C there is no longitudinal stress. Find the stresses in each metal when heated to 200°C. The value of coefficient of linear expansion for steel and copper is 11×10^{-6} per °C and 18×10^{-6} per °C respectively. Take $E_s = 2.1 \times 10^5$ MPa and $E_c = 1 \times 10^5$ MPa. [8]

(*b*) A bar LMNP, fixed at L and P is subjected to axial forces as shown in Fig. 1. Determine : [8]

(*i*) Forces in portion LM, MN and NP.

(*ii*) Displacement of points M and N.

Take E = 200 GN/m^2.

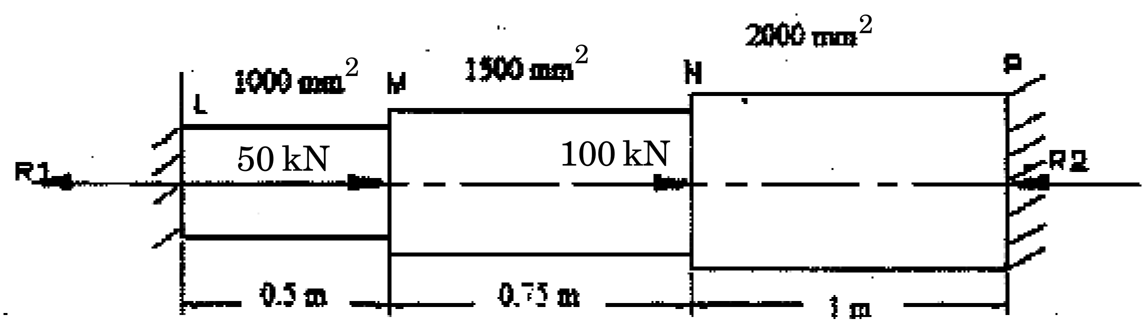


Fig. 1

Unit 2

3. (*a*) A simply supported beam of length 10 m long carries a uniformly distributed load and two point loads as shown in Fig. 2. Draw the shear force and bending moment diagram, also calculate maximum bending moment. [12]

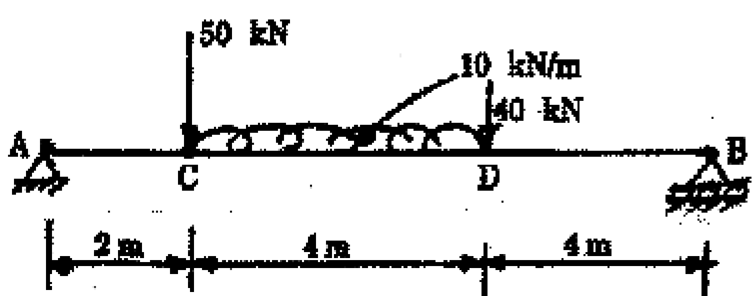


Fig. 2

(*b*) Show that for a simply supported beam of length 'L' subjected to a central concentrated Load of 'W', deflected at mid span is given by $y = WL^3/48EI$ Downward. Use double integration method. [6]

Or

4. (*a*) A cantilever AE of 5 m long is subjected to forces as shown in figure. Draw the shear force and bending moment diagram for the beam shown in Fig. 3. [10]

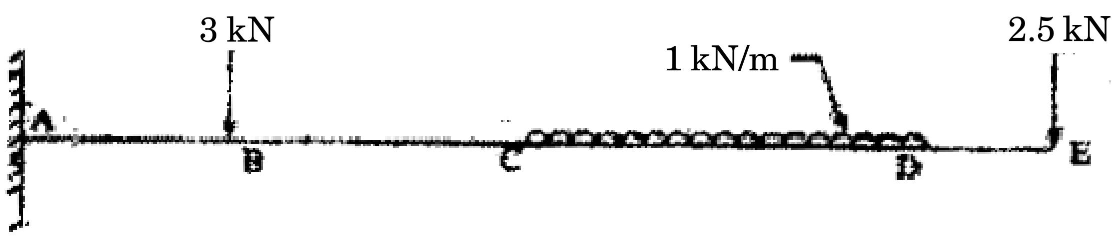


Fig. 3

(*b*) A cantilever of 3 m length and uniform rectangular cross-section 150 mm wide and 300 mm deep is loaded with 30 kN load at its free end. In addition to this it carries a uniformly distributed load of 20 kN per meter run over its entire length, calculate :

(*i*) The maximum slope and deflection

(*ii*) The slope and deflection at 2 m from fixed end. [8]

Unit 3

5. (*a*) An element in plane stress is subjected to stresses σ_x = 70 MP Tensile, σ_y = 35 MPa Compressive and τ_{xy} = 35 MPa as shown in Fig. 4. Determine the principal stresses and their planes, also determine maximum shear stress and planes on which it acts. [8]

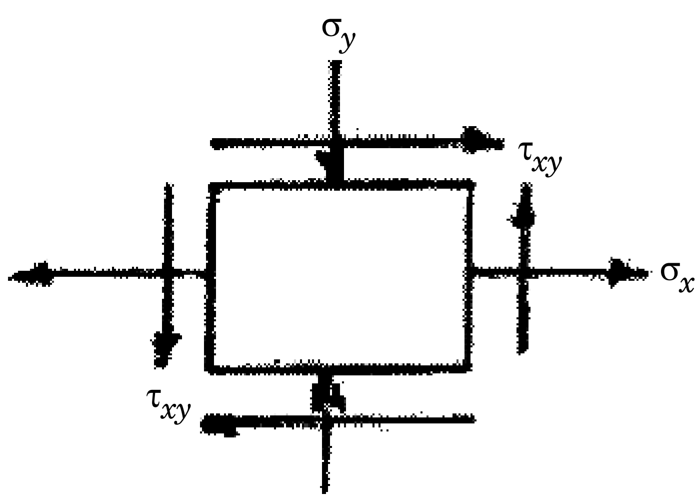


Fig. 4

(*b*) Derive an expression for principal stresses and maximum shear stress for a shaft subjected to combined bending and twisting moment. [8]

Or

6. (*a*) On a mild steel plate, a circle of diameter 50 mm is drawn before the plate is stressed as shown in Fig. 5. Find the length of major and minor axes of an ellipse formed as a result of the deformation of the circle marked. Take E = 200 GPa, Poisson's ratio = 0.25. [8]

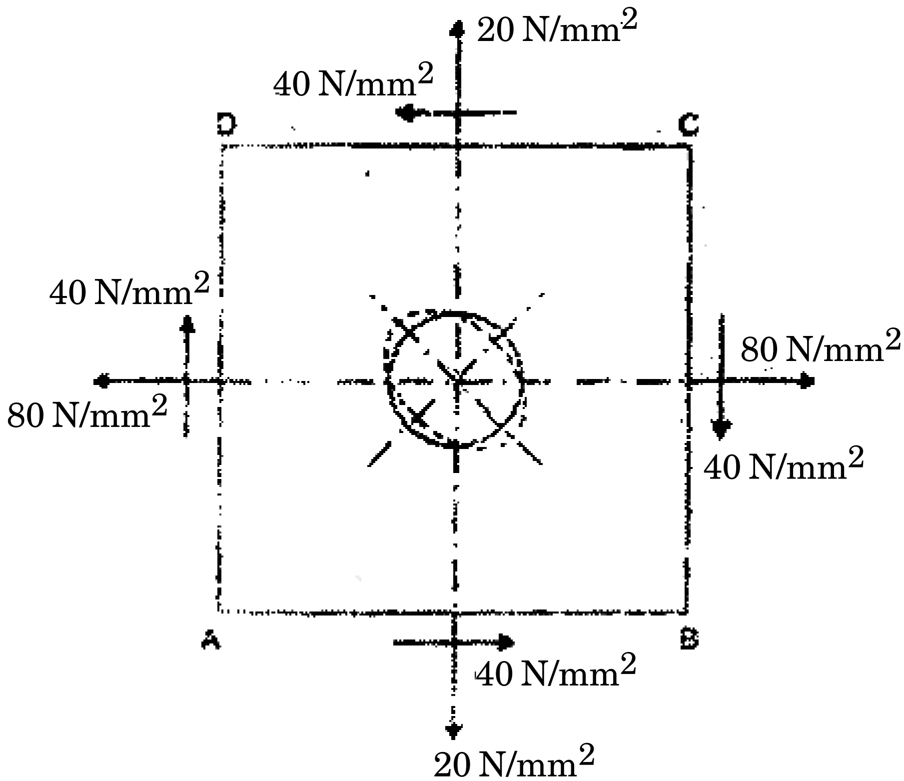


Fig. 5

(*b*) Write short notes on any *two* of the following : [8]

(*i*) Maximum Distortion energy

(*ii*) Maximum principal stress theory

(*iii*) Maximum shear stress theory.

SECTION II

Unit 4

7. (*a*) Derive the following expression :

$$\frac{\sigma}{y} = \frac{M}{I} = \frac{E}{R}. \qquad [8]$$

(*b*) A beam of the cross-section shown in Fig. 6 is bent about a horizontal axis. If the bending moment is 8 kN-m, determine the total force action on the top flange. [8]

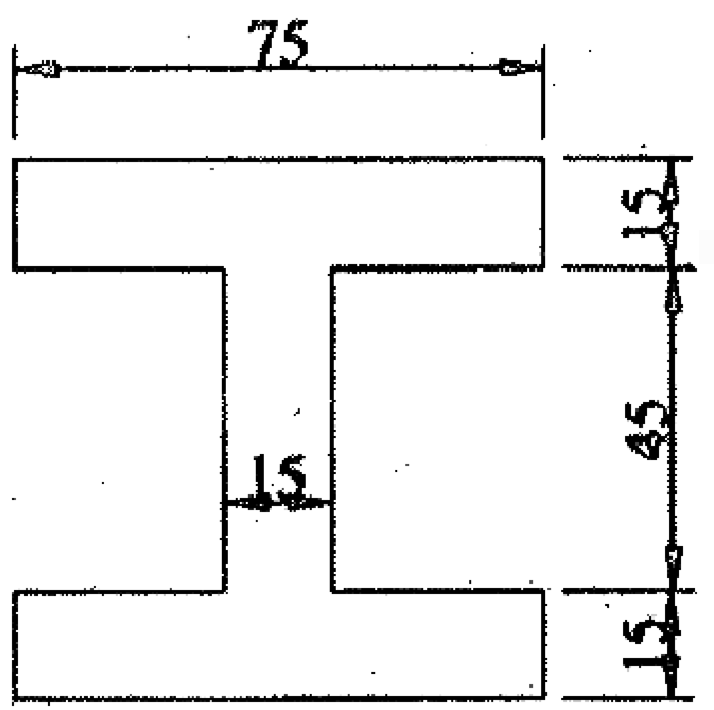


Fig. 6

Or

8. (*a*) For a hollow circular section whose external diameter is twice the internal diameter, find the ratio of maximum shear stress to average shear stress. [6]

(*b*) A beam AB of length L and rectangular cross-section carries a uniformly distributed load W and is supported as shown in Fig. 7 :

(*i*) Show that the ratio of the maximum values of the shearing and normal stresses of the beam is equal to $\frac{2h}{L}$, where h and L are respectively the depth and the length of beam.

(*ii*) Determine the depth h and width b of the beam knowing that L = 5 m, W = 8 kN/m, Z_m = 1.08 MPa and σ_m = 12 MPa. [10]

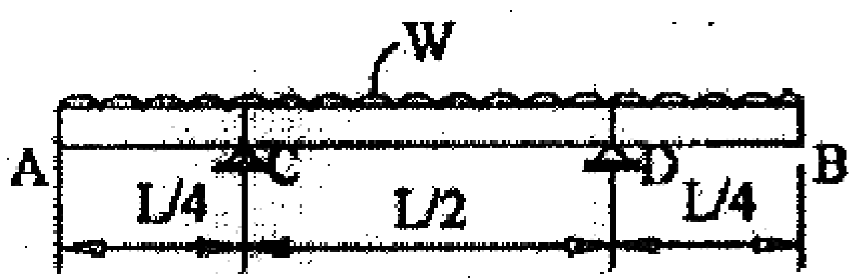


Fig. 7

Unit 5

9. (*a*) Derive Euler's formula for buckling load for column with hinged ends. Also state the limitations of Euler's formula. [8]

(*b*) A hollow shaft is 1 m long and has external diameter 50 mm. It has 20 mm internal diameter for a part of length and 30 mm internal diameter for the rest of length. If the maximum shear stress is not to exceed 80 N/mm^2, determine the maximum power transmitted by it at a speed of 300 rpm. If the twists produced in the two portions of the shaft are equal, find the lengths of the two portions. Refer Fig. 8. [8]

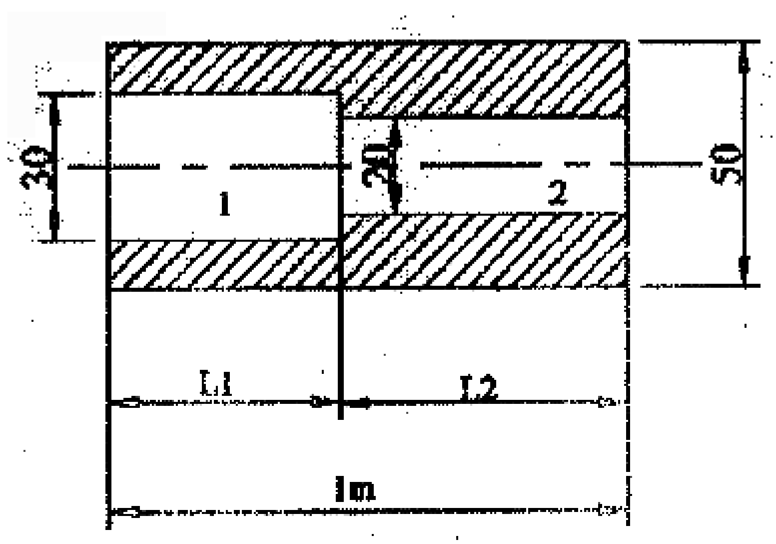


Fig. 8

Or

10. (*a*) Derive the following expression :

$$\frac{T}{J} = \frac{z}{r} = \frac{G\theta}{L}.$$ [8]

(*b*) Two brass rods used as compression member, each of 3 m effective length, have the cross-sections as shown in Fig. 9 : [8]

(*i*) Determine the wall thickness of the hollow square rod for which the rods have the same cross-sectional area.

(*ii*) Using E = 105 GPa, determine the critical load of each rod.

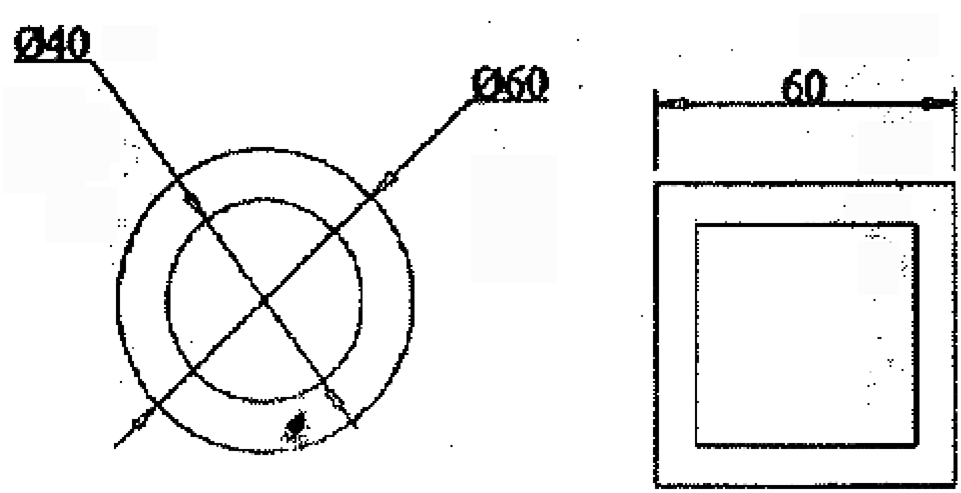


Fig. 9

Unit 6

11. (*a*) Write a short note on Preferred Size. [4]

(*b*) Explain various steps in the process of designing machine components. [6]

(*c*) A knuckle joint is subjected to an axial load of 100 kN. Determine the diameter of knuckle pin considering the load to be uniformly distributed over the pin in the eye and uniformly varying over the portion of pin in fork.

Allowable tensile and compressive stress for pin is 600 N/mm^2

Allowable shear stress for pin is 300 N/mm^2

Allowable bearing pressure for pin is 200 N/mm^2

Thickness of eye is 1.5 d where d is pin diameter. [8]

Or

12. (*a*) A 'C' frame subjected to a load of 10 kN is as shown in Fig. 10. It is made of gray cast iron with allowable normal stress of 120 N/mm^2. Determine the dimensions of the cross-section of the frame. [6]

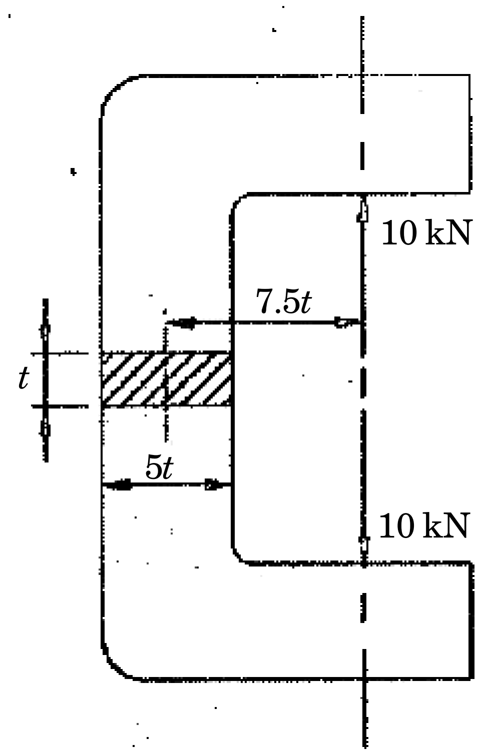


Fig. 10

(*b*) Write a short note on design for environment. [6]

(*c*) Explain the term design synthesis. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4262]-120

S.E. (Mech.) (II Sem.) EXAMINATION, 2012

PRODUCTION TECHNOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

(*vi*) Solve Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q. No. **5** or Q. No. **6** from section A, Q. No. **7** or Q. No. **8**, Q. No. **9** or Q. No. **10**, Q. No. **11** or Q. No. **12** from section B.

SECTION A

1. (*a*) An orthogonal cut 2.5 mm wide is made at a speed of 0.5 m/s and feed of 0.26 mm with a H.S.S. tool having a 20° rake angle. The chip thichness ratio is found to be 0.58, the cutting force is 1400 N and the feed thrust force is 360 N, find : [10]

(*i*) Chip thickness

(*ii*) Shear plane angle

(*iii*) Resultant force

(*iv*) Coefficient of friction on the face of the tool

(*v*) Friction force and normal force on the chip

(*vi*) Shearing force and normal force on the shear plane.

(*b*) Sketch a single-point cutting tool and show on it the various tool elements and tool angles. Give the function of each tool elements. List the various tool angles and discuss their significance. [6]

Or

2. (*a*) A seamless tube of 50 mm outside diameter is turned on lathe with cutting speed of 20 m/min. The tool rake angle is 15° and feed rate is 0.2 m/rev. The length of chip in one revolution measures 80 mm. Calculate : [10]

(*i*) Chip thickness ratio

(*ii*) Shear plane angle

(*iii*) Shear flow speed

(*iv*) Shear strain.

(*b*) Prove that $T = \left(\frac{1}{n} - 1\right)K_2$, where 'T' is a tool life for maximum production, '*n*' is the exponent in the tool life equation and K_2 is the tool changing time. [6]

3. (*a*) Explain continuous surface Broaching machine with working sketch. [5]

(*b*) Explain the concept of gear shaping process with neat sketch. [5]

(*c*) What is the major disadvantages of self-opening die hands (Thread Chasers) ? [6]

Or

4. (*a*) Explain the process of thread grinding with neat sketch. [5]

(*b*) Explain the process of gear hobbling with neat sketch. [5]

(*c*) Draw the neat sketch of broach geometry details. [6]

5. (*a*) Explain with a neat sketch NC coordinate system. [6]

(*b*) State advantages of FMS over conventional CNC system. [6]

(*c*) Explain with a neat sketch NC motion control system. [6]

Or

6. (*a*) Explain the meaning of every work written in the following line : [4]

G02 X37 Z20 M04 T02 F70 E0B.

(*b*) List functions, advantages and limitations of CNC machines. [4]

(*c*) Write notes on (any *two*) : [10]

(*i*) Tool magazines

(*ii*) M codes

(*iii*) Functions of DNC.

SECTION B

7. (*a*) Why are strippers required ? List various types of strippers and explain any *one* with neat sketch. [6]

(*b*) Describe the following terms : [12]

(*i*) Centre of Pressure

(*ii*) Strip layout

(*iii*) Spring back.

Or

8. (*a*) Explain methods of reducing cutting forces in sheet metal works. [8]

(*b*) A cup without flanges and height 20 cm. and diameter 10 cm. is to be made from sheet metal 2.5 mm thick. Find the diameter of strip at each draw if reduction in 45% , 25%, 19.25% respectively. [10]

9. (*a*) What is necessity for unconventional machining processes ? Enlist the requirement that demands the use of advanced machining process. [6]

(*b*) Define electrical discharge machining. What are functions of dielectric fluid used in EDM ? What the dielectric fluids commonly used in EDM ? [8]

(*c*) Why reuse of abrasives is not recommended in AJM ? [2]

Or

10. (*a*) Explain the EBM in detail with neat sketch. [6]

(*b*) What is LASER ? What are the gases commonly used in LASER ? [4]

(*c*) What is the function of abrasive slurry in USM ? Explain how the abrasive selection is made ? [6]

11. (*a*) Explain 3-2-1 principle of location. [6]

(*b*) State various types of clamping devices used in jig and fixtures and explain any *one* in detail with neat sketch. [6]

(*c*) How can be provision for chip clearance provided on jig ? [4]

Or

12. (*a*) Define jig and fixture. Differentiate between them with suitable example. [8]

(*b*) What are the types of drill jigs ? Explain any *one* in detail with neat sketch. [6]

(*c*) What is meant by V-locations ? Show a sketch how V-location can be applied to locate a small lever. [2]

Total No. of Questions—**12**]

[Total No. of Printed Pages—**8**

Seat No.	

[4262]-121

S.E. (Mech. S/W) (Semester First) EXAMINATION, 2012

THERMAL ENGINEERING–I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What is an isothermal process ? Derive an expression for the work done during an isothermal process. [5]

(*b*) Distinguish between reversible and irreversible process. [4]

(*c*) A certain quantity of gas has a volume of 0.028 m^3 at a pressure of 1.25 bar and 25°C. It is compressed to a volume of 0.0042 m^3 according to the law $PV^{1.3} = C$. Determine :

(*i*) Final Temperature;

(*ii*) Work done during compression. [7]

Or

2. (*a*) Prove that efficiency of reversible engine depends on temperature of source and sink and is independent of working substance. [5]

(*b*) Derive an expression for the change of entropy for isothermal process in terms of volume. [5]

(*c*) 5 kg of air is compressed in a reversible steady flow polytropic process from 100 kPa and 40°C to 1000 kPa and during this process the law followed by gas is $PV^{1.25} = C$. Determine the shaft work, heat transferred and change in entropy. Take $C_V = 0.717$ kJ/kg°K, R = 0.287 kJ/kg°K. [6]

3. (*a*) Discuss briefly the difference between externally fired and internally fired steam generators. [4]

(*b*) Discuss the main advantages of artificial drought system over natural drought system. [4]

(*c*) A coal fired boiler plant consumes 400 kg of coal per hour. The boiler evaporates 3200 kg of water at 44.5°C into superheated steam at a pressure of 12 bar and 274.5°C. If the calorific value of fuel is 32760 kJ/kg of coal. [8]

Determine :

(*i*) Equivalent evaporation from and at 100°C

(*ii*) Thermal efficiency of the boiler.

Assume specific heat of superheated steam as 2.1 kJ/kg°K.

Or

4. (*a*) Derive an expression for drought in mm of water for minimum discharge rate of gases through the chimney. [5]

(*b*) Define :

(*i*) Boiler efficiency;

(*ii*) Equivalent evaporation. [4]

(*c*) A chimney is 60 m high and the temperature of atmospheric air is 27°C. If 15 kg of air/kg of fuel used. Find the temperature for maximum discharge of hot gases and drought pressure in mm of water. [7]

5. (*a*) Explain the method of finaling dryness fraction of steam with the help of combined separating and throttling calorimeter and discuss the limitations for the same. [4]

(*b*) Explain throttling process of steam with the help of h-s plane. [4]

(*c*) 1 kg of steam initially dry saturated at 1.1 MPa expands in a cylinder, following the law $PV^{1.13} = C$. The pressure at the end of expansion is 0.1 MPa. Determine :

(*i*) Final volume

(*ii*) Final dryness fraction

(*iii*) work done

(*iv*) Change in internal energy

(*v*) Heat transferred. [10]

Or

6. (*a*) Prove that efficiency of a Rankine cycle using superheated steam is greater than the efficiency of a corresponding Rankine cycle using steam without superheat. Both the cycle operates between same boiler and condenser pressure limit. [6]

(*b*) Why the Carnot cycle can not be considered as the theoretical cycle for steam power plant even though its efficiency is maximum ? [5]

(c) A steam power plant is supplied with dry saturated steam at a pressure of 12 bar and exhausts into a condenser at 0.1 bar. Calculate Rankine efficiency by using :

(i) Steam table and

(ii) Mollier chart. [7]

SECTION II

7. (a) What is the significance of knowing volumetric analysis of dry combustion products ? [4]

(b) Explain with neat sketch Boy's gas calorimeter. [6]

(c) During a trial on a boiler, the dry flue gas analysis by volume was obtained as CO_2 = 13%, CO = 0.3%, O_2 = 6%, N_2 = 80.7%. The coal analysis by weight was reported as C = 62.4%, H_2 = 4.2%, O_2 = 4.5%, moisture = 15% and ash = 13%. Estimate : [6]

(i) Theoretical air required to burn 1 kg of coal.

(ii) Mass of air actually supplied per kg of coal.

(iii) The amount of excess air supplied per kg of coal burnt.

Or

8. (a) What are alternative fuels used in I.C. Engines ? [4]

(*b*) Explain the following terms related to fuels : [6]

(*i*) Flash point

(*ii*) Pour point

(*iii*) Volatility.

(*c*) In a boiler trial the composition of dry flue gases by volume is CO_2 = 11.5%, CO = 2.5%, O_2 = 5% and N_2 = 81% (by difference). If the fuel used has 80% of carbon by mass, determine the air fuel ratio and the excess air supplied per kg of fuel. [6]

9. (*a*) Derive an expression for thermal efficiency and mean effective pressure of the Diesel cycle. [8]

(*b*) The temperature and pressure of the air at the beginning in a engine working on dual cycle are 100°C and 1 bar respectively. The compression ratio is 13. The maximum pressure of the cycle is limited to 80 bar. The amount of heat added is 1700 kJ/kg of air. Determine : [8]

(*i*) The temperatures at salient points of the cycle.

(*ii*) Ideal thermal efficiency. Take $\gamma = 1.4$ for air.

Or

10. (*a*) With the help of P–V and T–S diagram compare the air standard Otto, Diesel and dual combustion cycle for same maximum pressure and maximum temperature. [8]

(*b*) For an ideal diesel engine operating on Diesel cycle with $\gamma = 1.4$, determine the thermal efficiencies for cut-off ratio of 1.25, 1.5 and 2. The pressure and temperature at the beginning of compression is 0.98 and 30°C respectively and compression ratio is 13. Comment on the efficiency results. [8]

11. (*a*) What is the influence of intake temperatures and intake pressure, clearance and compression and expansion indices on performance of reciprocating compressor ? [6]

(*b*) Explain the following terms related to compressor : [6]

(*i*) Free air delivered

(*ii*) Capacity of compressor

(*iii*) Volumetric efficiency.

(*c*) A single-stage, single acting compressor delivers 15 m^3 of free air per minute from 1 bar to 8 bar. The speed of the compressor is 300 RPM. Assuming that compression and expansion follows that law $PV^{1.3} = C$ and clearance is $\frac{1}{16}$th of swept volume, find diameter and stroke of the compressor. Take L/D = 1.5. The temperature and pressure of air at the suction are same as atmospheric air. [6]

Or

12. (*a*) Discuss various methods to improve isothermal efficiency of reciprocating compressor. [4]

(*b*) Prove that intercooler pressure (P_2) for minimum work required for two-stage reciprocating air compressor is given by $P_2 = \sqrt{P_1 P_3}$. [6]

(*c*) A 3-stage compressor is used to compress H_2 from 1.04 bar to 35 bar. Compression in all stages follows the law $PV^{1.25} = C$. The temperature of air at inlet of compressor is 288 K. Neglecting clearance and assuming perfect intercooling find out the indicated power required in kW to deliver 14 m^3 of H_2 per minute measured at inlet conditions and intermediate pressures also.

Take R = 4.125 kJ/kgK (for H_2). [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-122

S.E. (M.S.) (Second Semester) EXAMINATION, 2012

THEORY OF MACHINE AND MACHINE DESIGN–I

(2008 PATTERN)

Time : Four Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

UNIT I

1. (*a*) How are the kinematic pairs classified ? Explain with examples. [6]

(*b*) Write short notes on : [10]

(*i*) Functioning of quick-return mechanism (any *one*).

(*ii*) Condition for correct steering for a four wheeled vehicle.

Or

2. (*a*) What is Kutzback's criterion for degree of freedom of plane mechanism ? In what way is Gruebler's criterion different from it ? [6]

(*b*) Explain with neat sketches inversions of double slider crank chain with applications. [6]

(*c*) Write a note on Hooke's joint and its applications. [4]

UNIT II

3. (*a*) For the mechanism shown in the figure (*i*), find the velocity of slider D and angular velocity of link CD, using instantaneous centers of velocity method, where :

OQ = 100 mm, OA = 200 mm, QC = 150 mm, CD = 500 mm

Speed of OA about O is 120 rpm uniform in the clockwise direction. [14]

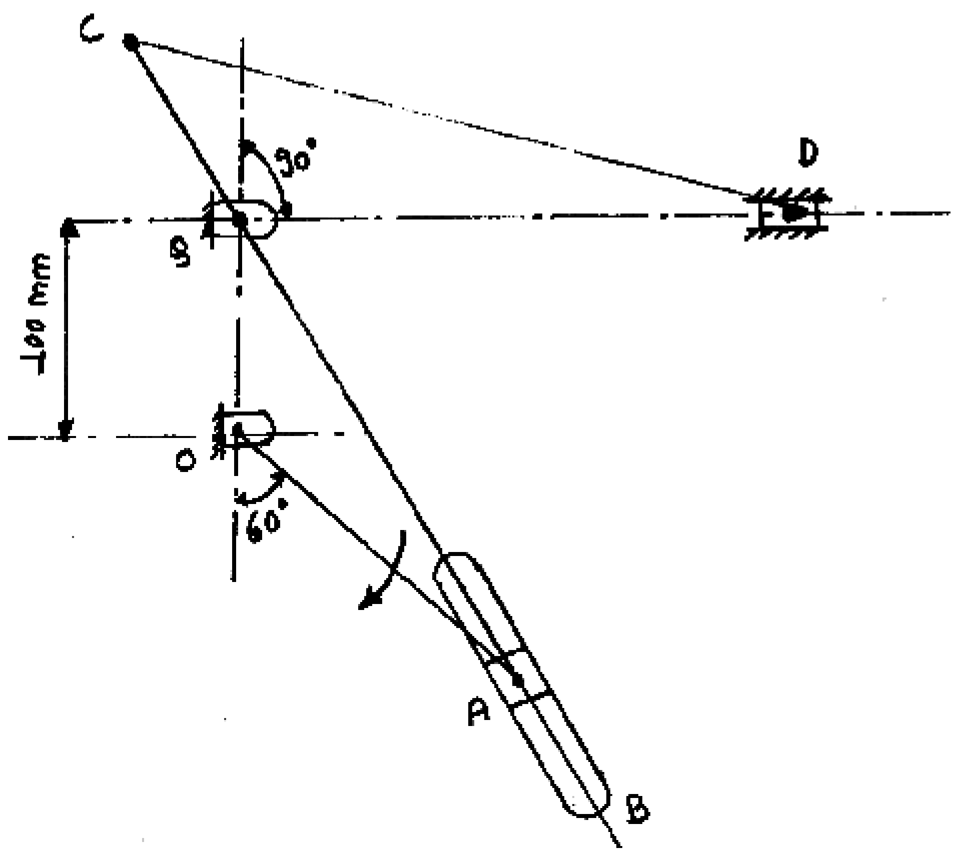


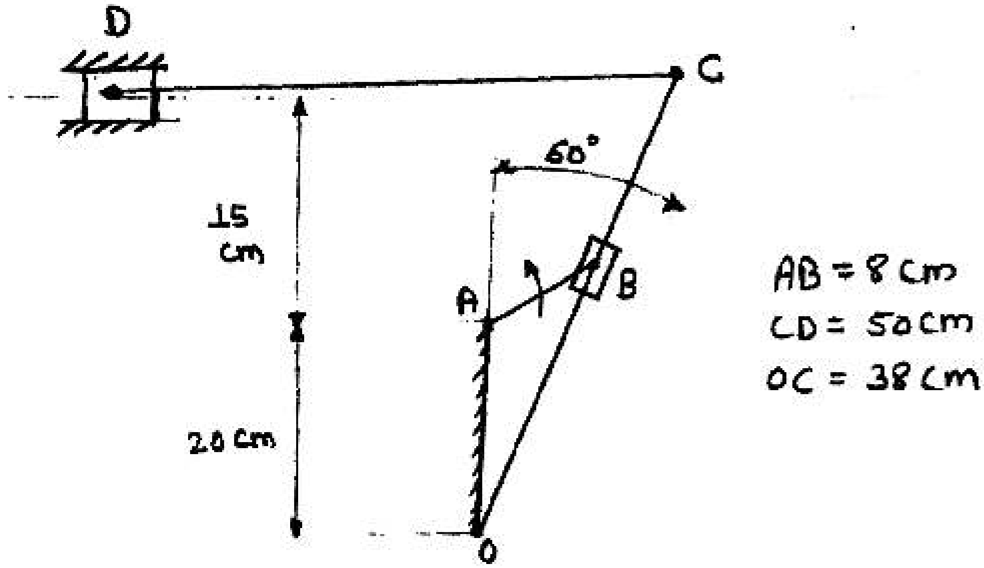
Fig. (*i*)

(*b*) Derive loop closure equation for four bar mechanism. [4]

Or

4. (*a*) The quick return mechanism shown in Fig. (*ii*) in which the crank AB rotates at 200 rpm. Find the velocity and acceleration of ram D, when crank makes an angle 60° with vertical line

OA. Also determine the acceleration of sliding block B along slotted lever OC. [14]



(*b*) Explain the applications of Kennedy's theorem. [4]

UNIT III

5. (*a*) Derive the frequency equation for Trifilar Suspension. [6]

(*b*) The connecting rod of an horizontal engine is 400 mm long between centers. The obliquity ratio is 4 and crank rotates uniformly at 2000 rpm clockwise. When the piston has travelled 50 mm from inner dead center, determine using analytical method : [10]

(*i*) Angular position of crank

(*ii*) Velocity and acceleration of piston

(*iii*) Angular velocity of connecting rod.

Or

6. (*a*) Write short notes on the following : [8]

(*i*) Two point mass dynamically equivalent system.

(*ii*) Correction couple.

(*b*) A connecting rod has mass 3 kg. For 50 oscillations it needs 40 seconds when suspended from small end and 35 seconds when suspended from big end. The distance between the points of suspension is 20 cm. Find the moment of inertia of the connecting rod and position of its CG from the small end. [8]

SECTION II

7. (*a*) Compare the weight, strength and stiffness of a hollow shaft of the same external diameter as that of solid shaft. The inside diameter of the hollow shaft being half the external diameter. Both the shafts have same material and length. [8]

(*b*) Two shafts of 35 mm 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 N-m at 350 r.p.m. For the safe stresses mentioned below, calculate : [8]

(*i*) Diameter of bolt

(*ii*) Thickness of flanges

(*iii*) Key dimensions

(*iv*) Hub length

(*v*) Power transmitted.

Safe shear stress for shaft material = 63 MPa,

Safe stress for bolt material = 56 MPa,

Safe stress for cast iron coupling = 10 MPa,

Safe stress for key material = 46 MPa.

Or

8. (*a*) A plate of 100 mm wide and 12.5 mm thick is to be welded to another plate by means of parallel fillet welds. The plates are subjected to a load of 50 kN. Find the length of weld so that maximum stress does not exceeds 56 MPa. Consider the joint is under first static loading and then fatigue loading. [8]

(*b*) State design considerations in parallel and Kennedy keys. [8]

9. (*a*) Explain concept of overhauling and self-locking of power screws. Derive the expression of their effect on efficiency of power screws. [8]

(*b*) Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity G = 84 kN/mm^2. Neglect the effect of stress concentration. Draw a fully dimensioned sketch of the spring, showing details of the finish of end coils. [8]

Or

10. (*a*) Explain working principle of differential and compound screws. Derive the expression for efficiency of compound screws. [8]

(*b*) A close coiled helical compression spring of 12 active coil has a spring stiffness of k. It is cut into two springs having 5 and 7 turns. Determine the spring stiffness of resulting springs. [8]

11. Write short notes on the following (any *three*) : [18]

(*i*) Type of belt drives

(*ii*) Material used for belt

(*iii*) Slip of belt

(*iv*) Creep of belt

(*v*) Design of solid rimmed flywheel.

Or

12. Write short notes on the following (any *three*) : [18]

(*i*) Coefficient of fluctuation of speed.

(*ii*) Turning moment diagram for 4S internal combustion engine.

(*iii*) Construction of flywheel.

(*iv*) Maximum power transmitted by belt.

(*v*) Design considerations in flat and V pulley drives.

Total No. of Questions—**12**] [Total No. of Printed Pages—**7+1** Chart

Seat No.	

[4262]-123

S.E. (Mech./SW) (Second Semester) EXAMINATION, 2012

THERMAL ENGINEERING-II

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Give classification of refrigerants. [5]

(*b*) Compare vapour compression and vapour absorption refrigeration system. [5]

(*c*) A refrigerator working on Bell-Coleman cycle operates between pressure limits of 1.05 bar and 8.5 bar. Air drawn from cold chamber at 10°C is compressed and then it is cooled to 30°C before entering the expansion cylinder. Expansion and compression follows the law $PV^{1.35} = C$. Determine :

(*i*) Theoretical C.O.P.

(*ii*) Mass flow rate of air required in kg/min for a refrigeration capacity of 10 ton if actual C.O.P. is 0.5 of the theoretical.

(*iii*) Power required to run the plant. [8]

Or

2. (*a*) Explain with neat sketch lithium bromide-water vapour absorption refrigeration system. [5]

(*b*) Give desirable properties of refrigerants. [5]

(*c*) 28 tonnes of ice from and at 0°C is produced per day in ammonia refrigeration plant. The temperature range in compressor is from 25°C to –15°C. The refrigerant is dry and saturated at the end of compression. If actual COP is 60% of theoretical COP, calculate the power required to drive compressor. Assume latent heat of ice = 335 kJ/kg. Use properties of refrigerant given below : [8]

Temperature	h_f (kJ/kg)	h_g (kJ/kg)	**Entropy** (kJ/kgK)	
			S_f	S_g
+25	100.04	1319.22	0.3473	4.4852
–15	–54.56	1304.99	–2.1338	5.0585

3. (*a*) Explain the following terms : [6]

(*i*) Dew point temperature

(*ii*) Degree of saturation

(*iii*) Effective temperature.

(*b*) Distinguish clearly between comfort air conditioning and industrial air conditioning. [5]

(*c*) One kg of air at 40°C DBT and 50% RH is mixed with 2 kg of air at 20°C DBT and 20°C dew point temperature. Calculate temperature and specific humidity of mixture. [5]

Or

4. (*a*) Write a note on comfort chart. [5]

(*b*) Explain with neat sketch summer air conditioning system. [6]

(*c*) Moist air has 38°C DBT and 16°C DPT. Obtain the following psychrometric properties without using psychrometric chart :

(*i*) WBT

(*ii*) Specific humidity

(*iii*) Relative humidity

(*iv*) Degree of saturation

(*v*) Specific enthalpy. [5]

5. (*a*) Explain the working of capillary tube as an expansion device giving its advantages and disadvantages. [5]

(*b*) Write a short note on compressor protection devices. [5]

(*c*) Explain various leak detection methods used after changing the refrigeration system. [6]

Or

6. (*a*) What are the desirable properties of an ideal duct material ? Name some commonly used duct materials. [5]

(*b*) Briefly explain the equal friction loss method of duct design giving its advantages. [6]

(*c*) Explain friction losses and dynamic losses for air flow through duct. [5]

SECTION II

7. (*a*) Explain with neat sketch simple carburettor. [5]

(*b*) What are the functions of lubricating system ? [5]

(*c*) The following observations were taken during trial of single cylinder, four-stroke oil engine running at full load :

Area of indicator diagram = 300 mm^2, Length of diagram = 40 mm, Spring stiffness = 1 bar/mm, Speed = 400 r.p.m., Brake load = 400 N, Spring balance reading = 50 N, Diameter of brake drum = 1.2 m, Fuel consumption per hour = 3 kg, C.V. of fuel = 42000 kJ/kg, Cylinder diameter = 160 mm, Stroke = 200 mm. Find indicated power, brake power, mechanical efficiency and brake thermal efficiency. [8]

Or

8. (*a*) Explain with neat sketch battery ignition system. [5]

(*b*) Explain Morse test. [5]

(*c*) The following data relate to two-stroke oil engine during trial. Room temperature = 20°C, Bore = 20 cm, Stroke = 26 cm, Speed = 400 r.p.m., Brake drum diameter = 120 cm, Rope dia. = 1 cm, Net brake load = 460 N, IMEP = 2.8 bar, Oil consumption = 3.7 kg/h, C.V. of oil = 42000 kJ/kg. Mass of jacket cooling water = 456 kg/h. Rise in temperature of cooling water = 28°C. Temperature of exhaust gas leaving the exhaust gas calorimeter = 8 kg/min. Rise in temperature of calorimeter water = 8°C. Calculate indicated power, brake power, mechanical efficiency, and brake thermal efficiency. Draw up heat balance sheet. [8]

9. (*a*) Explain stages of combustion in SI engine. [6]

(*b*) Write a note on preignition. [5]

(*c*) Discuss the general principles of SI engine combustion chamber design. [5]

Or

10. (*a*) What is meant by 'delay period' in diesel engine and what is its importance ? [5]

(*b*) Explain phenomenon of diesel knock. Compare it with phenomenon of detonation in SI engine. [6]

(*c*) What are different methods of generating swirl in CI engine combustion chambers ? [5]

11. (*a*) What is turbocharging ? What are its advantages ? [5]

(*b*) Explain any *two* types of superchargers. [6]

(*c*) What modifications are necessary for a supercharged engine ? [5]

Or

12. (*a*) What are the sources of pollutants from petrol engine ? [5]

(*b*) Describe with neat sketch after burner method for exhaust emission control. [5]

(*c*) How can smoke intensity be measured ? Describe with neat sketch any *one* type of smokemeter. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-124

S.E. (Mech. S/W) (II Sem.) EXAMINATION, 2012

MANUFACTURING ENGINEERING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define pattern allowances. Explain the following pattern allowances with neat sketch : [8]

(*i*) Shrinkage allowance

(*ii*) Machining allowance

(*iii*) Camber allowance

(*iv*) Rapping allowance.

(*b*) Write short notes on : [8]

(*i*) Tube Drawing

(*ii*) Swaging.

Or

2. (*a*) What are permanent mould castings ? Explain process of investment casting. [8]

(*b*) Explain various types of rolling mills. Write a short note on roll forging. [8]

3. (*a*) Define with the help of suitable sketch submerged arc welding (SAW). Also explain advantages and drawbacks of SAW. [8]

(*b*) Explain the principle of gas welding. Explain the following types of flames and its significance : [8]

(*i*) Neutral Flame

(*ii*) Oxidising Flame

(*iii*) Reducing Flame.

Or

4. (*a*) Explain the principle of Resistance welding. Write a short note on : [8]

(*i*) Spot welding

(*ii*) Seam welding

(*iii*) Projection welding.

(*b*) What are adhesives ? How these adhesives are used in manufacturing process industries ? Explain classification of adhesives with applications. [8]

5. (*a*) What are lathe mechanisms ? Explain feed reversing mechanism with neat sketch. [8]

(*b*) Explain construction and working of drilling machine with neat sketch. Also explain typical drill tool geometry. [10]

Or

6. (*a*) Explain with neat sketch construction and working of column and knee type milling machine. [8]

(*b*) What are superfinishing processes ? Write short notes on the following superfinishing processes : [10]

(*i*) Lapping

(*ii*) Burnishing.

SECTION II

7. (*a*) What are the types of chip formation ? Explain. [6]

(*b*) What is Tool Life ? Explain the relation between Tool Life and Cutting Speed. [6]

(*c*) How does thread milling differs from thread cutting ? [6]

Or

8. (*a*) Explain Merchant's force circle diagram. [6]

(*b*) Explain the working principle of generating the gears with neat sketch : [6]

(*i*) Gear hobbing

(*ii*) Gear shaving.

(*c*) The following data was collected from an orthogonal machine test on steel :

Cutting speed = 18 m/min

Rake angle = 20°

Clearance angle = 10°

Width of cut = 3.2 mm

Undeformed chip thickness = 0.10 mm

Deformed chip thickness = 0.25 mm

Cutting force = 800 N and Normal force is 500 N.

Calculate shear angle, friction coefficient (μ) friction force on rake face. [6]

9. (*a*) Explain the parts and working of CNC system with neat figures. [5]

(*b*) Explain with neat sketch, working principles and process parameter and application of electro-discharge machining. [5]

(*c*) Differentiate between : [6]

(*i*) CNC and DNC

(*ii*) LBM and EBM.

Or

10. (*a*) Explain the ultrasonic machining process with neat sketch and write its applications. [5]

(*b*) Explain FMS ? State advantages of FMS over conventional CNC system. [5]

(*c*) Write short notes on : [6]

(*i*) Automatic Tool Changer.

(*ii*) Plasma arc machining.

11. (*a*) Explain different types of dies used in press working operations. [5]

(*b*) What is 3-2-1 principle ? Explain with figures. [5]

(*c*) How do you calculate blank size and no. of draws in drawing operations ? [6]

Or

12. (*a*) What is Centre of Pressure ? Explain methods of calculating centre of pressure with suitable example. [5]

(*b*) Write the difference between Jig and fixture. [5]

(*c*) What is bending ? Explain : [6]

(*i*) Bending Radius

(*ii*) Bend allowance

(*iii*) Bending pressure.

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-125

S.E. (Mech. S/W) (Second Semester) EXAMINATION, 2012

COMPUTER APPLICATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

(*vi*) Use of electronic pocket calculator is allowed.

SECTION I

UNIT I

1. (*a*) Using Newton-Raphson method, solve the following equation $x^3 - 5x + 3 = 0$. Do upto three iterations only. [8]

(*b*) Differentiate between Newton-Raphson method and modifide Newton-Raphson method. [4]

(*c*) Draw the flowchart for Simpson's 1/3rd rule. [4]

Or

2. (*a*) Find integration, using Gauss-Legendre 2-point formula : [8]

$$\int_1^4 (x^3 + x - 1)\, dx .$$

(*b*) Draw the folowchart for Successive Approximation method. [4]

(*c*) Draw the graphical representation of False Position method. [4]

UNIT II

3. (*a*) The velocity distribution of fluid near flat surface is given below :

x	**V**
0.1	0.72
0.3	1.81
0.6	2.73
0.8	3.47

'*x*' is the distance from surface (mm) and 'V' is the velocity $\left(\frac{\text{mm}}{\text{sec}}\right)$. Use Lagranges interpolation polynomials to obtain the velocity at $x = 4$. [8]

(*b*) Find $\frac{dy}{dx} + \frac{d^2y}{dx^2}$ at $x = 3.8$. [8]

x	y
1	0
2	0.693
3	1.098
4	1.386

Or

4. (*a*) Evaluate *f*(nine), using Newton's divided difference formula : [8]

x	$f(x)$
5	150
7	392
11	1452
13	2366
17	5202

(*b*) The relation between x and y is defined by a function $y = \frac{x^2}{10}$;

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 6$.

The given value of x are 0, 1, 2, 3, 4, 5, 6. [8]

UNIT III

5. (*a*) Solve the equation :

$$2x_1 + 3x_2 - 4x_3 = -9$$

by Gauss-Jordon method. [10]

(*b*) Explain LU Decomposition method. [8]

Or

6. (*a*) Apply the Gauss-Seidal iterative method with pivotting to solve the following equations : [10]

.

(*b*) Explain Cholesky method. [8]

SECTION II

UNIT IV

7. (*a*) Fit the curve $y = ab^*$ using the following data :

x	***y***
2.1	5.14

2.5	6.708
3.1	10.29
3.5	13.58
4.1	20.578

Find the values of a and b. [10]

(*b*) Write a short note on error propagation. [6]

Or

8. (*a*) An experiment is conducted on expansion of steam in a cylinder having 100 mm diameter and 200 mm length. Find equation of curve in $P\,(\text{bar}) = CV^{-N}$: [10]

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

(*b*) Explain different types of errors with suitable example. [6]

9. (*a*) Given $dy/dx = (x + y)$ with initial condition $y(0) = 1$. Find $y(0.05)$ and $y(0.1)$ correct upto 5 decimal places by using Modified Euler's method. [10]

(*b*) Draw a flow chart to solve ordinary differential equation by Taylor series method to determine the values of y at $x = 0.1$ and $x = 0.2$ from $dy/dx = x^2y - 1$, $y(0) = 1$. [6]

Or

10. (*a*) Solve the simultaneous differential equations $dy/dx = yz + x$ and $dz/dx = xz + y$, where $y(0) = 0$, $z(0) = -1$, for $y(0.1)$ and $z(0.1)$ using Runge-Kutta 4th order method. [10]

(*b*) Draw a flowchart to solve Q. No. 9(*a*). [6]

11. (*a*) A steel plate of 150 mm × 150 mm has its four sides held at 100(upper), 80(left), 50(lower) and 0°C(right). Estimate the steady state temperature distribution at interior points assuming grid size of 50 mm. [12]

(*b*) Draw flowchart for Q. No. 11(*a*). [6]

Or

12. (*a*) Solve the boundary value problem $d^2y/dx^2 - 64y + 10 = 0$ with $y(0) = y(1) = 0$. Using finite difference method, calculate $y(0.5)$, taking step size $h = 0.025$. [12]

(*b*) Draw flowchart to calculate the finite difference solution of the equation $\partial u/\partial t = \partial^2 u/\partial x^2$ $(0 \le x \le 1)$ subjected to the conditions :

$u = \sin(\pi x)$ when $t = 0$ for $0 \le x \le 1$

$u = 0$ at $x = 0$ and $x = 1$ for $t > 0$

taking $h = 0.1$ and $k = 0.001$ for all locations at $t = 0.002$ by using Schmidt method. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-131

S.E. (Production/Industrial) (I Sem.) EXAMINATION, 2012

(Common to Prod. S/W)

HEAT AND FLUID ENGINEERING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define the following terms : [8]

(*i*) Ideal fluid and real fluid

(*ii*) Compressibility and bulk modulus

(*iii*) Dynamic viscosity and kinematic viscosity

(*iv*) Surface tension and vapour pressure.

(*b*) The space between two square flat parallel plates is filled with oil. Each side of the plate is 60 cm. Thickness of the oil film is 12.5 mm. The upper plate which moves at 2.5 m/sec. requires a force of 98.1 N to maintain the speed.

Determine :

(*i*) Dynamic viscosity of oil in poise.

(*ii*) Kinematic viscosity of oil in stokes if specific gravity of the oil is 0.95. [8]

Or

2. (*a*) A triangular plate of base 40 cm and altitude 60 cm is immersed in a water keeping its symmetric axis parallel and away 8 m from free surface of water. Determine the force exerted on it and center of pressure both vertically and laterally. [8]

(*b*) State and prove Pascal's law. [4]

(*c*) Find the corresponding height of fluid when fluid is :

(*i*) water

(*ii*) oil of sp. gr. 0.9.

The intensity of pressure at a point is 45 kN/m^2. [4]

3. (*a*) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of oil of sp. gr. 075. The discharge of oil through venturimeter is 80 litres/sec. Find the reading of the oil-mercury differential manometer. Take $C_d = 0.98$. [8]

(*b*) Derive Euler's equation of motion along a streamline, and hence derive the Bernoulli's theorem. [8]

Or

4. (*a*) What is Pitot tube ? How will you determine the velocity at any point with the help of Pitot tube. Write any *three* differences between venturimeter and orificemeter. [8]

(*b*) Find out the depth and top width of a V-notch discharging 0.7 m^3/s. The head over the notch is 10 cm when the discharge is 0.009 m^3/s. Take $C_d = 0.6$. [8]

5. (*a*) Explain the working principle of Reciprocating pump with neat sketch. Compare it with Centrifugal pump. [8]

(*b*) Show that :

$$Q = g^{1/2}H^{5/2}f\left\{\frac{h}{H}, \frac{L}{H}, \frac{\mu}{g^{3/2}H^{1/2}}, \frac{\sigma}{g\,\rho\,H^2}\right\}$$

using Buckingham's π-theorem, where, Q-discharge, μ-viscosity, ρ-density, h-height, H-head, L-length. Take g, H and ρ as a repeating variable. [10]

Or

6. (*a*) Find the head loss due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3 m/s using :

(*i*) Darcy-Weisbach equation

(*ii*) Chezy's equation.

Where C = 60 and kinematic viscosity = 0.01 stoke. [8]

(*b*) What are the different types of losses of energy in pipes ? Write the equation for each loss with neat sketch. [10]

SECTION II

7. (*a*) The following results were obtained in a boiler trial :

Feed water/hr = 800 kg

Feed water inlet temperature = 27°C

Steam produced at a pressure = 10 bar

Dryness fraction of steam = 0.97

Coal used = 100 kg/hr

C.V. of coal = 25000 kJ/kg

Ash and unburnt coal collected = 7.25 kg/hr

C.V. of unburnt fuel = 2000 kJ/kg

Flue gases formed/kg of fuel = 17.3 kg

Flue gas temperature = 325°C

Temperature of air in the room = 16°C

C_p of flue gases = 1.025 kJ/kgK.

Draw up energy balance on minute basis and find boiler efficiency. [10]

(*b*) Explain the working principle of Green Economiser and superheater with neat sketch. [6]

Or

8. (*a*) Volumetric analysis of products of combustion of a hydrocarbon fuel is as under

CO_2 = 12.5%, CO = 0.3%, O_2 = 5% and remaining is N_2. Determine :

(*i*) Air-Fuel Ratio

(*ii*) Carbon and hydrogen percentage by mass

(*iii*) Percentage of excess air. [8]

(*b*) Define the following terms :

(*i*) Mole fraction and Mass fraction

(*ii*) Stoichiometric air and Excess air. [4]

(*c*) Define the following terms :

(*i*) Flash point

(*ii*) Cloud point

(*iii*) Fire point

(*iv*) Pour point. [4]

9. (*a*) An air refrigeration open system operating between 11 bar and 1 bar required for a refrigeration of 15 tonnes. Temperature of air leaving the cold chamber is (–2°C) and at leaving the cooler is 30°C. The compression and expansion follows $Pv^{\gamma} = C$. Neglect losses and clearance in the compressor and expander. Determine :

(*i*) Theoretical COP

(*ii*) Mass of air circulated per minute.

(*iii*) Piston displacement per minute in the compressor and expander.

(*iv*) Theoretical power per tonne of refrigeration COP and Power required in kW. [8]

(*b*) Describe the working of Vapor Compression Refrigeration system with neat sketch. Draw P-h and T-s diagram. [8]

Or

10. (*a*) What are the different types of air conditioning system, explain the Central Air Conditioning System. [8]

(*b*) Explain the following with psychrometic chart :

(*i*) Heating and Humidification

(*ii*) Cooling and Dehumidification. [4]

(*c*) Define the following terms :

(*i*) Dry bulb temperature

(*ii*) Wet bulb temperature

(*iii*) Due point temperature

(*iv*) Relative humidity. [4]

11. (*a*) Show that for minimum work required or maximum efficiency considering intercooler is perfect, the intermediate pressure is the geometric mean of initial and final pressure (i.e. $P_2^2 = P_1 \cdot P_2$) for multistage compression and hence derive that :

$$W = x\frac{n}{n-1}P_1V_1\left\{\left(\frac{P_{x+1}}{P_1}\right)^{\frac{n-1}{xn}} - 1\right\}$$

where, x is number of stage and n is polytropic index. [10]

(*b*) A single stage single acting compressor is working between 1 bar and 7 bar, intake temperature is 27°C. Take FAD as 7.5 m^3/min and clearance ratio as 0.04; L/D = 1.3 and 300 rpm and n = 1.3. Determine :

(*i*) Volumetric efficiency

(*ii*) Bore and stroke dimensions

(*iii*) Indicated power

(*iv*) Isothermal efficiency. [8]

Or

12. (*a*) A trial carried out on a four stroke single cylinder petrol engine. The following are the observations taken during trial :

Cylinder diameter = 30 cm

Engine stroke = 50 cm

Clearance volume	=	6750 cm^3
Indicated mean effective pressure	=	7.64 bar
Net load on the brake	=	1.864 kN
Brake diameter	=	1.5 m
Rope diameter	=	2.5 cm
Speed	=	250 rpm
Fuel used	=	20 m^3/hr
C.V. of fuel	=	44000 kJ/m^3

Determine :

(*i*) The compression ratio

(*ii*) The mechanical efficiency

(*iii*) The indicated thermal efficiency

(*iv*) The air standard efficiency

(*v*) The relative efficiency

(Assume $\gamma = 1.4$ for air.) [10]

(*b*) Compare Otto cycle and Diesel cycle with at least *four* points. [4]

(*c*) Describe the methods of air consumption. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+3**

Seat No.	

[4262]-132

S.E. (Production & Production Sandwich)

(First Semester) EXAMINATION, 2012

STRENGTH ANALYSIS OF MACHINE ELEMENTS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Attempt any *one* question from each Unit of Section I and Section II respectively.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Use of non-programmable electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

UNIT I

1. (*a*) Define precisely the following : [6]

(*i*) Young's modulus

(*ii*) Poisson's ratio

(*iii*) Volumetric strain

(*iv*) Bulk modulus.

(*b*) As shown in Fig. 1 link BG and DE are both made of steel and are 12 mm wide and 6 mm thick. Determine the force in each link when a force P = 2.5 kN is applied to the rigid member AF. Also find corresponding displacement of point A. Take $E_{\text{for steel}} = 2 \times 10^5$ N/mm^2. [10]

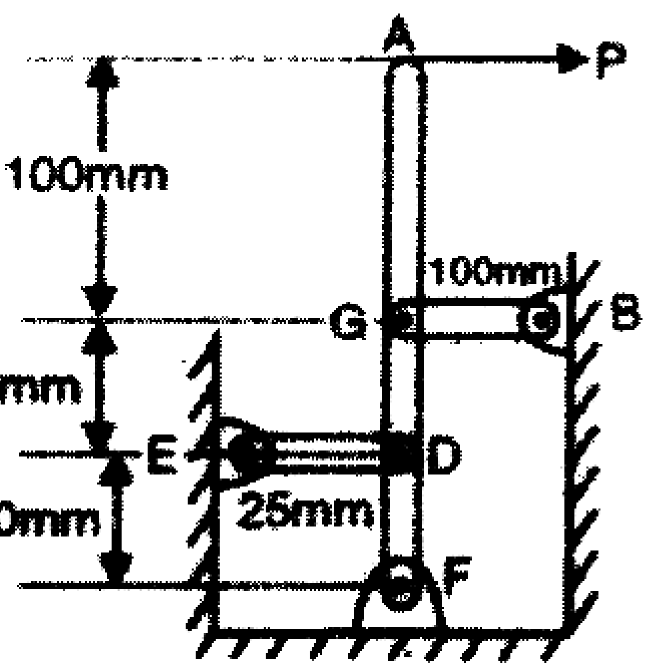


Fig. 1

Or

2. (*a*) A bar of 30 mm is subjected to a pull of 60 kN in an experiment. The measured extension length of 200 mm is 0.09 mm and change in diameter is 0.0039 mm. Calculate the Poisson's ratio and the values of the three moduli. [6]

(*b*) A flat steel plate AB of 10 mm thickness; tapers uniformly from 100 mm to 50 mm width, in a length of 400 mm. Determine the elongation of the plate, if an axial tensile force of 5 kN acts on it. Take $E_{for\ steel} = 2 \times 10^5$ N/mm^2. [10]

UNIT II

3. (*a*) In a simply supported beam the two supports are 5 mm apart. The beam is 8 m long with two overhangs of 2 m and 1 m on the left hand and the right hand sides respectively. The beam carries concentrated loads of 40 kN at the left hand end, 40 kN at 4 m, 20 kN at 6 m both from the left end and 20 kN at the right end of the beam. Draw shear force and bending moment diagrams for the beam. [8]

(*b*) A simply supported beam with over-hanging ends carries transverse loads as shown in Fig. 2. If W = 10 w, what is the overhanging length on each side, such that the bending moment at the middle of the beam, is zero ? Sketch the shear force and bending moment diagrams. [10]

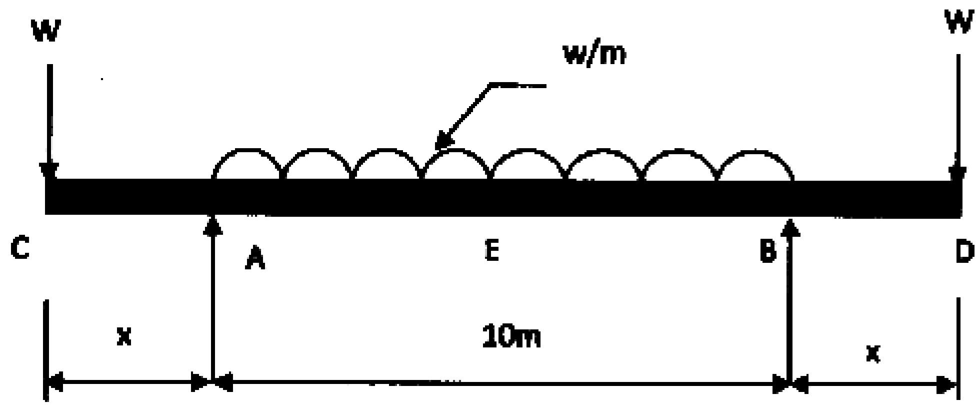


Fig. 2

Or

4. (*a*) A cantilever PQ of 1.5 m is fixed at point P and carries a concentrated load of 2 kN at the free end Q. It also carries a uniform distributed load (UDL) of 1 kN/m over a span of 1 m from the fixed end. Draw the S.F. and B.M. diagrams for this beam. [8]

(*b*) A beam ABCD is fixed at A and D, and hinged at E and F respectively, as shown in Fig. 3. Draw the shear force and bending moment diagrams indicating all important values. [10]

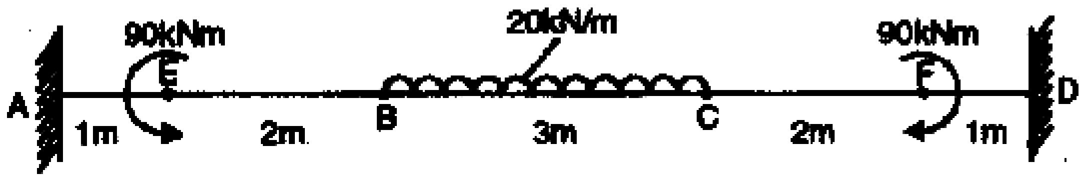


Fig. 3

UNIT III

5. (*a*) Prove the relations,

$$\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$$

where,

M = Total moment of resistance offered by the beam section in N-mm

I = Moment of Inertia of the section about the neutral axis in mm^4

σ = Stress intensity in the fiber N/mm^2

y = Distance of the fiber from the neutral axis in mm

E = Modulus of elasticity in N/mm^2

R = Radius of neutral surface in mm. [6]

(*b*) A cast iron bracket as shown in Fig. 4 is subjected to bending and has cross-section of I-form with unequal flanges. The total depth of the section is 280 mm and the metal is 40 mm thick throughout. The top flange is 200 mm wide. Find the position of neutral axis and the moment of inertia of the section about the neutral axis and determine the maximum bending moment that should be imposed on this section if the tensile stress in the top flange is not to exceed 20 N/mm^2. What is the value of the compressive stress in the bottom flange ? [10]

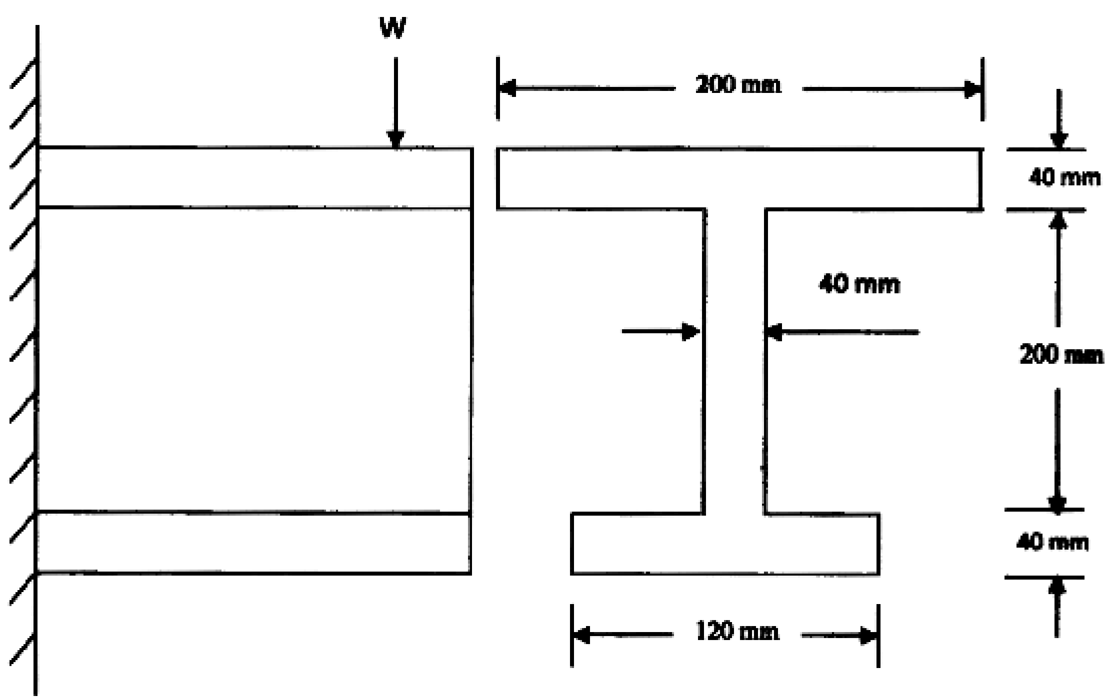


Fig. 4

Or

6. (*a*) Define the term 'bending stress' and explain clearly the theory of simple bending. [6]

(*b*) Draw shear stress distribution on a 'T' section with flange 150 mm × 15 mm deep and flange 200 mm × 20 mm wide. The section is symmetric about vertical axis. The shear force applied is 110 kN. [10]

SECTION II

UNIT IV

7. (*a*) Deduce expressions for stresses on an inclined plane in a body subjected to pure shear stress condition. [8]

(*b*) The stresses on two perpendicular planes through a point are 120 MPa tensile and 80 MPa compression along with 60 MPa shear. Determine the normal and shear stress components on a plane at 60° to that of the 120 MPa stress and also the resultant and its inclination with the normal component on the plane. [8]

Or

8. (*a*) What is strain energy of a material ? Derive the expressions for the strain energy in different forms. [8]

(*b*) A vertical composite tie bar rigidly fixed at the upper end consists of steel rod of 16 mm diameter enclosed in a brass tube of 16 mm internal diameter and 24 mm external diameter, each being 2 m long. Both are fixed together at the ends. The tie bar is suddenly loaded by a weight of 8 kN falling through a distance of 4 mm. Determine the maximum stresses in the steel rod and the brass tube. Take E_s = 205 GPa and E_b = 100 GPa. [8]

UNIT V

9. (*a*) Deduce the torsion equation stating the assumptions made. Deduce the expressions for maximum stresses in solid and hollow shafts. [8]

(*b*) Determine the diameter of a solid shaft which will transmit 90 kW at 160 rpm if the shear stress in the shaft is limited to 60 N/mm^2. Find also the length of the shaft, if the twist must not exceed 1° over the entire length. Take C = 8×10^4 N/mm^2. [10]

Or

10. (*a*) Compare the weight of a solid shaft with that of a hollow one to transmit a given power at a given speed with a given maximum shearing stress, the outside diameter of the hollow shaft being 1.5 times the internal diameter. [10]

(*b*) A hollow shaft with external and internal diameters of 120 mm and 80 mm respectively is to be replaced by a solid shaft of the same weight. Find the torques transmitted by the shafts if the permissible shear stress is 100 MPa. If the solid shaft is replaced by a hollow shaft of 160 mm external diameter, what is the torque transmitted for the same weight of the shafts ? [8]

UNIT VI

11. (*a*) A simply supported beam of 8 m length carries two point loads of 64 kN and 48 kN at 1 m and 4 m respectively from the left hand end. Find the deflection under each load and the maximum deflection. E = 210 GPa and $I = 180 \times 10^6$ mm^4. [8]

(*b*) Establish the governing differential equation of beams. What are its limitations ? [8]

Or

12. (*a*) What is meant by equivalent length of columns ? What are its values per different end conditions of columns ? [6]

(*b*) A straight cylinder bar of 15 mm diameter and 1.2 m long is freely supported at its two ends in a horizontal position. It is loaded with a concentrated load of 100 N at the center when the center deflection is observed to be 5 mm. If placed in the vertical position and loaded vertically, what load would cause it to buckle ? Also find the ratio of the maximum stress in the two cases. [10]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-133

S.E. (Production) (I Sem.) EXAMINATION, 2012

MACHINE TOOL OPERATIONS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Solve *three* questions from each Section.

(*ii*) Use separate answer-sheet for each Section.

(*iii*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain back gear mechanism with suitable sketch. [9]

(*b*) Explain working of All geared headstock with suitable sketch. [9]

Or

2. (*a*) Explain Tumbler gear feed reversing mechanism with suitable sketches. [6]

(*b*) Find full taper angle, if D = 120 mm, d = 90 mm and length = 150 mm. [6]

(*c*) The pitch of leadscrew is 12 mm and the pitch of the thread to be cut is 3 mm. Find the change gears and draw a suitable sketch. [6]

P.T.O.

3. (*a*) Explain construction and working of Jig boring machine with suitable sketch. [8]

(*b*) Explain construction and working of drill head assembly with suitable sketch. [8]

Or

4. (*a*) Explain working of floating holder with suitable sketch. [8]

(*b*) Discuss various types of reamers with suitable sketches. [8]

5. (*a*) Discuss up milling and down milling with suitable sketches. [8]

(*b*) Explain construction and working of column and knee type milling machine. [8]

Or

6. (*a*) Explain construction and working of Universal dividing head. [8]

(*b*) Calculate indexing for 84 divisions, hole circles available are :

Plate I — 15, 16, 17, 18, 19, 20

Plate II — 21, 23, 27, 29, 31, 33

Plate III — 37, 39, 41, 43, 47, 49. [8]

SECTION II

7. (*a*) Explain hydraulic mechanism used in shaper with suitable sketch. [9]

(*b*) Explain autofeed mechanism used in shaper with suitable sketch. [9]

Or

8. (*a*) Explain construction and working of open and cross belt mechanism used in planer. [9]

(*b*) Discuss various types of Broaching machines with suitable sketches. [9]

9. (*a*) Discuss external centerless grinding with suitable sketches. [8]

(*b*) Explain marking system of grinding wheel. [8]

Or

10. (*a*) Explain mounting of grinding wheel with suitable sketch. [8]

(*b*) Explain the terms loading, glazing, dressing and truing used in grinding. [8]

11. Explain :

(*a*) Metal spraying

(*b*) Electroplating

(*c*) Polishing. [16]

Or

12. Write short notes on the following : [16]

(*i*) Lapping

(*ii*) Honing

(*iii*) Tumbling.

Total No. of Questions—**12**]

[Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-134

S.E. (Production & Production Sandwich)

(I Sem.) EXAMINATION, 2012

(Common to Prod. S/W)

MATERIAL SCIENCE

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Show the following planes and directions in cubic unit cell :

(1 1 1), (1 1 0), (1 0 0), [1 1 2], [2 1 0], [1 0 1]. [6]

(*b*) Explain line defects and surface defects with neat diagrams. [8]

(*c*) Define : Space lattice, Unit cell. [2]

Or

2. (*a*) Explain the factors affecting Recrystallisation temperature. [4]

(*b*) Explain with neat diagrams the effect of cold working on properties of metals and the structural changes during annealing of metals. [8]

(*c*) Derive the relation between tensile stress and resolved shear stress during loading of a single crystal. [4]

3. (*a*) Compare Brinell hardness test with Vickers hardness test. [4]

(*b*) Write short notes on : [8]

(*i*) Ultrasonic test

(*ii*) Radiography.

(*c*) Draw self-explanatory diagrams : [4]

(*i*) Fatigue fracture

(*ii*) Erichsen cupping test.

Or

4. (*a*) Explain magnetic particle test. [4]

(*b*) Suggest suitable hardness tester for the following and explain why ? [8]

(*i*) Rolling mill rolls

(*ii*) Ball bearing

(*iii*) Synthetic rubber

(*iv*) Crank shaft.

(*c*) Distinguish between Charpy and Izod impact tests. [4]

5. (*a*) State Gibbs phase rule and explain its importance. [4]

(*b*) Why is coring not desirable and how is it eliminated ? [4]

(*c*) Draw an equilibrium diagram for Ag-Cu system which are partially soluble in the solid state. The data is as follows : [10]

Melting temp. of Ag—961°C, Melting temp. of Cu—1083°C, Eutectic composition—28.1% Cu, Eutectic temp.—780°C, Solubility of Cu in Ag—8.8% Cu at 780°C, Solubility of Ag in Cu—92.1% Cu. The solubility in both decreases to 2% at room temperature. Discuss slow cooling of alloy with 6% Cu from liquid and calculate % of individual phases at room temperature. (Draw microstructures wherever required.)

Or

6. (*a*) Define : [4]

(*i*) System

(*ii*) Phase

(*iii*) Variable

(*iv*) Component.

(*b*) Draw cooling curves and calculate the degrees of freedom for pure metal, binary eutectic alloy. [8]

(*c*) State the Hume Rothery's rules of solid solubility. [4]

(*d*) Draw the equilibrium diagram for layer type system. [2]

SECTION II

7. (*a*) State Hall-Petch equation and explain how refinement of grain size gives a strengthening effect. [6]

(*b*) Explain the steps involved in precipitation hardening and state the conditions for the same. [6]

(*c*) Draw neat sketches : [6]

(*i*) Resistance pyrometer

(*ii*) Disappearing filament optical pyrometer.

Or

8. (*a*) State Seebeck and Thomson effects and state the requirements of a thermocouple. [6]

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

(*i*) Solid solution strengthening

(*ii*) Dispersion strengthening.

(*c*) Explain the factors on which the strength of fibrous composite materials depends. [6]

9. (*a*) State the methods of prevent corrosion and explain cathodic and anodic coatings. [8]

(*b*) Write short notes on : [8]

(*i*) Stress corrosion

(*ii*) Pitting corrosion.

Or

10. (*a*) Write short notes on : [12]

(*i*) Cathodic and Anodic Inhibitors

(*ii*) Electroplating

(*iii*) Anodising.

(*b*) Differentiate between Dry and Wet corrosion. [4]

11. (*a*) Explain Sieve method and the Elutriation method for determination of powder size. [8]

(*b*) Explain the sintering mechanism and state the main driving force for sintering. [4]

(*c*) Explain : Compressibility and Green density. [4]

Or

12. (*a*) Explain Thermal decomposition and Integranular corrosion process of Powder production. [8]

(*b*) Draw flow charts and explain : [8]

(*i*) Electrical contact materials

(*ii*) Sintered metal friction materials.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-136

S.E. (Production) (II Sem.) EXAMINATION, 2012

WELDING AND FOUNDRY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain with neat sketch Tungsten Inert Gas (TIG) and Metal Inert Gas (MIG) weldings with their advantages, disadvantages and applications. [10]

(*b*) Explain Voltage-current and Voltage-Arc Length characteristics in Welding. [8]

Or

2. (*a*) Describe with neat sketch Submerged Arc Welding (SAW) process, working principle and its applications. [8]

P.T.O.

(*b*) Expalin stud-welding process with respect to the following : [10]

(*i*) Definition and concept

(*ii*) Principle of operation

(*iii*) Advantages, disadvantages and applications.

3. (*a*) Distinguish with suitable sketches types of oxyacetylene gas flame. [8]

(*b*) Explain the Alternating Current (AC), Direct Current Straight Polarity (DCSP) and Direct Current Reverse Polarity (DCRP) in arc welding. [8]

Or

4. (*a*) Compare with neat sketch leftward and rightward gas welding techniques. [8]

(*b*) Describe seam welding with its advantages, disadvantages and applications. [8]

5. (*a*) Explain flash butt welding with its advantages, disadvantages and applications. [8]

(*b*) Write a short note on explosive welding. [8]

Or

6. (*a*) Write a short note on dye penetrant testing weld. [8]

   (*b*) Compare soldering and brazing processes with respect to flux used, process temperature, joint design and filler metal used. [8]

SECTION II

7. (*a*) With neat sketch explain the construction and operation of a Cupola furnace. [8]

   (*b*) Write the procedure for permeability test of moulding sand. [8]

Or

8. (*a*) With neat sketch explain the construction and operation of electric arc furnace. [8]

   (*b*) Explain in detail various allowances given to the patterns. [8]

9. (*a*) Explain with neat sketches various centrifugal casting processes. [8]

   (*b*) Differentiate between permanent mould casting and pressure die-casting. [8]

Or

10. (*a*) Explain with neat sketch Investment casting process. [8]

    (*b*) Explain various casting defects with their causes and remedies. [8]

11. (*a*) Explain directional and progressive solidification of casting. [10]

(*b*) What is casting yield ? How to improve it ? [8]

Or

12. (*a*) Define gating ratios. Differentiate between pressurized and un-pressureized gating. [8]

(*b*) Write short notes on : [10]

(*i*) Various components of gating system and their functions

(*ii*) Criteria used for riser design and their placements.

Total No. of Questions—**12**]

[Total No. of Printed Pages—**8+2**

Seat No.	

[4262]-137

S.E. (Production/Production S/W) (Second Semester)

EXAMINATION, 2012

DESIGN OF MACHINE ELEMENTS

(Common to Prod. S/W)

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

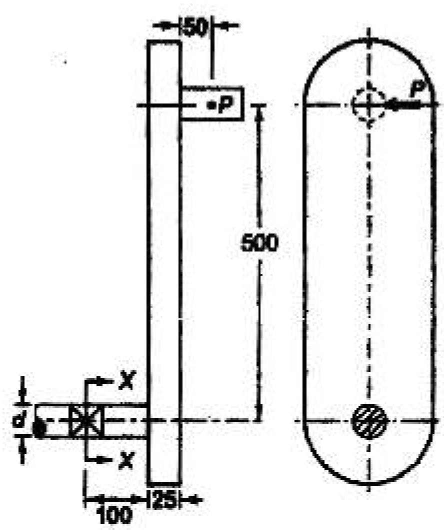
1. (*a*) Explain what do you understand by : [4]

(*i*) Service factor.

(*ii*) Factor of safety.

(*b*) What is design analysis and design synthesis ? [4]

(*c*) The dimensions of an overhang crank are given in Fig. 1. The force P acting at the crankpin is 1 kN. The crankpin made of steel 30C8 (S_{yt} = 400 N/mm^2) and the factor of safety is 2. Using maximum shear stress theory of failure, determine the diameter *d* at the section—XX. [10]



(All dimensions are in mm)

Fig. 1

Or

2. (*a*) A bell crank lever is to be designed to raise a load of 5 kN at the short arm end. The arm lengths are 150 mm and 500 mm. The permissible stresses for lever and pin materials in shear and tension are 60 N/mm^2 and 90 N/mm^2 respectively. The bearing pressure on the pin is to be limited to 12 N/mm^2. Assume the lever cross-section as $t \times 4t$ (t-Thickness of lever in mm) and fulcrum pin length as 1.25 times pin diameter. [10]

(*b*) Explain direct and bending stresses with example. [4]

(*c*) Explain the various stages in a design process. [4]

3. A shaft is supported on two bearing which are 1 m apart. The shaft carries two belt pulleys A and B at a distance of 200 mm and 800 mm from the left hand bearing. The diameter of both pulleys is 500 mm with 180° overlap. The two belt directions are perpendicular to each other. The maximum belt tension in any belt is 2500 N. The ratio of belt tension is 2.2. The shaft is made of steel with an ultimate tensile strength of 800 N/mm^2 and tensile yield strength of 550 N/mm^2. If K_b and K_t are 1.5 and 1.0 respectively, design the shaft using A.S.M.E. code. [16]

Or

4. A bushed-pin type flexible flange coupling is used to transmit 30 kW power at 1440 rpm from an electric motor to a machine. If the peak torque is 20% more than the average torque, design and draw the coupling. Assume the following permissible stresses for the components of coupling : [16]

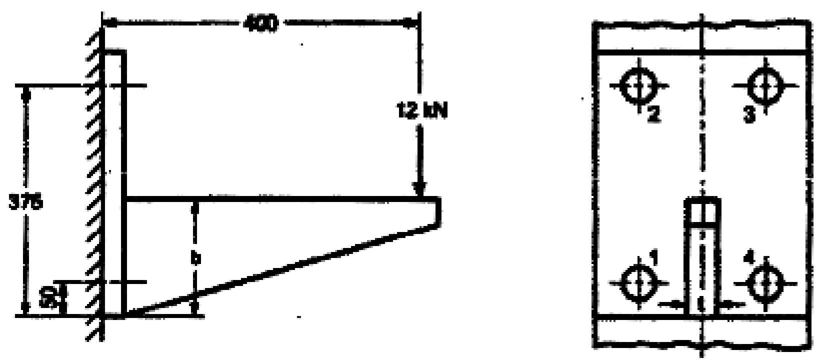
	C.I. (Flange)	**Plain carbon steel (shaft and key)**	**Alloy steel (Pin)**
Allowable tensile stress, N/mm^2	20	80	250
Allowable compressive stress, N/mm^2	60	80	250
Allowable shear stress, N/mm^2	15	35	125

Take permissible bearing pressure = 1 N/mm^2.

5. (*a*) A bracket, shown in Fig. 2, is fixed to a steel column by using 4 bolts. A load of 12 kN acts on the bracket at a distance of 400 mm from the face of the column. The permissible tensile stress for the bolt and bracket material is 84 N/mm^2. The b/t ratio for the cross-section of the arm of the bracket is 45. Determine :

(*i*) the size of the bolts and

(*ii*) the cross-section of the arm of bracket. [12]



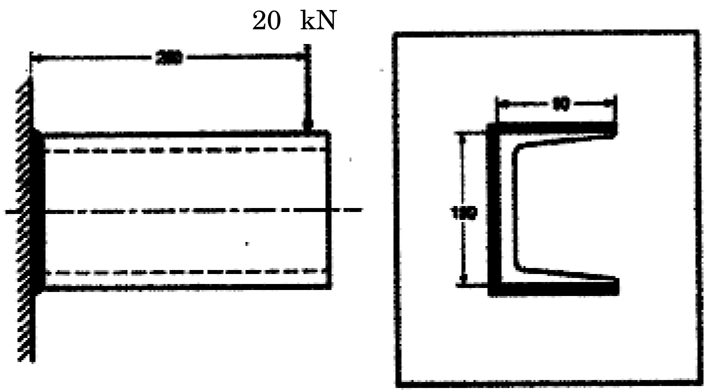
(All dimensions are in mm)

Fig. 2

(*b*) Sketch any *two* methods of locking a nut on the screw threads. [4]

Or

6. (*a*) A cantilever beam of channel section is welded to the support by means of a fillet welds as shown in Fig. 3. A load of 20 kN is acting on the beam at a distance 250 mm from the plane of weld. If the permissible shear stress in the weld material is 94 MPa, determine the size of the weld. [12]



(All dimensions are in mm)

Fig. 3

(*b*) State the advantages and limitation of the welded joints. [4]

SECTION II

7. (*a*) What do you mean by screw efficiency and overall efficiency ? Explain the variation of screw efficiency with respect to lead angle. [6]

(*b*) A double-treaded power screw, with ISO metric trapezoidal threads is used to raise a load of 300 kN. The nominal diameter is 100 mm and the pitch is 12 mm. The coefficient of friction at the screw threads is 0.15. Neglecting collar friction, calculate :

(1) torque required to raise the load;

(2) torque required to lower the load; and

(3) efficiency of the screw. [10]

Or

8. (*a*) The mean diameter of the square threaded screw having pitch of 10 mm is 50 mm. A load of 20 kN is lifted through a distance of 170 mm. Find the work done in lifting the load and the efficiency of the screw, when :

(*i*) The load rotates with the screw, and

(*ii*) The load rests on the loose head which does not rotate with the screw.

The external and internal diameter of the bearing surface of the loose head are 60 mm and 10 mm respectively. The coefficient of friction for the screw and bearing surface may be taken as 0.08. [10]

(*b*) What is 'self-locking' of power screw ? What is the condition for 'self-locking' ? [6]

9. (*a*) A railway wagon moving at a velocity of 1.5 m/s is brought to rest by a bumper consisting of two helical springs arranged in parallel. The mass of the wagon is 1500 kg. The springs are compressed by 150 mm in bringing the wagon to rest. The spring index can be taken as 6. The springs are made of oil-hardened and tempered steel wire with ultimate tensile strength of 1250 N/mm^2 and modulus of rigidity of 81370 N/mm^2. The permissible shear stress for the spring wire can be taken as 50% of the ultimate tensile strength. Design the spring and calculate :

(*i*) wire diameter

(*ii*) mean coil diameter

(*iii*) number of active coil

(*iv*) total number of coil

(*v*) solid length

(*vi*) free length

(*vii*) pitch of the coil

(*viii*) required spring rate

(*ix*) actual spring rate. [12]

(*b*) Explain the following terms :

(1) Wahl Stress factor

(2) Spring Index. [4]

Or

10. (*a*) It is required to design a helical compression spring with plain end, for carrying a maximum static force of 1000 N. The allowable shear stress and modulus of rigidity for spring material are 400 N/mm^2 and 85 kN/mm^2 respectively. The spring rate is 48 N/mm. If spring index is 5, determine :

(*i*) wire diameter

(*ii*) total number of coils

(*iii*) free length

(*iv*) pitch

Draw neat sketch of spring and give necessary dimension. [12]

(*b*) What is surge in springs ? What remedial measures will you suggest to avoid it ? [4]

11. (*a*) Explain the aesthetic design principles. [6]

(*b*) Explain significance of cost consideration during design stage itself. How can this be achieved ? [6]

(*c*) Write short notes on :

(1) Morgan's color code

(2) DFM. [6]

Or

12. (*a*) Describe the various guidelines to be followed in design of the parts for the following process :

(*i*) Casting

(*ii*) Forging

(*iii*) Welding. [12]

(*b*) State the general guidelines in designing control panels and layout display. [6]

Total No. of Questions—**12**]

[Total No. of Printed Pages—**4**

Seat No.	

[4262]-138

S.E. (Production/Industrial) (Second Semester)

EXAMINATION, 2012

INDUSTRIAL ORGANISATION AND MANAGEMENT

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Assume suitable data, if necessary.

SECTION I

Unit I

1. (*a*) What is "Partnership Firm" ? What are the salient features, advantages, disadvantages of partnership firm ? [6]

(*b*) Explain Henry Fayol's principles of management. [10]

Or

2. (*a*) Define organisation and explain functions of organisation. [8]

(*b*) Explain the following with the chart : [8]

(1) Line Organization

(2) Staff Organization

Unit II

3. (*a*) Discuss the McGregor's theory of X and Y. What are its implications for motivational practices ? [9]

(*b*) Discuss various styles of leadership. Which one is preferable ? Why ? [9]

Or

4. (*a*) Define group dynamics and group cohesiveness. Explain factors affecting cohesiveness. [9]

(*b*) Define motivation. Explain Maslow's theory of need hierarchy with its limitations. [9]

Unit III

5. (*a*) Discuss :

(*i*) Angel investors

(*ii*) Venture capitalist as the sources of finance for an entrepreneur. [8]

(*b*) What are various growth strategies available to an entrepreneur ? [8]

Or

6. (*a*) Explain various government supporting agencies to finance an entrepreneur. [8]

(*b*) Define and explain the significance of the following for an entrepreneur : [8]

(*i*) Break-even point

(*ii*) Margin of safety and angle of incidence.

SECTION II

Unit IV

7. (*a*) What is customer equity ? How can a company increase its customer equity ? [8]

(*b*) Explain steps in marketing research. [8]

Or

8. (*a*) Define sales promotion. What are the various sales promotion tools ? [8]

(*b*) List and explain steps in the buyer decision process. [8]

Unit V

9. (*a*) Define training and explain various types and methods of training. [8]

(*b*) Explain various functions of human resource management. [8]

Or

10. (*a*) What is recruitment ? Why is it called as positive process and selection as negative process ? Explain any *two* methods of recruitment. [8]

(*b*) Discuss objectives and benefits of training and development. [8]

Unit VI

11. (*a*) Explain wage payments under the following :

(1) Rowan plan

(2) Emerson's efficiency plan

(3) Beduax plan. [9]

(*b*) List and explain various merit rating methods. [9]

Or

12. (*a*) Define the term factory and discuss briefly the provisions relating to health and welfare of the workers under the Factory's Act, 1948. [9]

(*b*) List down various qualitative and quantitative methods. Explain the following :

(1) Job classification method

(2) Point method. [9]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-139

S.E. (Prod.S/W) (First Semester) EXAMINATION, 2012

MANUFACTURING PROCESSES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q. No. **5** or Q. No. **6**, from Section I and Q. No. **7** or Q. No. **8**, Q. No. **9** or Q. No. **10**, Q. No. **11** or Q. No. **12**, from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

(*vi*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

SECTION I

UNIT 1

1. (*a*) Make a neat cross-sectional sketch of a cupola indicating its various zones and describe the following : [6]

(*i*) Its construction

(*ii*) Its different zones and their functions.

(*b*) Explain with neat sketch Permeability test for moulding sand. [6]

(*c*) What is pattern ? Explain any *three* types of pattern with neat sketch. [6]

Or

2. (*a*) Differentiate between permanent mould casting and sand casting. [4]

(*b*) Sketch and describe the working of hot chamber die casting machines in short. [6]

(*c*) Step-by-step describe the complete procedure of investement casting ? What are the main advantages and limitations of investment casting ? State the area of application of this process ? [8]

UNIT 2

3. (*a*) How direct extrusion differs from indirect extrusion ? Discuss their relative merits and demerits. List few extruded products you know. [8]

(*b*) Define forging and describe with the help of neat sketch a 'Board Drop' hammer used for drop forging. State their relative merits. List few products made by forging process. [8]

Or

4. (*a*) What is continuous rolling mill ? Sketch it and state its advantages. [6]

   (*b*) What are common forging defects ? State their causes. [4]

   (*c*) Explain the 'Mechanical Working' of metals. Compare hot working with cold working process. [6]

UNIT 3

5. (*a*) Differentiate between forehand and backhand gas welding techniques with sketch. [4]

   (*b*) Explain in detail Tungsten Arc Gas Shielded (TAGS) welding process with suitable sketch. [6]

   (*c*) Explain the principle of operation, advantages and area of application of 'Explosive Welding'. Draw neat sketch. [6]

Or

6. (*a*) Write short notes on : [6]

   (*i*) Seam Welding

   (*ii*) Projection Welding.

   (*b*) Compare the Soldering and Brazing joining processes with respect to principle, temperature and applications. [4]

(*c*) Explain with neat sketch the principle of electron beam welding machine ? State its merits, limitations and area of applications. [6]

SECTION II

UNIT 4

7. (*a*) Sketch and describe the head stock of lathe. [6]

(*b*) Describe the following operations performed on lathe with neat sketch : [5]

(*i*) Drilling

(*ii*) Parting off.

(*c*) Sketch 'Single Point Cutting Tool' and show all angles on it. [5]

Or

8. (*a*) Sketch and describe the following : [6]

(*i*) Three Jaw Chuck

(*ii*) Follower Rest

(*iii*) Lathe Centres.

(*b*) Draw neat and well labelled diagram of the following : [5]

(*i*) Thread cutting setup on lathe

(*ii*) Back geared headstock of lathe.

(*c*) Explain taper turning using tailstock set over method. [5]

UNIT 5

9. (*a*) Make a neat sketch of Universal Milling Machine indicating the various controls and constructional features. [4]

(*b*) With the help of sketch, explain the construction and working of radial drilling machine. [8]

(*c*) With the help of a suitable sketch explain the working of universal dividing head. [6]

Or

10. (*a*) Index 69 divisions by compound indexing method. [6]

The hole circle available are :

Plate I — 15, 16, 17, 18, 19, 20

Plate II — 21, 23, 27, 29, 31, 33

Plate III — 37, 39, 41, 43, 47, 49.

(*b*) Explain the following drilling operations with neat sketch : [6]

(*i*) Counter-boring

(*ii*) Counter-sinking

(*iii*) Spot facing.

(*c*) Sketch and describe the following milling cutters : [6]

(*i*) End milling cutters

(*ii*) Slab mill

(*iii*) Metal slitting saw.

UNIT 6

11. (*a*) What are the natural and artificial abrasives ? Why are the latter preferred over the former ? [4]

(*b*) Explain the terms Truing and Dressing of a grinding wheel. [6]

(*c*) Describe the construction and working of a tool and cutter grinder with neat sketch. State its applications. [6]

Or

12. (*a*) How a grinding wheel is marked (Coded) ? Describe Indian Standard marking system with example. [4]

(*b*) Explain Honing and Lapping in short. [6]

(*c*) "Use hard wheels for soft materials and soft wheel for hard materials." Comment on this statement. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-140

S.E. (Production) (S/W) (Second Semester) EXAMINATION, 2012

PRODUCTION AND INDUSTRIAL MANAGEMENT—I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* questions from Section I and any *three* questions from Section II.

(*ii*) Answers to the Sections should be written in separate answer-books.

(*iii*) Use of calculator is allowed.

(*iv*) Figures to the right indicate full marks.

(*v*) Answer *one* question from Q. Nos. **1** and **2**, **3** and **4**, **5** and **6**, **7** and **8**, **9** and **10**, **11** and **12**.

SECTION I

1. (*a*) Explain different types of Management. [8]

(*b*) Explain contribution of F.W. Taylor in the field of Management. [8]

Or

2. (*a*) Explain the principle of Scientific Management. [8]

(*b*) Explain the role of Public and Private firms in Indian Society. [4]

(*c*) Write a short note on Group Dynamics. [4]

3. (*a*) What are the different basics techniques used in Industrial Engineering ? [8]

(*b*) Define productivity. Explain, what is meant by Factor productivity and Tool productivity and explain productivity of material. [8]

Or

4. (*a*) What do you mean by Plant Layout ? Explain in detail work space design. [8]

(*b*) Write a short note on Total Productive Maintenance. [4]

(*c*) Explain steps involved in Production Planning. [4]

5. (*a*) What are work element ? Explain various types of work element in detail. [8]

(*b*) Explain micro-motion study. How is it carried out ? What are the different symbols used in Micro-Motion Study. [10]

Or

6. (*a*) Importance of Bi-Mechanical Cycle in Ergonomics. [6]

(*b*) Explain two-handed process chart in detail. [6]

(*c*) Explain 5 W and 1 H. [6]

SECTION II

7. (*a*) Explain aim and objective of time study. [8]

(*b*) A stopwatch study of a clerical operation gave the following elemental data :

Element	**Cycle time**				
	1	**2**	**3**	**4**	**5**
A	0.13	0.21	0.13	0.14	0.14
B	0.56	0.57	0.54	0.56	0.57
C	0.21	0.18	0.18	0.16	0.17
D	0.23	0.30	0.31	0.33	0.33

(*i*) Element B is machine paced

(*ii*) The operator is rated at 120%

Allowance for this job is 16%. Calculate standard time of the job. [10]

Or

8. (*a*) Explain the following : [8]

(*i*) Observed Time

(*ii*) Qualified Worker

(*iii*) Interface Allowance

(*iv*) Contingency Allowance.

(*b*) List out the different theories of Motivation. Explain any *two* theories in detail. [10]

9. (*a*) What is meant by leadership ? Explain the Contingency Theory of Leadership. [8]

(*b*) Explain the Trait Theory of leadership. [4]

(*c*) Explain the qualities of good entrepreneur. [4]

Or

10. (*a*) Write short notes on the following :

(1) Job Evaluation

(2) Types of different Incentive schemes. [12]

(*b*) Explain various functions of HR Department. [4]

Or

11. (*a*) Explain the Break-even Analysis in detail along with example. [8]

(*b*) Explain various sources of finance and role financial institute in Indian Industry. [8]

Or

12. (*a*) Explain along with example different types of Overhead Costs. [8]

(*b*) Compare and contrast Costing and Cost Control. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

Seat No.	

[4262]-140B

S.E. (Production) EXAMINATION, 2012

MANUFACTURING PROCESSES—I

(2003 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Attempt *one* question from each Unit from each Section I and Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Assume suitable data, if necessary.

SECTION I

UNIT I

1. (*a*) Discuss various types of allowances for pattern with suitable sketches. [10]

(*b*) Explain types of cores with suitable sketches. [8]

Or

2. (*a*) Discuss types of materials used in pattern making. [10]

(*b*) Explain various types of moulds with suitable sketches. [8]

UNIT II

3. (*a*) Explain cold chamber die casting with suitable sketches. [8]

(*b*) Explain metals used in die casting. [8]

Or

4. (*a*) Explain shell moulding with suitable sketches. [8]

(*b*) Explain investment casting with suitable sketches. [8]

UNIT III

5. (*a*) Explain Tumbler gear mechanism with suitable sketches. [8]

(*b*) Write notes on : [8]

(*i*) Types of chucks

(*ii*) Types of centres.

Or

6. (*a*) Explain Apron mechanism with suitable sketches. [8]

(*b*) Write notes on : [8]

(*i*) Type of mandrels

(*ii*) Taper turning by tailstock setover method.

SECTION II

UNIT IV

7. (*a*) Explain types of drilling machines with neat sketches. [10]

(*b*) Discuss various types of Reamers with neat sketches. [8]

Or

8. (*a*) Explain nomenclature of drill with neat sketches. [8]

(*b*) Explain various types of boring machines with suitable sketches. [10]

UNIT V

9. (*a*) Explain constructing and working column and knee type milling machine with neat sketch. [8]

(*b*) Discuss upmilling and downmilling with neat sketches. [8]

Or

10. (*a*) Explain working of hydraulic mechanism of shaper with neat sketch. [8]

(*b*) Explain methods of indexing. [8]

UNIT VI

11. (*a*) Explain marking system of grinding wheel. [8]

(*b*) Explain mounting of grinding wheel with suitable sketch. [8]

Or

12. Write notes on : [16]

(*i*) Lapping

(*ii*) Tumbling

(*iii*) Electroplating.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-140-C

S.E. (Prod. & Prod. S/W) EXAMINATION, 2012
INDUSTRIAL ELECTRONICS
(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain the *two* transistor analogy of S.C.R. [8]

(*b*) Explain with neat circuit diagram the working of light dimmer. [8]

Or

2. (*a*) Explain : [8]

(*i*) Fan regulator

(*ii*) Off-line UPS with the help of suitable diagram.

(*b*) Explain VI characteristics of UJT. Also explain UJT as a relaxation oscillator. [8]

3. (*a*) Define counter. State various types of counter and explain any *one* in detail. [8]

(*b*) List various types of shift resistor. Explain 3-bit left shift resistor along with O/P waveform. [8]

Or

4. (*a*) What are the requirements of an instrumentation amplifier ? Draw neat sketch of 3 op-amp instrumentation amplifier. Derive the expression for output voltage. [8]

(*b*) Draw and explain square wave generator using op-amp. Sketch the output waveform and waveform across capacitor. [8]

5. (*a*) State the working principle of stepper motor. Explain construction of stepper motor in detail. [10]

(*b*) Draw a neat circuit diagram of PID controller and explain its operation with advantages and disadvantages. [8]

Or

6. Write notes on the following : [18]

(*a*) PLC

(*b*) CNC

(*c*) DNC.

SECTION II

7. (*a*) Explain in detail what factor you will consider while selecting a transducer for particular application. [8]

(*b*) List various methods of level measurement. Explain any *one* of them in detail. [8]

Or

8. (*a*) Define proximity sensors and explain its types in detail. [8]

(*b*) Explain actuators in detail. [8]

9. (*a*) For the first order system find out output of the system when input applied to the system is unit ramp. [8]

(*b*) State and explain the following specifications of a first order system : [8]

(*i*) Rise time

(*ii*) Time constant

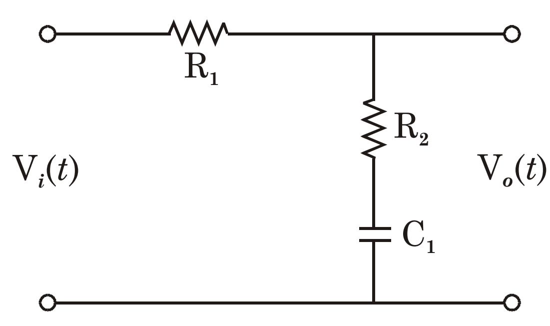
(*iii*) Delay time

(*iv*) Percentage overshoot.

Or

10. (*a*) Explain the performance of second order system to step input. Comment on overshoot. [8]

(*b*) For the network given below find $\frac{V_0(s)}{V_i(s)}$: [8]



11. (*a*) Draw and explain distributed digital control structure for water treatment plant. [10]

(*b*) Explain the generalised data acquisition system with the help of block diagram. [8]

Or

12. Write short notes on the following : [18]

(*i*) Thermal power plant

(*ii*) Steel plant

(*iii*) SCADA.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-141

S.E. (Electrical) (I Sem.) EXAMINATION, 2012

POWER PLANT ENGINEERING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* questions from Section I and any *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

(*v*) Use of scientific calculator, steam table, Mollier charts is allowed.

SECTION I

UNIT I

1. (*a*) Explain with neat sketch working of "ORSAT APPARATUS". [6]

(*b*) Compare Pulverized bed combustion and Fluidized bed combustion systems along with their neat sketches. [10]

Or

2. A steam power plant works on simple Rankine cycle receives steam from boiler at 3.5 MPa and 350°C. It is exhausted to the condenser at 10 kPa. Determine :

(*i*) Heat supplied to the boiler

(*ii*) Dryness fraction of the steam entering the condenser

(*iii*) Pump work

(*iv*) Turbine work

(*v*) Net work done

(*vi*) Work Ratio

(*vii*) Specific steam consumption

(*viii*) Rankine cycle efficiency.

Consider the pump work. [16]

UNIT II

3. (*a*) Explain with neat sketches different methods of "Feed water Treatment". [10]

(*b*) Explain with neat sketch working of "Fusible Plug". [6]

Or

4. (*a*) Write a short note on "Coal Handling Systems". [8]

(*b*) Explain with neat sketch "Natural Draught". [8]

UNIT III

5. (*a*) What are the factors considered for selection of site for a "Hydroelectric Power Plant" ? [6]

(*b*) What are the advantages and disadvantages of hydropower plant as compared with thermal power plant ? [6]

(*c*) Explain with neat sketch working of Kaplan Turbine. [6]

Or

6. (*a*) Write a short note on "Surge Tanks". [6]

(*b*) Explain with neat sketch working of "Pump Storage Plant". [6]

(*c*) Write a short note on "Hydrograph" and "Flow Duration Curve". [6]

SECTION II

UNIT IV

7. (*a*) What is Boiling Water Reactor (BWR) ? Explain it with a neat sketch. How does it differ from Pressurised Water Reactor (PWR) ? [8]

(*b*) Explain with the help of neat diagram an essential components of a Nuclear Reactor. [8]

Or

8. (*a*) What factors should be considered while selecting a site for diesel power plant ? Also state the applications of diesel power plant. [8]

(*b*) Describe a breeder reactor with a neat sketch. What are its advantages and disadvantages ? [8]

UNIT V

9. (*a*) What are the advantages of a gas turbine power plant over diesel and steam power plants of same capacity ? Also state the applications of gas turbine plants. [8]

(*b*) Write the note on fuel cells and its applications. Also list the advantages and disadvantages. [8]

Or

10. (*a*) Describe Ocean Thermal Energy Conversion (OTEC) Plant with a diagram. [8]

(*b*) Write a note on Gas turbine materials and Gas turbine fuels. [8]

UNIT VI

11. (*a*) List the various types of "Tariff" and explain any *three* in detail. [8]

(*b*) The following data relate to a 2000 kW diesel power station :

Peak load on the plant = 1500 kW

Load factor = 0.4

Capital cost per kW installed = Rs. 1,200

Annual cost = 15% on capital

Annual operating cost = Rs. 50,000

Annual Maintenance costs :

(1) Fixed = Rs. 9,000

(2) Variable = Rs. 18,000

Cost of fuel = Re. 0.45 per kg

Cost of lubricating oil = Rs. 1.3 per kg

Calorific value of fuel = 41800 kJ/kg

Consumption of fuel = 0.45 kg/kWh

Consumption of lubricating oil = 0.002 kg/kWh

Determine :

(1) Annual energy generated

(2) Cost of generation per kWh. [10]

Or

12. (*a*) Explain in detail : [8]

(1) Load curve

(2) Load duration curve.

(*b*) The annual peak load on a 30 MW is 25 MW. The power station supplies power through four transformers whose connected loads are 12 MW, 10.5 MW, 6 MW and 7 MW. The maximum demands on these transformers are 10 MW, 8.5 MW, 5 MW and 4.5 MW respectively. The annual load factor is 0.45 and the plant is operating for 70% of the period in a year. Determine the following parameters :

(1) Average load on station

(2) Energy supplied per year

(3) Demand factor

(4) Diversity factor

(5) Power station use factor. [10]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4262]-142

S.E. (Electrical) (I Sem.) EXAMINATION, 2012

MATERIAL SCIENCE

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) You are advised to attempt not more than 6 questions.

(*vi*) Your answers will be valued as a whole.

(*vii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*viii*) Assume suitable data, if necessary.

***Physical Constants* :**

(1) Angstrom Unit (AU) = 1×10^{-10} metres.

(2) Dielectric constant of free space ($\in_0$) = 8.85×10^{-12} farad/metre.

(3) Electron volt (eV) = 1.602×10^{-19} Joules.

(4) Permeability of free space (μ_0) = $4\pi \times 10^{-7}$.

(5) Mass of electron (m) = 9.107×10^{-31} kg.

(6) Mass of proton (m_p) = 1.627×10^{-27} kg.

(7) Velocity of light (c) = 3×10^{8} metre/second.

(8) Charge on electron (e) = 1.601×10^{-19} coulomb.

(9) Debye unit = 3.33×10^{-30} coulomb-metre.

(10) Boltzmann's constant (k) = 1.38×10^{-23} Joule degree^{-1}.

SECTION I

1. (*a*) Explain orientation polarization in detail. How is it different than ionic polarization ? [9]

(*b*) Differentiate between photoconductive and photoemissive cells. [9]

Or

2. (*a*) Write different materials used for photovoltaic material. Describe its construction and working principle. [9]

(*b*) Differentiate between piezoelectric, ferroelectric and pyroelectric materials. [9]

3. Write down properties and applications of the following : [16]

(*i*) Paper Press Board

(*ii*) Sf_6 gas

(*iii*) Ceramics

(*iv*) Mica and Asbestos.

Or

4. (*a*) How does breakdown occur in vacuum ? Explain by using any *one* theory. [8]

(*b*) Define : [8]

(*i*) breakdown voltage;

(*ii*) breakdown strength;

(*iii*) Primary ionization; and

(*iv*) Secondary ionization.

5. (*a*) Differentiate between Soft Magnetic Materials and Hard Magnetic Materials. [8]

(*b*) Calculate Hysteresis loss in a specimen of iron subjected to a magnetization of 60 Hz. The weight of specimen is 50 kg and its density is 8000 kg/m^3. Hysteresis loop area is equivalent 250 J/m^3. What will be hysteresis loss of specimen of 40 Hz ? [8]

Or

6. Explain with properties and applications Diamagnetism, Para-magnetism, Ferro-magnetism and Ferri-magnetism. [16]

SECTION II

7. (*a*) Write a short note on thermocouple. [4]

(*b*) What is a bimetal ? Give *two* applications of bimetal. [4]

(*c*) A filament of a 230 V, 60 W lamp is to be constructed. The temperature of the filament is to be 1500°C at 60 W. Resistivity of the filament material at 30°C is 5.3×10^{-6} Ω-cm and temperature co-efficient α_{30} = 0.005/°C. Calculate the length of the filament at 30°C if its diameter at 30°C is 0.025 mm. [8]

Or

8. (*a*) Describe the groups into which the materials as electric conductors are divided. [6]

(*b*) Write a short note on superconductivity. [6]

(*c*) Give the electrical properties and applications of Nichrome and Tungsten. [4]

9. (*a*) What are molecular machines ? Why are molecular machines currently been extensively investigated ? What are different possible applications of molecular machines ? [8]

(*b*) Write a short note on different types of conduction mechanisms involved in nanomaterials. [8]

Or

10. (*a*) What are carbon clusters ? Write a short note on C_{60}. [8]

(*b*) How are carbon nanotubes fabricated ? Give *two* methods with sketches wherever necessary. [8]

11. (*a*) List the parameters which need to be tested as per IS code of practice in respect of underground power cable. Describe any *one* test in detail. [9]

(*b*) Describe in detail the procedure for determination of dielectric strength of air as per relevant IS code of practice. What precautions are taken during the experiment ? [9]

Or

12. (*a*) Explain the loss tangent (tan δ) of a dielectric. Describe a method of measurement of tan δ of a dielectric by Schering Bridge as per IS code of practice. Draw and label connection diagram. [10]

(*b*) With a neat sketch, explain how flux density is measured with the help of Gauss-meter. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-143

S.E. (Electrical) (First Semester) EXAMINATION, 2012

ANALOG AND DIGITAL ELECTRONICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw and explain input and output characteristics of CB configuration. [8]

(*b*) Explain with neat circuit diagram working of Push-Pull amplifier. [8]

Or

2. (*a*) Explain drain characteristic of FET. [8]

(*b*) Explain DC load line analysis of CE configuration amplifier. [8]

3. (*a*) Explain briefly parameters of ideal and practical operational amplifier. [8]

(*b*) Explain op-amp as : [8]

(*i*) Zero crossing detector

(*ii*) Precision rectifier.

Or

4. (*a*) Compare open loop and closed loop configuration of op-amp. [8]

(*b*) Write a short note on op-amp as instrumentation amplifier. [8]

5. (*a*) Draw neat circuit diagram and explain op-amp as a sine wave generator. [9]

(*b*) Explain LM-317 as a adjustable voltage regulator. [9]

Or

6. (*a*) Explain with neat diagram IC 555 as a monostable multivibrator. Draw output waveforms. [9]

(*b*) Draw and explain first order low pass filter. [9]

SECTION II

7. (*a*) Explain the Gray code and excess-3 code. [6]

(*b*) Convert the code $(01110110)_{BCD}$ into equivalent binary, octal and hexadecimal number system. [6]

(*c*) Explain SOP and POS form for three variables. [6]

Or

8. (*a*) Using Boolean algebra prove the following : [4]

$$\overline{X}YZ + XY\overline{Z} + \overline{X}YZ + XYZ = Y.$$

(*b*) From the following truth table, design the logic circuit using k-map : [8]

Inputs			**Output**
A	B	C	Y
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1

(*c*) Explain hexadecimal and binary number system. [6]

9. (*a*) What is the use of PRESET and CLEAR terminals in filp-flop ? Write a short note on JK master slave filp-flop. [8]

(*b*) With the help of a neat circuit diagram, explain the working of ring counter. If initial data loaded is $(0001)_2$, then draw the timing diagram for same. [8]

Or

10. (*a*) Explain the meaning of modulus-N counter. Design and explain the operation of MOD 8 asynchronous counter with wave forms. [8]

(*b*) Explain the following shift registers : [8]

(*i*) Serial-in serial-out shift register

(*ii*) Parallel-in parallel-out shift register.

11. (*a*) State the difference between multiplexer and demultiplexer. Design 1 : 8 demultiplexer using 1 : 4 demultiplexer. [8]

(*b*) Explain Successive Approximation ADC in detail. [8]

Or

12. (*a*) Explain circuit diagram and working of R-2R type DAC. [8]

(*b*) Write short notes on : [8]

(*i*) EPROM

(*ii*) RAM.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-144

S.E. (Electrical) (First Semester) EXAMINATION, 2012

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answer to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, non-programmable electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Compare giving example : [6]

(*i*) Repeatability and reproducibility

(*ii*) Reliability and maintainability

(*iii*) Scale range and scale span.

(*b*) The inductance of a certain moving iron ammeter is $\left(8 + 4\theta - \frac{1}{2}\theta^2\right)\mu H$, where θ is the deflection in radians from zero position. Calculate the scale position in radians for a current of 10 A if the deflection for a current of 5A is $\pi/6$ rad. Also determine the spring constant. [6]

(*c*) State the advantages of instrument transformers over shunt and multipliers. [4]

Or

2. (*a*) Classify different types of standards used in measurement with their scope of applications. [6]

(*b*) State and explain the causes of errors occurring in moving iron instruments with both DC and AC measurements. [6]

(*c*) A moving coil milli-ammeter gives a full scale deflection with 15 mA and has a resistance of 7Ω. Calculate : [4]

(*i*) The resistance to be connected to enable the instrument to read upto 2A and

(*ii*) To enable it to read up to 5V.

3. (*a*) Write notes on : [6]

(*i*) Mezzer

(*ii*) Earth tester.

(*b*) Draw the circuit diagram of Anderson Bridge and derive the equation for determining the unknown quantities. [6]

(*c*) An a.c. bridge is connectd as follows : [6]

Branch AB is an inductive resistor, Branch BC, CD and DA are non-inductive resistors. A standard variable capacitor is connected across the variable resistor in branch CD. The supply is connected to A and C and the detector to B and D. Determine the resistance and inductance of branch AB by identifying the bridge. The resistances are as follows :

BC = 600 Ω, CD = 1000 Ω and C = 0.5 μF, DA = 400 Ω.

Or

4. (*a*) Classify the resistance into low, medium and high resistances. Explain the procedure of measuring a low resistance with the help of Kelvin's Double Bridge. [6]

(*b*) Describe how Schering Bridge is used for measurement of an unknown capacitance.

Derive the condition of balance. Draw the phasor diagram of the bridge circuit under balance condition. [6]

(*c*) The arms of an ac bridge are arranged as follows : [6]

Arm AB : $Z_1 = 50 \angle 30^\circ\ \Omega$, Arm BC : $Z_2 = 100 \angle 0^\circ \Omega$

Arm CD : $Z_4 = 100 \angle 0^\circ\ \Omega$ and Arm AD : $Z_3 = 200 \angle -60^\circ \Omega$

Determine whether it is possible to balance the bridge under above conditions.

5. (*a*) Draw the connection diagram and vector diagram for power measurement in a 3-phase capacitive load using two wattmeters, assume the load is star connected.

Hence derive the expression for the power factor of load circuit. [8]

(*b*) Write notes on (any *two*) : [8]

(*i*) Power analyser

(*ii*) Tri-vector meter

(*iii*) Frequency meter.

Or

6. (*a*) Draw the connection diagram and vector diagram for reactive power measurement in 3-phase balanced circuit. Derive the expression for the reactive power of the load circuit. [8]

(*b*) Write notes on (any *two*) : [8]

(*i*) Polyphase wattmeters

(*ii*) TOD meter

(*iii*) Extension of wattemeter range by instrument transformer.

SECTION II

7. (*a*) Describe the construction and working of single-phase induction type energy meter with a neat diagram. Draw the phasor diagram of energy meter showing respective quantities ? [10]

(*b*) Explain the meaning of term burden in an instrument transformer. [4]

(*c*) A 5A, 230 V meter on full load unity power factor test makes 60 revolutions in 360 sec. If the normal disc speed is 520 rev per kWh, what is percentage error ? [4]

Or

8. (*a*) Draw the connection diagram of two element energy meter with C.T. and P.T. for range extension. [6]

(*b*) Explain how the following adjustments are made in single-phase induction type of energy meter : [4×3=12]

(*i*) Lag adjustment

(*ii*) Adjustment of friction

(*iii*) Creep.

9. (*a*) With a suitable sketch explain working of dual trace CRO. [8]

(*b*) Explain measurement of pressure using McLeod gauge. [8]

Or

10. (*a*) Explain measurement of voltage, current, phase angle and frequency using CRO. [8]

(*b*) Give detailed classification of transducers. [6]

(*c*) Explain vacuum pressure. [2]

11. (*a*) With the help of neat sketch explain construction and working of LVDT. State its advantages and disadvantages. [8]

(*b*) Explain the construction and working of load cell ? [4]

(*c*) Define ultrasonic transducer ? State its application ? [4]

Or

12. (*a*) Give detail types of strain guage ? Explain foil strain gauge ? [8]

(*b*) Give types of flow and explain construction and working of venturimeter. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-145

S.E. (Electrical) (II Sem.) EXAMINATION, 2012

POWER SYSTEM—I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define and explain the importance of the following terms in generation : [8]

(*i*) Connected load

(*ii*) Maximum demand

(*iii*) Demand factor

(*iv*) Average load.

(*b*) Discuss the advantages of interconnected grid system. [8]

Or

2. (*a*) A base load station having a capacity of 18 MW and a standby station having a capacity of 20 MW share a common load. Find the annual load factors and plant capacity factors of two power stations from the following data :

Annual standby station output = 7.35×10^6 kWh

Annual base load station output = 101.35×10^6 kWh

Peak load on standby station = 12 MW

Hours of use by standby station/year = 2190 hours. [8]

(*b*) Describe the desirable characteristics of a tariff. [8]

3. (*a*) Discuss the functions and principle of operation of automatic voltage regulator. Name different types of voltage regulators. [8]

(*b*) Each conductor of a 3-phase high-voltage transmission line is suspended by a string of 4 suspension type disc insulators. If the potential difference across the second unit from top is 13.2 kV and across the third from top is 18 kV, determine the voltage between conductors. [8]

Or

4. (*a*) Discuss the necessity of excitation system used for alternators. Explain one of the types of excitation system used for alternators in brief. [8]

   (*b*) Define string efficiency. State different methods used for improving the string efficiency. Derive the expression for voltage distribution across the units of a string of suspension insulators. [8]

5. (*a*) Derive an expression for the inductance of a three-phase overhead transmission line when conductors are symmetrically spaced. [8]

   (*b*) The three conductors of a 3-phase line are arranged at the corner of a triangle of sides 2 m, 2.5 m and 4.5 m. Calculate the inductance per km of the line when the conductors are regularly transposed. The diameter of each conductor is 1.24 cm. [6]

   (*c*) What is skin effect ? Why is it absent in the D.C. system ? [4]

Or

6. (*a*) Explain the concept of GMD and GMR. [6]

(*b*) What is meant by transposition of conductors in an overhead line ? Why is it essential ? How is it carried out ? [6]

(*c*) A three-phase 50 Hz overhead transmission line consists of three conductors each of diameter 0.3 cm. The spacing between the conductors is as follows :

A – B = 4 m, B – C = 4.5 m, C – A = 5.2 m.

Find the inductance and inductive reactance per phase per km of the line. [6]

SECTION II

7. (*a*) Derive an expression for capacitance per phase of a three-phase overhead transmission line with unsymmetrical spacing of conductors assuming transposition. [10]

(*b*) A single phase line is having two single standard conductors and radius of each 0.328 cm. The conductors are separated 3 m apart and 7.5 m above ground. Calculate : [8]

(*i*) Capacitance to neutral/km without considering earth effect.

(*ii*) Capacitance to neutral/km with considering earth effect.

Or

8. (*a*) Derive the equation for capacitance per km of a single phase overhead transmission line having distance 'D' between conductors and '*r*' is the radius of each conductor. [6]

(*b*) Explain the "Method of Images" in determing the effect of earth on the capacitance calculation for overhead transmission lines. [6]

(*c*) A three-phase, 50 Hz, 132 kV overhead line has conductor placed in horizontal plane 4 m apart. Conductor diameter is 2 cm. If the line length is 100 km, calculate :

(*i*) capacitance of each conductor to neutral

(*ii*) charging current per phase.

Assuming complete transposition. [6]

9. (*a*) Express the relationship for the sending end voltage and current in terms of receiving end voltage and current for a medium length transmission line with Nominal 'π' method of representation. Evaluate the generalized circuit constants. [8]

(*b*) A three-phase overhead long transmission line has total series impedance per phase $(200 \angle 80°)$ Ω and total shunt admittance of $(0.0013 \angle 90°)$ (mho/ph). The line deliver a load of 80MW at 0.8 p.f. lagging and 220 kV between lines. Determine A, B, C and D parameters. [8]

Or

10. (*a*) Give classification of transmission lines based on length. Explain the influence of power factor on the performance of a transmission line. [8]

(*b*) Derive the hyperbolic expressions for sending end voltage and current in terms of receiving end voltage and current for a long transmission line. [8]

11. (*a*) What are the different factors affecting sag of a transmission line ? Derive an expression for sag when supports are at equal level. [8]

(*b*) A transmission line has a span of 150 m between level supports. The conductor has cross-sectional of 2 cm^2. The tension in the conductor is 2000 kg. If the specific gravity of the conductor material is 9.9 gm/cm^3 and wind pressure is 1.5 kg/m length, calculate the sag. What is vertical sag ? [8]

Or

12. (*a*) Derive an expression for maximum and minimum dielectric stress in a single core cable. [8]

(*b*) How are the effect of wind and ice loading taken into account while determing the resultant loading of the conductors ? [4]

(*c*) Explain different types of cable. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-146

S.E. (Electrical) (II Sem.) EXAMINATION, 2012

ELECTRICAL MACHINES—I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Obtain an equivalent and an approximate circuit of 1Φ transformer referred to primary side. Show all the parameters on them. [6]

(*b*) A 1Φ, 250/500V transformer gave the following results :

O.C. Test	**S.C. Test**
250 V	20 V
1 A	12 A
80 W	100 W
LV side	HV side

Calculate the circuit constants and show them on equivalent circuit referred on primary side. [10]

Or

2. (*a*) What is an autotransformer ? Obtain an expression for saving copper used in autotransformer as compared to similar two winding transformer. [8]

(*b*) With neat circuit diagram, explain open circuit and short circuit tests on a single phase transformer for finding the voltage regulation and efficiency. [8]

3. (*a*) State and explain conditions to be satisfied for the parallel operation of 1Φ transformer. [8]

(*b*) With neat connection diagram, explain the operation of V-V connection of the transformers. State the merits and demerits. [8]

Or

4. (a) State, sketch and explain the standard types of 3Φ transformer connections. Also state one application of each. [8]

(b) Two transformers are connected in parallel to supply a common load of 125 kVA at 0.8 lagging power factor. The rating of transformer A is 100 kVA and has resistance and reactance of 0.9% and 10% respectively. The rating of transformer B is 50 kVA and has resistance and reactance of 1.0% and 5% respectively. How will the two transformers share the common load ? [8]

5. (a) Compare simple LAP winding and WAVE winding of a DC machine with sketch. [6]

(b) Obtain the torque equation of DC motor. [6]

(c) A 500 V DC series motor has resistance of 0.25 Ω and runs at 500 rpm when taking a current of 50 A. Calculate the speed, when taking a current of 30 A if the flux is reduced to 60% of that at 50 A. [6]

Or

6. (a) Sketch the power flow diagram of DC motor. [6]

(*b*) Explain the construction of DC machine. [8]

(*c*) In a brake test on a DC motor, the effective load on the brake drum was 23 kg, the effective diameter of the drum was 45 cm and the speed was 960 rpm. The input to the motor was 28 A at 230 V. Calculate the efficiency of the motor. [4]

SECTION II

7. (*a*) Sketch and explain 3 point starter. State its merits and demerits. [8]

(*b*) Draw and explain the characteristics of d.c. series motors. Give the *two* applications of each. [8]

Or

8. (*a*) Define commutation. State the different methods to improve it and explain any *one* of them. [8]

(*b*) Explain any *two* methods of speed control of a d.c. shunt motor. [8]

9. (*a*) Derive the expression for the torque of a 3-ph induction motor and obtain condition for maximum torque. What is the expression for the maximum torque ? [8]

(*b*) A 3-ph, 50 Hz, 6 poles induction motor running on full load with a slip of 4% develops a torque of 149.3 N-m at its pullet rim. The friction and windage losses are 200 W and the stator copper and iron losses equal 1,620 W. Calculate :

(*i*) Output power

(*ii*) Rotor copper losses

(*iii*) Efficiency at full load. [8]

Or

10. (*a*) Compare squirrel cage rotor and wound rotor of a 3-ph induction motor. [6]

(*b*) A 3-ph, 50 Hz, 4 poles, 1440 rpm induction motor has star connected rotor winding having per phase impedance of $(0.2 + j1)\ \Omega$ at standstill. When the stator is energised at rated voltage and frequency, the rotor induced emf per phase at standstill is 120 V.

(*i*) Calculate the rotor current, rotor power factor and torque both at starting and full laod.

(*ii*) If an external resistance of 1 Ω per phase is inserted in rotor circuit, calculate the rotor current, rotor power factor and torque at starting. [10]

11. (*a*) State and explain any *two* methods of speed control of a 3-ph induction motor. [8]

(*b*) Why are starters necessary for starting 3-ph induction motor ? Name different types of starters used for starting 3-ph squirrel cage induction motors. With neat sketch the operation of star-delta starter. [10]

Or

12. (*a*) A 10 h.p. squirrel cage induction motor when started by means of a star-delta starter takes 1.7 times full load line current and develops 35% of full load torque at starting. Calculate the starting torque and current in terms of full load values, if an autotransformer with 60% tapping were employed. [8]

(*b*) Draw and explain how to construct the circle diagram of an induction motor. Also express the maximum torque, maximum input, maximum output on the circle diagram. [10]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-147

S.E. (Electrical) (II Sem.) EXAMINATION, 2012

NETWORK ANALYSIS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II unitwise.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain the following terms : [10]

(*i*) Bilateral Network and Unilateral Network (*ii*) Linear Network and Non-linear Network

(*iii*) Lumped Network and Distributed Network

(*iv*) Dependent and Independent current sources

(*v*) Dependent and Independent voltage sources.

(*b*) Using source transformation and source shifting, simplify the network shown in Fig. 1. Determine the current through simplified circuit. [8]

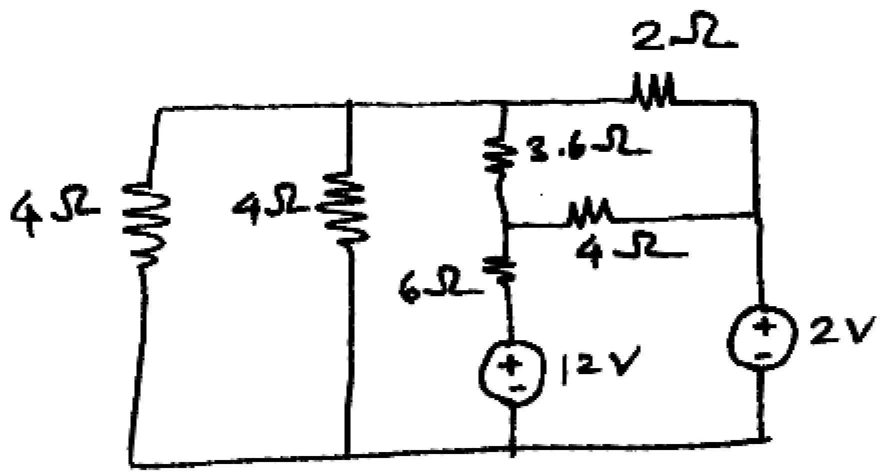


Fig. 1

Or

2. (*a*) Explain the concept of duality. [4]

(*b*) Explain the concept of supermesh and supernode with example. [6]

(c) For the circuit shown in Fig. 2, determine : [8]

(i) V_{AB}

(ii) V_{AC}

(iii) V_{AE}

(iv) V_{AD}.

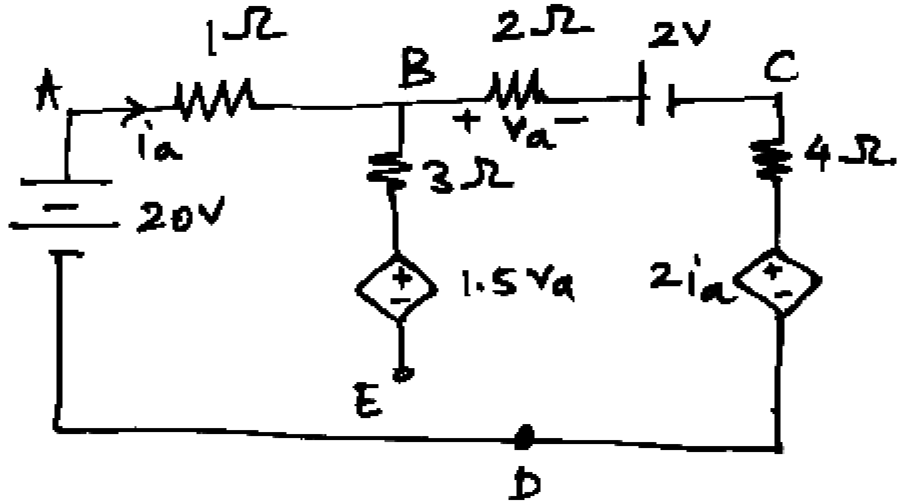


Fig. 2

3. (a) Calculate current though 10 Ω resistance by Superposition Theorem. (Refer Fig. 3) [8]

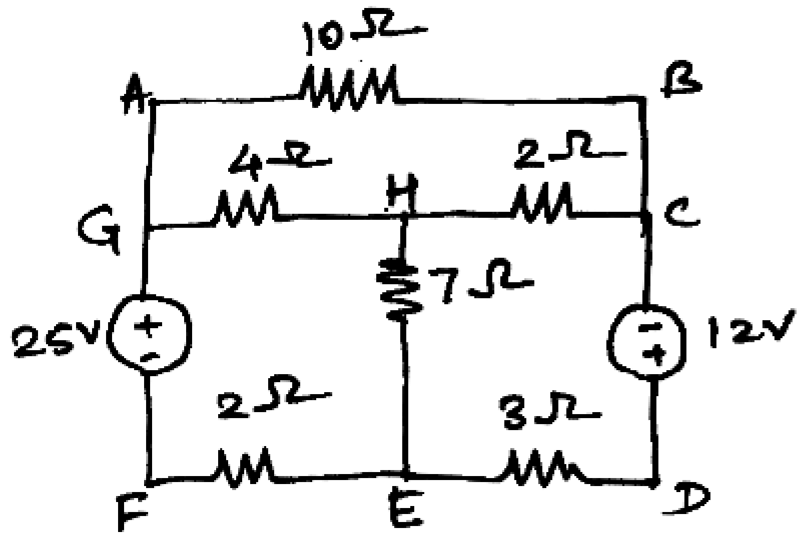


Fig. 3

(*b*) Verify the Reciprocity Theorem for voltage V_C and current I. (Refer Fig. 4) [8]

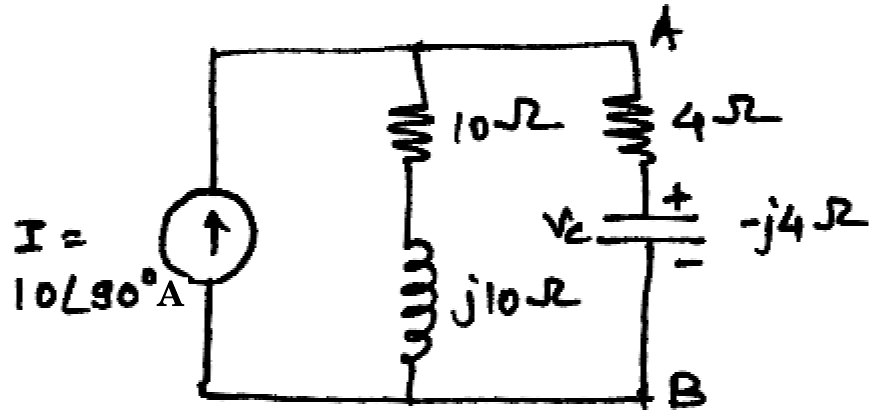


Fig. 4

Or

4. (*a*) State Compensation Theorem. Also explain the steps to be followed to obtain equivalent circuit. [8]

(*b*) Use Thevenin's theorem to calculate current through branch A-B. (Refer Fig. 5) [8]

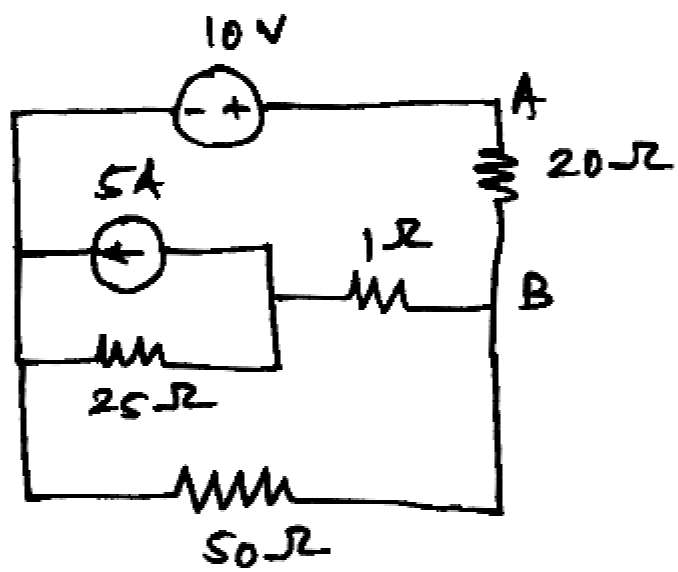


Fig. 5

5. (*a*) Obtain the expression for capacitor voltage in a RC series circuit connected to a d.c. voltage V for $t > 0$. Assume initial charge across capacitor as zero. Also sketch the response graph for the current through capacitor and from the graph define time constant of the circuit. [8]

(*b*) Find current equation when the switch is opened at $t = 0$. (Refer Fig. 6) [8]

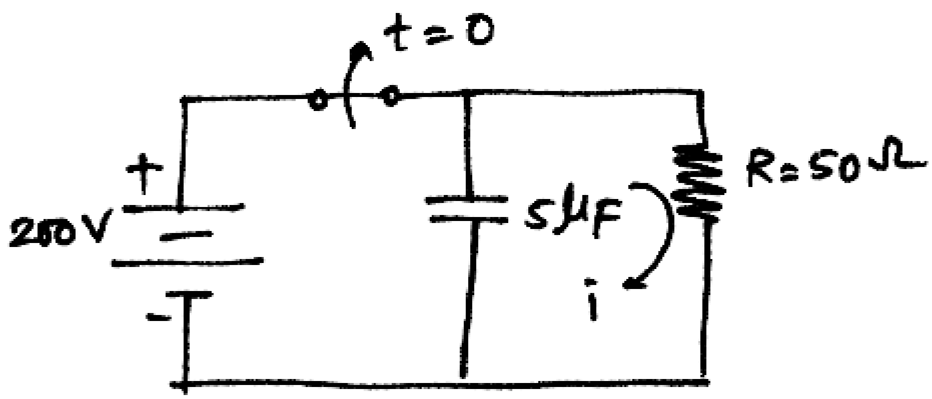


Fig. 6

Or

6. (*a*) State and prove Initial Value Theorem and Final Value Theorem using Laplace transform. [8]

(*b*) In the series RL circuit, an exponential voltage $V(t) = 50e^{-100t}$ V is applied by closing the switch at

$t = 0$. Find the expression of the resulting current. (Refer Fig. 7) [8]

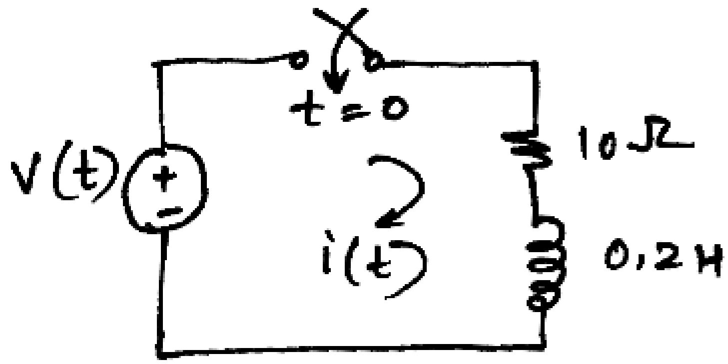


Fig. 7

SECTION II

7. (*a*) Derive the inter-relationship between : [8]

(*i*) Z and Y parameters

(*ii*) Z and transmission parameters.

(*b*) Find transmission parameters for the network shown in Fig. 8. [8]

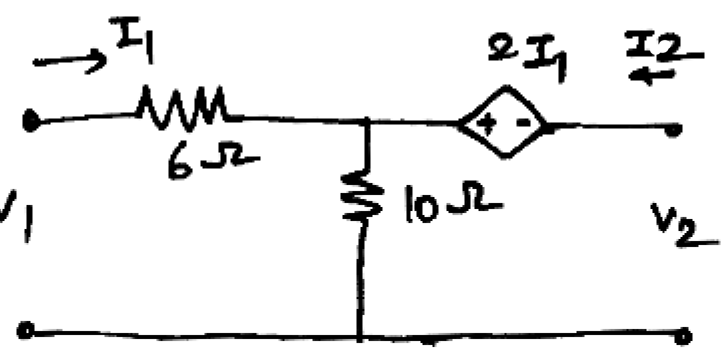


Fig. 8

Or

8. (*a*) Write a short note on insertion loss. [6]

(*b*) State and explain the maximum power transfer theorem for A.C. network. [10]

9. (*a*) Explain trigonometric Fourier series for the periodic signal. [8]

(*b*) Write a short note on Evaluation of Fourier coefficients of Fourier series. [8]

Or

10. (*a*) Explain properties of Fourier transform. [8]

(*b*) Write a short note on high pass and low pass filters. [8]

11. (*a*) Define all the network functions of single port network and two port network. [8]

(*b*) For a two port network shown in Fig. 9, find driving point impedence function and voltage ratio transfer function. [10]

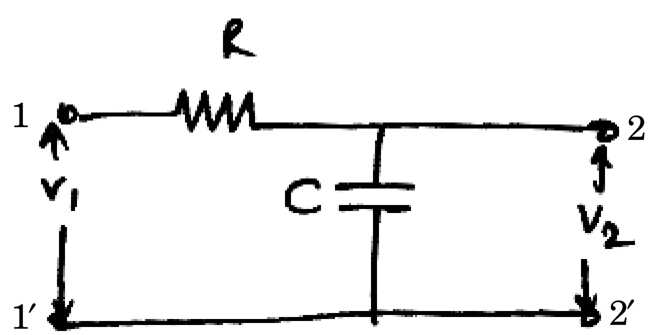


Fig. 9

Or

12. (*a*) Write a short note on location of Pole-zeros and time domain response. [8]

(*b*) Find the network functions $Z_{11}(s)$ and $Z_{21}(s)$ for the network shown in Fig. 10. [10]

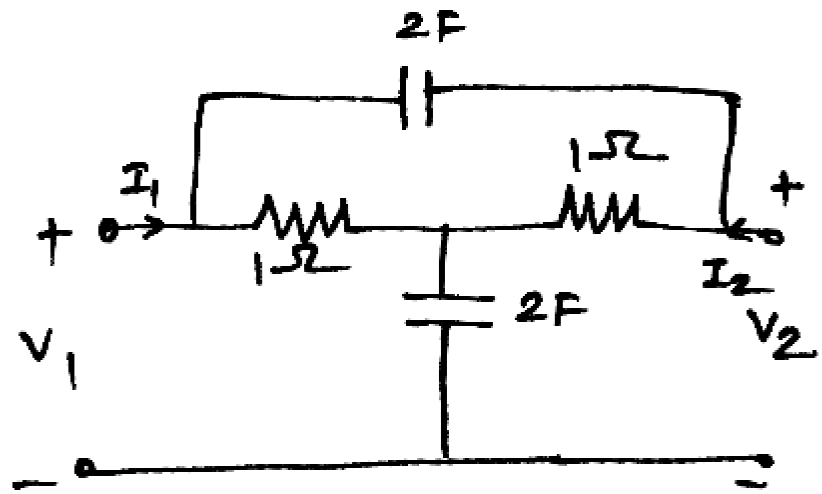


Fig. 10

Total No. of Questions—**12**]

[Total No. of Printed Pages—**4+1**

Seat No.	

[4262]-148

S.E. (Electrical) (II Sem.) EXAMINATION, 2012

DIGITAL COMPUTATIONAL TECHNIQUE

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) In Section I, attempt Q. No. **1** *or* Q. No. **2,** Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**. In Section II, attempt Q. No. **7** *or* Q. No. **8,** Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data if necessary.

SECTION I

1. (*a*) Explain Descartes' rule of sign with suitable example. [6]

(*b*) Using Synthetic division find $f(x) = 2x^3 - 6x + 13$, find $f(3)$, $f'(3)$, $f''(3)$, $f'''(3)$. [6]

(*c*) Explain numerical instability with example. [6]

P.T.O.

Or

2. (*a*) Use synthetic dvision and perform three iterations of Birge-Vieta method to find the root of the following equation with initial approximation $p_0 = 0$: [10]

$$f(x) = x^3 - 2x^2 - 5x + 6 = 0.$$

(*b*) Explain the basic principle of numerical methods with block diagram. Also explain computer for high speed calculations. [8]

3. (*a*) Explain Newton-Raphson method for two variables. [8]

(*b*) A real root of the equation $f(x) = x^3 - 5x + 1 = 0$ lies in interval (0, 1). Perform four iterations of the secant method. [8]

Or

4. (*a*) Find the smallest positive root of the equation $e^{-x} = \sin x$ using NR method taking initial value $x_0 = 0$. [8]

(*b*) What do you mean by transcendental equation ? Explain bisection method to find root of transcendental equation. [8]

5. (*a*) Use Gauss-Elimination method to solve the following system of equation : [8]

$$3x - y + 2z = 13;\ 2x + 3y + 3z = 10;\ x + 2y + z = 3.$$

(*b*) Use Gauss-Seidel method to solve the following system of equations assuming initial approximation $x = 3$, $y = 2$, $z = 1$: [8]

Or

6. (*a*) Find $[A]^{-1}$ using Gauss-Jordan method where : [8]

(*b*) Explain Gauss-Jacobi method to solve the system of non-linear equations. [8]

$8x - 3y + 2z = 20;\ 4x + 11y - z = 33;\ 6x + 3y + 12z = 35.$

$$A = \begin{pmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{pmatrix}.$$

SECTION II

7. (*a*) The following table gives relation between x and y, determine (*i*) $y(3.5)$ and (*ii*) $y(8.5)$ using appropriate interpolation formula : [9]

x	y
3	4.8
4	8.4
5	14.5
6	23.6
7	36.2
8	52.8
9	73.9

(*b*) What are the methods used in interpolation of data with unequal spacing ? Explain any *one* of them. [7]

Or

8. (*a*) Find y_{15} using Bessel's interpolation formula, if $y_{10} = 2854$, $y_{14} = 3162$, $y_{18} = 3544$, $y_{22} = 3992$. [8]

(*b*) Explain least square approximation for fitting of data into third order curve. [8]

9. (*a*) Use forth order RK method to estimate $y(0.4)$ when $y' = x^2 + y^2$ with $y(0) = 0$. Take $h = 0.2$. [8]

(*b*) Explain modified Euler's method for solution of ordinary differential equation. [8]

Or

10. (*a*) Use Taylor method recursively to solve the equation $y' = x^2 + y^2$ with $y(0) = 0$ for the interval (0, 0.4) using two subintervals of size 0.2. [8]

(*b*) Use modified Euler's method to solve the equation $y' = x^2 + y^2$ with $y(0) = 0$ for the interval (0, 0.4) using two subintervals of size 0.2. [8]

11. (*a*) Derive Newton Cote's formula for numerical integration. [6]

(*b*) Evaluate $\int_0^{\pi} \sqrt{1 + 3 \cos^2 x}\, dx$ using (*i*) Trapezoidal Rule (*ii*) Simpson's $\left(\frac{1}{3}\right)$rd rule. Take $h = \frac{\pi}{12}$. [12]

Or

12. (*a*) Find $f'(1)$ and $f''(1)$ from the following table : [12]

x	$f(x)$
1.0	0.0
1.2	0.128
1.4	0.554
1.6	1.296
1.8	2.432
2.0	4.000

(*b*) Derive formula of trapezoidal rule for numerical integration using Newton Cote's formula. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-149

S.E. (Electrical) (Second Semester) EXAMINATION, 2012

MICROPROCESSOR FUNDAMENTALS AND PROGRAMMING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw the block diagram architecture of 8085 microprocessor. [6]

(*b*) Explain the following instructions : [8]

(*i*) CALL Addr

(*ii*) LHLD Addr

(*iii*) ADD B

(*iv*) RAR

(*c*) Explain the functions of the following pins of 8085 : [4]

(*i*) $IO/\overline{M}$

(*ii*) S_0 and S_1

Or

2. (*a*) Design the microprocessor system for 8085 microprocessor such that it should contain 8 K byte of EPROM with starting addresses 0000H. [10]

(*b*) Explain various flags with format of status flag register. [8]

3. (*a*) What are the various interrupt lines of 8085 ? Explain instructions for enabling, disabling and masking of interrupts. [10]

(*b*) Discuss instruction cycle. [6]

Or

4. (*a*) Explain stack operation of 8085 microprocessor. [8]

(*b*) Write an assembly language program for adding two 16 bit numbers. The first number is stored at C000H (lower byte) and C001H (higher byte). The second number is stored at C002H (lower byte) and C003H (higher byte). Save the result at D000H (lower byte) and D001H (higher byte). [8]

5. (*a*) Draw and explain block diagram of 8251. [8]

(*b*) Explain RS232 standard for serial data transfer. [8]

Or

6. (*a*) Explain mode and command instruction format of 8251. [8]

(*b*) Explain synchronous and asynchronous data transfer. [8]

SECTION II

7. (*a*) Explain the mode 1 of 8255 PPI in output mode and list the functions of handshake signals. [8]

(*b*) Write down control word in mode 0 for port A as an O/P and port B and port C as an input. Write the initialization instruction for the same. [8]

Or

8. (*a*) Explain the read and write operation of 8254 as a counter. [8]

(*b*) Write a subroutine to initialize a counter 2 in mode 0 with a count $(A\ \ OF\ \ 8)_H$. Also determine the input frequency for counter 2. [8]

9. (*a*) Draw the complete interfacing diagram for interfacing 8 bit ADC to 8085 using 8255 PPI. [10]

(*b*) Draw the flow chart to measure voltage using ADC interfaced with 8085. [6]

Or

10. (*a*) Write a program to generate triangular wave using DAC interfaced with 8085. Draw the flow chart. [8]

(*b*) Draw the interfacing diagram for the flow measurement using 8085. Explain in brief. [8]

11. Write short notes on : [18]

(*a*) Measurement of speed of DC motor

(*b*) Interfacing of 7 segment display.

Or

12. (*a*) Draw the block diagram for temperature measurement. Explain it. Draw the flow chart. [8]

(*b*) Draw the interfacing connection diagram for interfacing stepper motor to 8085 using 8255. Write program to rotate in clockwise direction and draw the flow chart. [10]

Total No. of Questions—**12**]

[Total No. of Printed Pages—**7**

Seat No.	

[4262]-151

S.E. (E & TC)/(Electronics) (First Semester)

EXAMINATION, 2012

SIGNALS AND SYSTEMS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What is signal ? Explain classification of signals with example. [8]

(*b*) For each of the following signals, determine whether it is periodic, and if it is, find the fundamental period : [10]

(*i*) $x(t) = \cos^2 (2\pi t)$

(ii) $x(t) = \sin^3 (2t)$

(iii) $x[n] = (-1)^{n^2}$

(iv) $x[n] = \cos(2n)$

(v) $x(t) = e^{-2t} \cos(2\pi t)$.

Or

2. (a) Sketch the waveforms of the following signals : [8]

(i) $x(t) = u(t) - u(t - 2)$

(ii) $x(t) = -u(t + 3) + 2u(t + 1) - 2u(t - 1) + u(t - 3)$

(iii) $y(t) = r(t + 1) - r(t) + r(t - 2)$

(iv) $y(t) = r(t + 2) - r(t + 1) - r(t - 1) + r(t - 2)$

(b) For each of the following systems, determine whether it is : [10]

(i) memoryless

(ii) stable

(iii) causal

(iv) linear, and

(v) time invariant.

(1) $y(t) = \frac{d}{dt}\left[e^{-t}x(t)\right]$

(2) $y(n) = x(n) \sum_{k=-\infty}^{\infty} \delta[n-2k]$.

3. (a) Evaluate the convolution integral for a system with input $x(t)$ and impulse response $h(t)$, respectively, given by : [8]

$x(t) = u(t - 1) - u(t - 3)$; and

$h(t) = u(t) - u(t - 2)$.

(*b*) The impulse responses of the LTI system is $h(t)$. Find the condition for system to be stable, causal and memoryless based on impulse response. [8]

Or

4. (*a*) For each of the following systems, determine whether the corresponding system is : [8]

(*i*) Memoryless

(*ii*) Causal

(*iii*) Stable.

Justify your answer.

(1) $h[n] = \left(\frac{1}{2}\right)^n . u[n]$

(2) $h(t) = e^{at} . u(t)$.

(*b*) Find the expression for the impulse response relating the input $x(t)$ to the output $y(t)$ in terms of impulse response for each sub-system for the LTI system shown in the Fig. 1. [4]

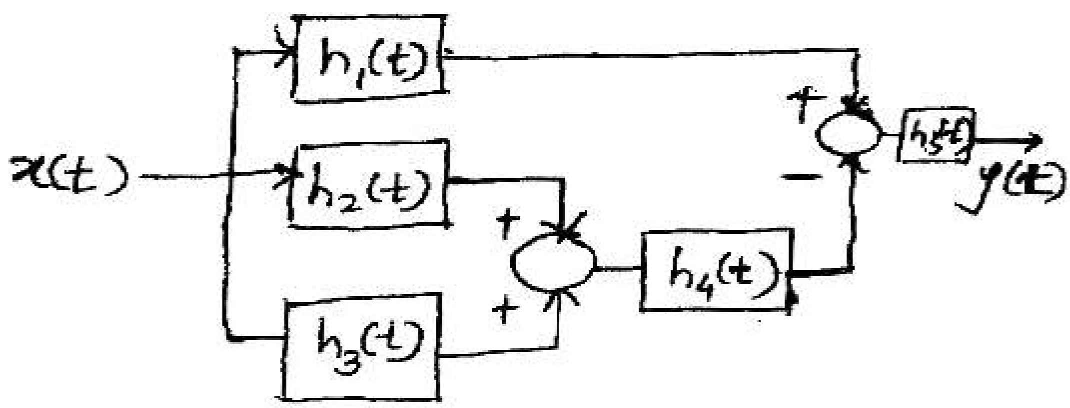


Fig. 1.

(*c*) Find the convolution of $x[n]$ and $h[n]$ and sketch the output where : [4]

$$x[n] = \left[1, 2, \underset{\uparrow}{0}, -1\right] \text{ and}$$

$$h[n] = \left[1, \underset{\uparrow}{-1}, 1, -1\right].$$

5. (*a*) State and prove the following properties of Fourier transform : [8]

(*i*) Duality

(*ii*) Convolution property.

(*b*) Find the Fourier transform of the following signals and sketch its amplitude and phase spectrum : [8]

(*i*) $e^{-at} \cdot u(t)$

(*ii*) $sgn(t)$.

Or

6. (*a*) What are the Dirichlet conditions for the exists of Fourier transform ? [4]

(*b*) Find the Fourier transform of the following signals : [12]

(*i*) $e^{-2t} \cos 5t \; u(t)$

(*ii*) $e^{at} \; u(-t)$

(*iii*) $te^{-at} \; u(t)$.

SECTION II

7. (*a*) Explain different applications of Laplace transform. [4]

(*b*) A stable system has the input $x(t)$ and output $y(t)$. Use Laplace transform to determine transfer function and impulse response $h(t)$ of the system given : [8]

$$x(t) = e^{-2t} u(t);$$

$$y(t) = -2e^{-t} u(t) + 2e^{-3t} u(t).$$

(*c*) Find initial and final value of : [6]

$$X(s) = \frac{s + 4}{s^2 + 3s + 5}.$$

Or

8. (*a*) Find the Laplace transform of the following signals using properties of Laplace transform : [12]

(*i*) $x(t) = u(t - 3)$

(*ii*) $x(t) = t^2 e^{-3t} u(t)$

(*iii*) $x(t) = 3e^{-2t} \cos(4t) - 5e^{-3t} \sin(2t) + 2$

(*iv*) $x(t) = \cosh(t)$.

(*b*) State and prove initial value theorem of the Laplace transform. [6]

9. (*a*) Define energy spectral density and prove relation between autocorrelation and energy spectral density. [8]

(*b*) Find the autocorrelation of the following signals : [8]

(*i*) $x_1[n] = \begin{bmatrix} 4, \overset{\downarrow}{3}, 2, 1 \end{bmatrix}$

(*ii*) $x_2[n] = u[n]$.

Or

10. (*a*) Find the energy spectral density of : [8]

$$x(t) = e^{-at} u(t)$$

Sketch the ESD plot.

(*b*) Define cross-correlation. State and prove any *three* properties of cross-correlation of energy signals. [8]

11. (*a*) Define the terms mean, moments, expectation and standard deviation. [4]

(*b*) Sketch Gaussian PDF and write expression for Gaussian PDF. [4]

(*c*) The probability density function of a random variable is given by : [8]

$$f_x(x) = \begin{cases} ke^{-4x} & x > 0 \\ 0 & x \le 0 \end{cases}$$

(*i*) Find the value of k

(*ii*) Find $p(2 < x \le 3)$

(*iii*) $p(x > 4)$

(*iv*) $p(x < 5)$.

Or

12. (*a*) What are different standard probability models ? Explain the following with mathematical expressions for CDF and PDF and sketch them : [8]

(*i*) Uniform distribution

(*ii*) Gaussian distribution.

(*b*) A student arrives late for a class 30% of the times. Class meets 5 times a week. Then find : [8]

(*i*) Probability of student being late for at least three classes in a given week.

(*ii*) Probability of student being late for two classes in a given week.

(*iii*) Probability of student will not be late at all during a given week.

Total No. of Questions—**6**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-151A

S.E. (E&TC) (First Semester) EXAMINATION, 2012

SIGNALS AND SYSTEMS

[For 2012 (Pattern) Batch]

(Only for Fresh Students)

Time : Two Hours **Maximum Marks : 50**

***N.B.* :—** (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

1. (*a*) (*i*) The discrete time signal :

$$x[n] = \begin{cases} 1 & n = 1, 2 \\ -1 & n = -1, -2 \\ 0 & n = 0 \text{ and } |n| > 0 \end{cases}$$

Find the time shifted signal :

$$y[n] = x[n + 3].$$ [5]

P.T.O.

(*ii*) Refer Fig. 1. Find even and odd part of CT signal. [4]

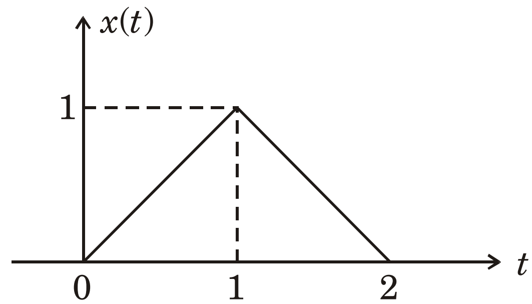


Fig. 1

(*b*) Compute the convolution integral using graphical method for :

$$x(t) = e^{-t} \text{ for } t \geq 0$$

$$h(t) = u(t).$$ [9]

Or

2. (*a*) (*i*) Check the following system for linearity :

$$y(t) = x(t) + x(t - 100).$$ [4]

(*ii*) Refer Fig. 2. Sketch and label the following signal $y[n]$:

$$y[n] = x[n] \cdot u[2 - n].$$ [5]

Fig. 2

(*b*) Find the convolution sum of two finite sequences defined as below. Also sketch the result.

$$x[n] = n + 1 \quad \text{for } 0 \leq n \leq 2$$
$$= 5 - n \quad \text{for } 2 \leq n \leq 4$$
$$= 0 \quad \text{elsewhere}$$
$$h[n] = \quad \text{for } 2 \leq n \leq 4$$
$$= 0 \quad \text{elsewhere}$$
[9]

3. (*a*) Find the exponential Fourier series and plot the magnitude and phase spectrum for the periodic signal $x(t)$. [8]

$\frac{-n}{2}$

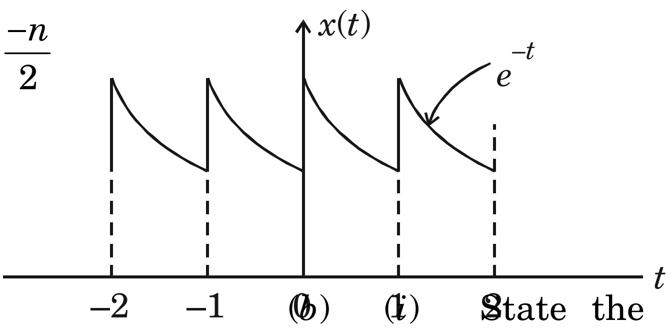


Fig. 3

(*b*) (*i*) State the properties of Laplace Transform and prove convolution property of LT. [4]

(*ii*) Find initial value for the function $x(t) = 2 - e^{3t}$ using initial value theorem. [4]

Or

4. (*a*) (*i*) State different properties of Fourier Transform and prove scaling property. [4]

(*ii*) Using scaling property find magnitude spectrum of $\pi\left(\frac{t}{2\tau}\right)$.

Given that :

$$\pi\left(\frac{t}{\tau}\right) \xleftrightarrow{\text{FT}} \tau \sin c\left(\frac{ul\tau}{2\pi}\right).$$ [4]

(*b*) State and prove time shifting property of LT. Using the same property determine the Laplace transform of :

$$x(t) = (t - 2)^3 \quad \text{for} \quad t > 2$$
$$= 0 \quad \text{for} \quad t < 2.$$ [8]

5. (*a*) Determine the cross correlation between two sequences given below :

$$x_1[n] = \{\underset{\uparrow}{1}, 2, 3, 4\}$$

$$x_2[n] = \{\underset{\uparrow}{3}, 2, 1, 0\}.$$ [8]

(*b*) Explain Binomial and Poisson's distribution function. [8]

Or

6. (*a*) (*i*) State and prove Parseval's theorem. [6]

(*ii*) Define ESD and PSD. [2]

(*b*) The tolerance of gasoline CANS produced by a manufacturing unit is 5%. The probability of any *one* CAN being out of tolerance is 0.03. If 3 CANS are selected by random :

(*i*) What is the probability that they are all out of tolerance ?

(*ii*) What is the probability of exactly two CANS being out of tolerance ?

(*iii*) What is the probability of exactly one being out of tolerance ?

(*iv*) What is the probability that all are in tolerance ? [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-152

S.E. (E & TC/Elex.) (First Semester) EXAMINATION, 2012

SOLID STATE DEVICES AND CIRCUITS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answer to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of log tables, slide rules, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Find the diode current I_D for Fig. 1. if : [9]

(*i*) Diode is ideal

(*ii*) $V_\gamma = 0.693$ V and $r_f = 0\Omega$

(*iii*) $V_\gamma = 0.693$ V and $r_f = 33\Omega$.

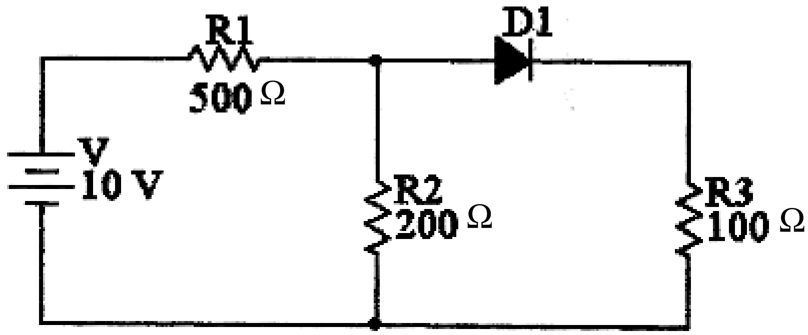


Fig. 1

(*b*) Explain the following non-ideal I-V characteristics of E-MOSFET : [7]

(*i*) Finite output resistance

(*ii*) Body effect

(*iii*) Temperature effect.

Or

2. (*a*) Explain construction, working and drain and transfer characteristics of N-EMOSFET. [9]

(*b*) As shown in Fig. 2., if two diodes having forward resistance 15 Ω, cut-in voltage 0.693 V :

(*i*) Calculate R if current through R is 25 mA.

(*ii*) If a battery of 2V is connected in series with R, calculate I through R. [7]

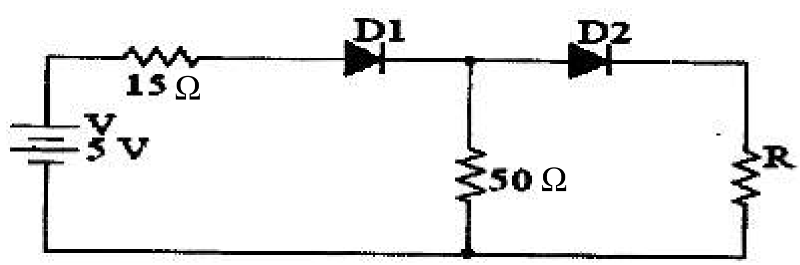


Fig. 2

3. (*a*) Give comparison with the following points for BJT (NPN) and EMOSFET (NMOS) : [8]

(*i*) Construction

(*ii*) Small Signal Model

(*iii*) Input and Output Characteristics

(*iv*) Input impedance.

(*b*) For the circuit shown in Fig. 3, if $V_{TN} = 1$ V, $K_n = 0.8$ mA/V_2, $\lambda = 0.01\ V^{-1}$, determine small signal voltage gain. Assume that EMOSFET is biased in saturation and $V_{GSQ} = 3V$. [8]

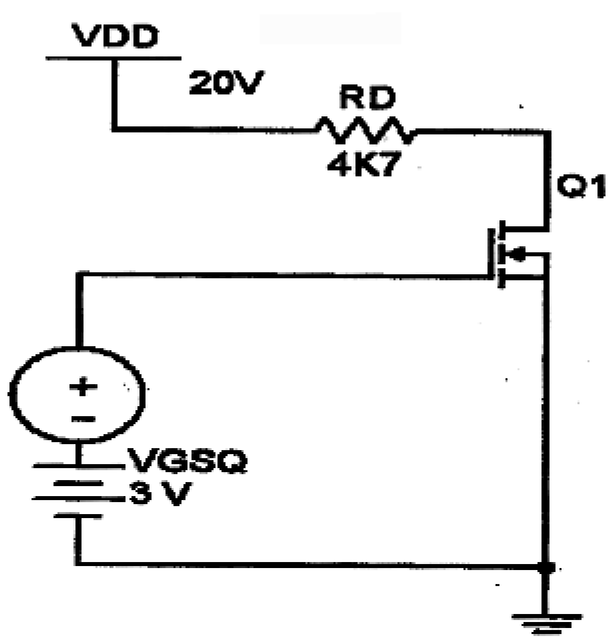


Fig. 3

Or

4. (*a*) Draw the following models for N-EMOSFET and explain any *one* in detail assuming that on external components connected :

(*i*) CS small signal model

(*ii*) CS high frequency model

(*iii*) CS PSPICE model. [8]

(*b*) For N-EMOSFET $V_T = 0.7$ V, W = 30 μm, L = 5 μm, $\mu_n = 650$ cm^2/V-s, $t_{ox} = 450$ Å (450×10^{-8}), $\varepsilon_{ox} = 3.9 \times 8.85 \times 10^{-14}$ F/cm. Assume transistor is biased in saturation region :

(*i*) Determine drain current when $V_{GS} = 2V_T$.

(*ii*) If t_{ox} is doubled, find new K. [8]

5. (*a*) Draw exact and approximate model for CE, CB and CC. [6]

(*b*) For CE amplifier with voltage divider bias and bypassed R_E $h_{fe} = 50$, $h_{ie} = 1100\ \Omega$, $h_{re} = 2.5 \times 10^{-4}$, $h_{oe} = 24$ μA/V, $R_1 = 8.2$ kΩ, $R_2 = 1.6$ kΩ, $R_C = 1.5$ kΩ, $R_E = 220\ \Omega$, $R_S = 1$ kΩ, $R_L = 4.7$ kΩ. Assume that all capacitor tends to infinite. Find A_V, A_{VS}, A_I, A_{IS}, R_i, R_o, R_i' , R_o' . [12]

Or

6. (*a*) Use h_{fe} = 50, h_{ie} = 1100 Ω to find A_V, A_{VS}, A_I, A_{IS}, R_i, R_o if CE amplifier is used with unbypassed R_E = 270 Ω, R_1 = 50 kΩ, R_2 = 10 kΩ, R_C = 1.1 kΩ, R_S = 1 kΩ, R_L = 3.3 kΩ. [12]

(*b*) Give comparison for CE, CB, CC amplifier for the following points : [6]

(*i*) A_V

(*ii*) A_I

(*iii*) R_i

(*iv*) R_o

(*v*) Applications.

SECTION II

7. (*a*) Explain construction and working of Phototransistor. [7]

(*b*) The following low frequency parameters are known for a given transistor at I_C = 10 mA, V_{CE} = 10 V at room temperature. h_{fe} = 100, h_{ie} = 500 Ω, h_{re} = 10^{-4}, h_{oe} = 10^{-5} A/V, at same operating point f_T = 50 MHz, C_{ob} = 3 pF. Compute the values of all the hybrid π-parameters and C_e. [9]

Or

8. (*a*) Draw, explain, give significance of Giacoletto model (Hybrid Pi-model). Give typical values of parameters. [7]

(*b*) Given the following transistor measurements made at $I_C = 5$ mA, $V_{CE} = 10$ V, at room temperature $h_{fe} = 100$, $h_{ie} = 600\ \Omega$, $|A_{ie}| = 10$ at 10 MHz, $C_C = 3$ pF. Find f_β, f_α, f_T, C_e, $r_{b'e}$, and $r_{b'b}$. [9]

9. (*a*) For a certain feedback amplifier mid-band voltage gain $A_{VO} = -1000$, $\beta = -0.1$, $V_S = 0.1$ V, find V_i. Hence comment on result. If at some higher frequency the amplifier gain has fallen to half its previous, without change in β, V_S, what is new V_i ? Comment on the result. [10]

(*b*) Explain Barkhausen criteria in detail. Draw RC phase shift oscillator and explain in detail. [8]

Or

10. (*a*) Identify feedback topolgy for Fig. 10, find gain, input impedance and output impedance with feedback if R_C = 4.7 kΩ, R_E = 100 Ω, R_S = 1 kΩ, h_{fe} = 50, h_{ie} = 1.1 kΩ, h_{re} = 10^{-4}, $1/h_{oe}$ = 40 K. [10]

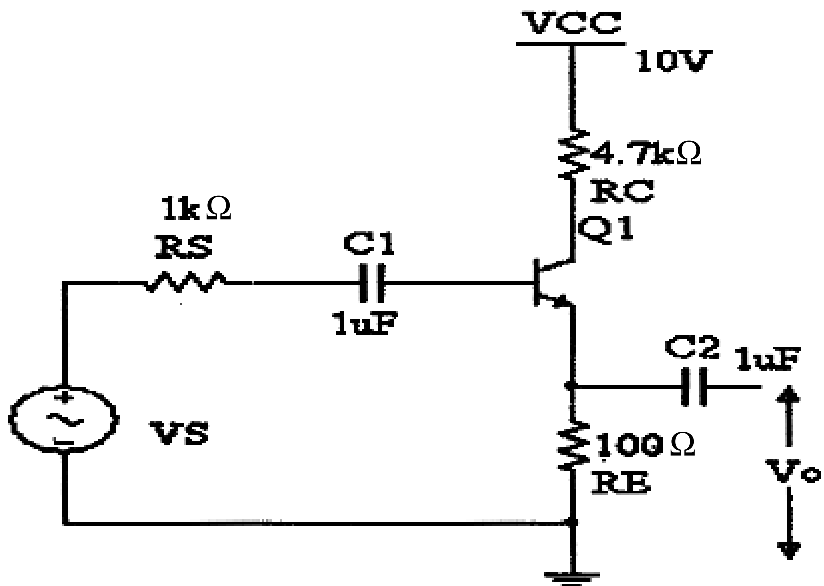


Fig. 10

(*b*) Compare Voltage series and Current shunt feedback amplifier for the following points : [8]

(*i*) Block diagram

(*ii*) R_i with R_S

(*iii*) R_o with R_L

(*iv*) Feedback gain

(*v*) Feedback factor.

11. (*a*) Give comparison for Power BJT and Power MOSFET. [8]

(*b*) Explain class B Push-Pull amplifier with : [8]

(*i*) Symmetry

(*ii*) Complementary.

Or

12. (*a*) Explain harmonic distortion in power amplifier. What is cross-over distortion ? Suggest suitable method to remove distortion. [8]

(*b*) Explain I-V characteristics of power BJT. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-153

S.E. (Electronics/E&TC) (First Sem.) EXAMINATION, 2012

NETWORK ANALYSIS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Find the value of 'K' in the circuit shown in Fig. 1, such that the power dissipated in 2 Ω resistor does not exceed 50 watts. [6]

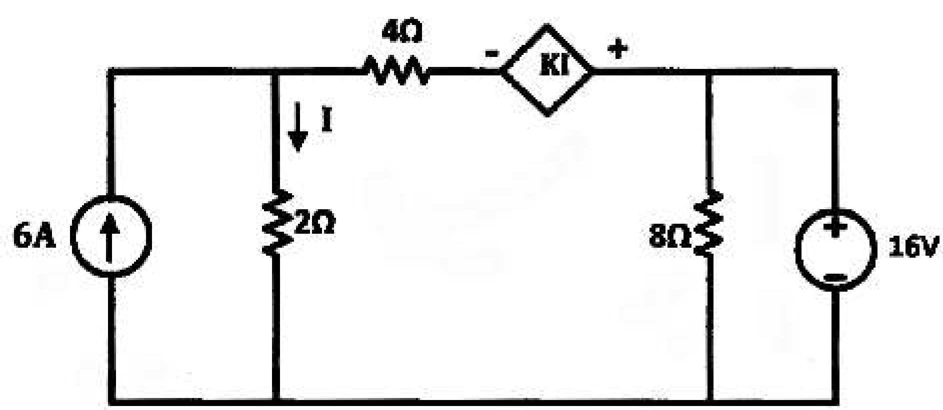


Fig. 1

(*b*) Explain the concept of supernode and supermesh. [4]

(*c*) For the circuit shown in Fig. 2, find the value of R that will receive maximum power. Determine this maximum power. [6]

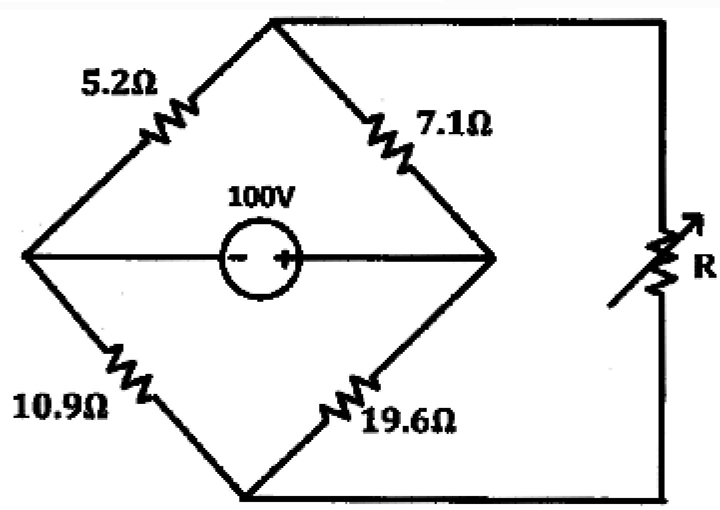


Fig. 2

Or

2. (*a*) Using nodal analysis, find current 'I' in the circuit shown in Fig. 3. [8]

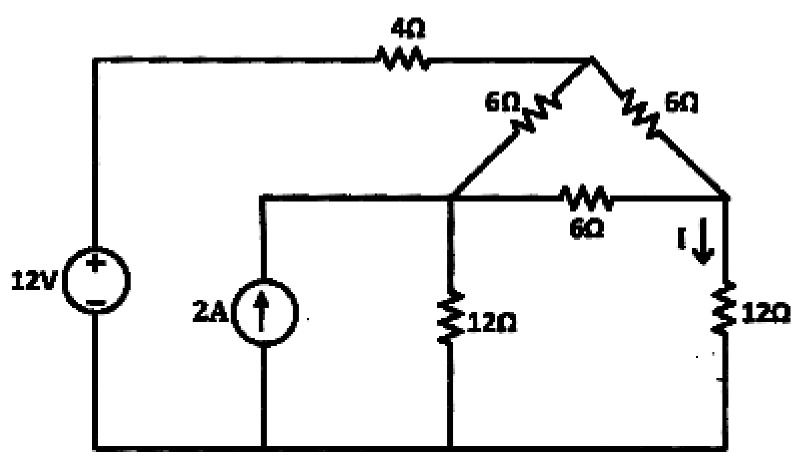


Fig. 3

(*b*) Obtain the Thevenin's and Norton's equivalent circuit at the terminals A-B for the circuit shown in Fig. 4. [8]

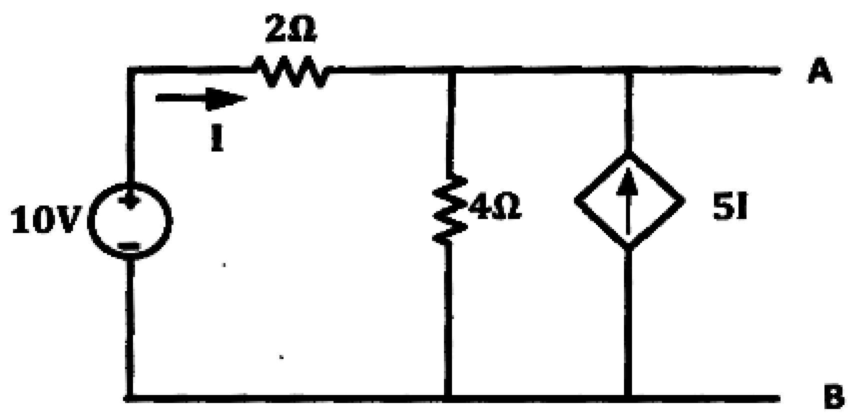


Fig. 4

3. (*a*) Derive the expression for bandwidth of series resonant circuit. [4]

(*b*) An inductive coil having a resistance of 50 Ω and an inductance of 0.05 H is connected in series with 0.02 μF capacitor. Find :

(*i*) Q-factor of the coil

(*ii*) Resonant frequency

(*iii*) Half power frequencies. [6]

(*c*) Discuss the applications and properties of parallel resonant circuits. [6]

Or

4. (*a*) Obtain the expression for selective and bandwidth of an antiresonant circuit. [6]

(*b*) A parallel resonant circuit has coil of 100 mH with Q-factor of 50. The coil is resonant at frequency 900 kHz. Find :

(*i*) Value of capacitor

(*ii*) Resistance in series with coil

(*iii*) Circuit impedance at resonance. [6]

(*c*) Derive the expression for an impedance of series resonant circuit in terms of Q_o and δ. [4]

5. (*a*) Design a suitable matching half section to match a symmetrical T network with $Z_{OT} = 500\ \Omega$ to a generator having internal resistance equal to $200\ \Omega$. [6]

(*b*) Design a composite low pass T-section filter having a design impedance of $600\ \Omega$, a cut-off frequency of 2000 Hz and a frequency of infinite attenuation of 2100 Hz. [8]

(*c*) Derive the relationship between neper and decibel. [4]

Or

6. (*a*) Explain the concept of insertion loss. [4]

(*b*) With neat diagrams explain the resistance curves for bandpass filter. Also obtain the design equations for bandpass filter. [8]

(*c*) Design π-type attenuator with the following specifications : Attenuation = 20 db, characteristic resistance = 20 Ω. [6]

SECTION II

7. (*a*) For the network shown in Fig. 5 the switch K is closed at $t = 0$, with the capacitor uncharged. Find the values of i, di/dt, d^2i/dt^2 at $t = 0^+$. [8]

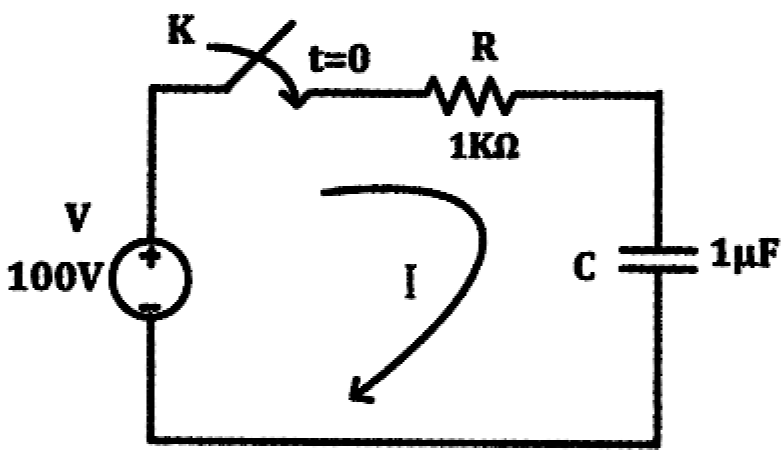


Fig. 5

(*b*) Solve the following differential equations using Laplace transform :

(*i*) $\dfrac{d^2i}{dt^2} + \dfrac{di}{dt} = t^2 + 2t;\ i\left(0^-\right) = 4;\ \dfrac{di}{dt}\left(0^-\right) = -2$

(*ii*) $\dfrac{d^2i}{dt^2} + 4i = \sin t - \cos 2t;\ i\left(0^-\right) = 0;\ \dfrac{di}{dt}\left(0^-\right) = 0.$ [10]

Or

8. (*a*) In the circuit shown in Fig. 6, the switch is changed from position 1 to 2 at $t = 0$. Determine the initial conditions of i, di/dt, d^2i/dt^2 at $t = 0^+$. [10]

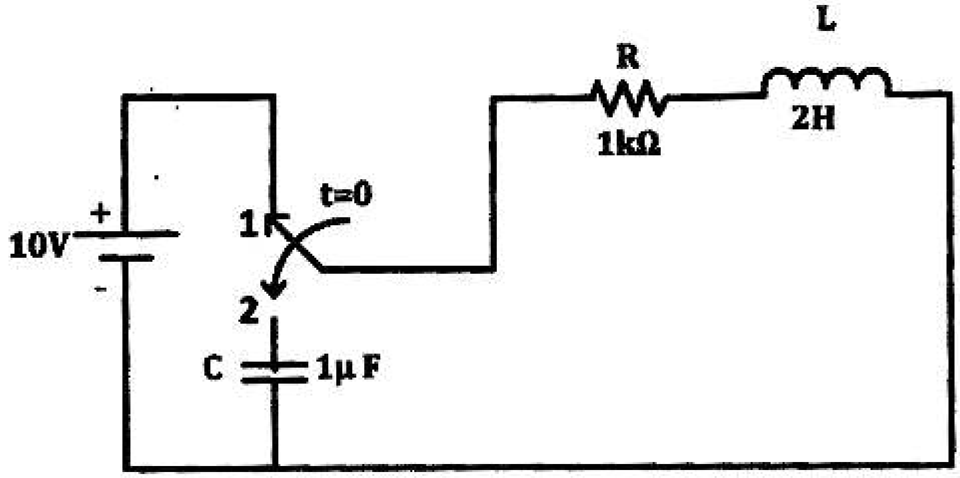


Fig. 6

(*b*) In the network shown in Fig. 7, the switch is moved from a to b at $t = 0$. Determine $i(t)$ and $V_C(t)$ using Laplace transform. [8]

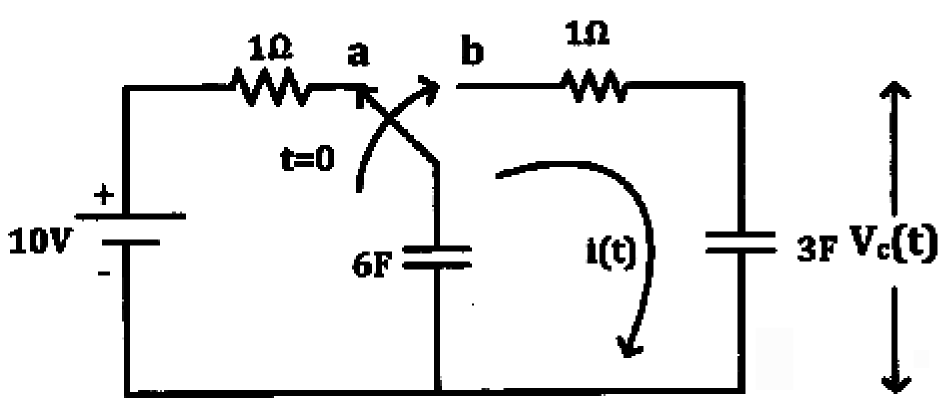


Fig. 7

9. (*a*) For the network shown in Fig. 8, find the admittance Y(S) as seen by source $i(t)$. Also plot the poles and zeros of Y(S). [8]

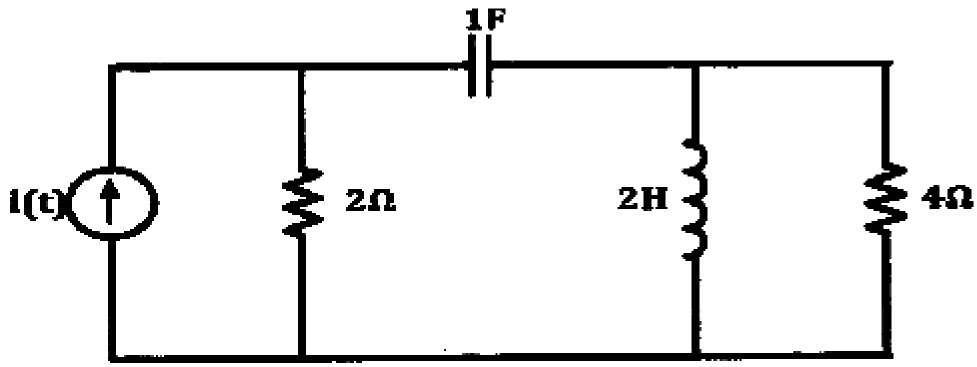


Fig. 8

(*b*) Find Z-parameters for the network shown in Fig. 9. [8]

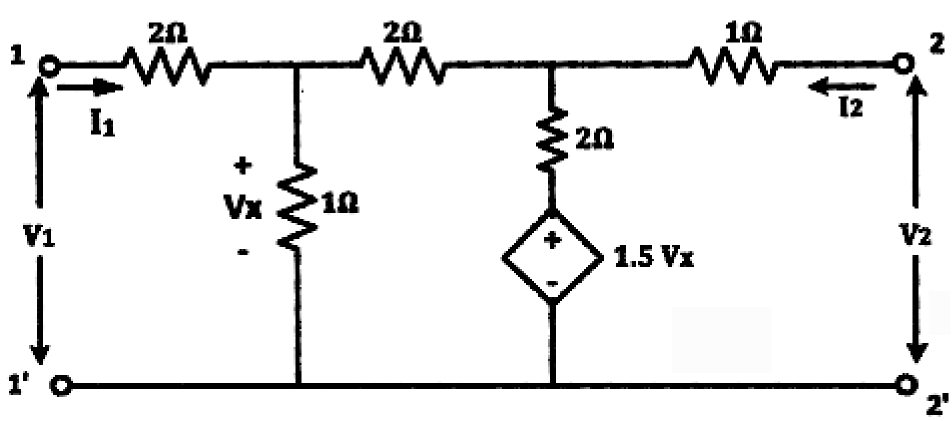


Fig. 9

Or

10. (*a*) Explain the significance of poles and zeros. [4]

(*b*) Find the current transfer ratio i_2/i_1 for the network shown in Fig. 10. [6]

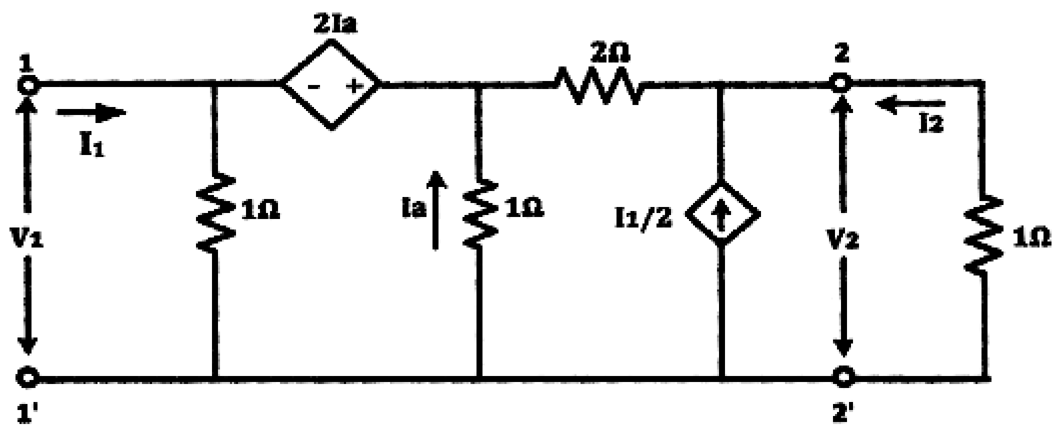


Fig. 10

(*c*) Obtain the reciprocity and symmetry conditions for Z and Y parameters. [6]

11. (*a*) Define the following terms and explain their physical significance as applied to the transmission lines :

(*i*) Attenuation

(*ii*) Characteristic Impedance

(*iii*) Propagation Constant

(*iv*) Phase shift and Phase velocity. [8]

(*b*) The open and short circuit impedances of a certain open wire transmission line of 40 km length at 796 Hz are :

$Z_{OC} = 328\angle 29.2°$ and $Z_{SC} = 1548\angle -6.8°$.

Calculate the values of Z_o, α, β, R, L, G and C. [8]

Or

12. (*a*) Explain the terms primary and secondary constants of transmission line. [6]

(*b*) A transmission line has the following parameters of 1 kHz frequency. R = 6 Ω/Km, L = 2 mH/Km, C = 0.005 μF/Km, G = 0.5 μmho/Km. Calculate α, β, λ and phase velocity. [6]

(*c*) Derive the expression for transfer impedance of a line in terms of Z_O, Z_R and γ. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-154

S.E. (E & TC) (First Semester) EXAMINATION, 2012

DIGITAL LOGIC DESIGN

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) In Section I : Attempt Q. No. **1** *or* **2**, Q. No. **3** *or* **4**, Q. No. **5** *or* **6**.

(*vi*) In Section II : Attempt Q. No. **7** *or* **8**, Q. No. **9** *or* **10**, Q. No. **11** *or* **12**.

SECTION I

1. (*a*) Minimize the function using K-map and implement using only one type of gate : [6]

$$F(A, B, C, D) = \pi m(0, 3, 5, 6, 10) \; d(1, 2, 11, 12).$$

(*b*) Write a short note on ALU. [4]

(*c*) Implement the following Boolean function using 8 : 1 multiplexer : [8]

$$F(W, X, Y, Z) = \bar{W}X\bar{Z} + WYZ + \bar{X}YZ + \bar{W}\bar{Y}Z.$$

Or

2. (*a*) Simplify the following function by using Quine-McCluskey method : [10]

$$F(A, B, C, D) = \Sigma m(0, 5, 6, 7, 9, 10, 13, 14, 15).$$

(*b*) Design 2 bit comparator using K-map and implement it. [8]

3. (*a*) Design and explain a 4 bit binary UP/DOWN ripple counter with a control for UP/DOWN counting. [8]

(*b*) Convert : [8]

(*i*) JK FF to SR FF

(*ii*) T FF to SR FF.

Or

4. (*a*) Design MOD 13 synchronous counter using T flip-flop. [8]

(*b*) Design pulse train generator using shift register to generate the following pulse :

......10110........ [8]

5. (*a*) Write a VHDL code for 2 bit comparator using behavioural modeling style. [8]

(*b*) Explain the following statements used in VHDL with suitable examples : [8]

(*i*) Process

(*ii*) Case

(*iii*) When-Else

(*iv*) Wait.

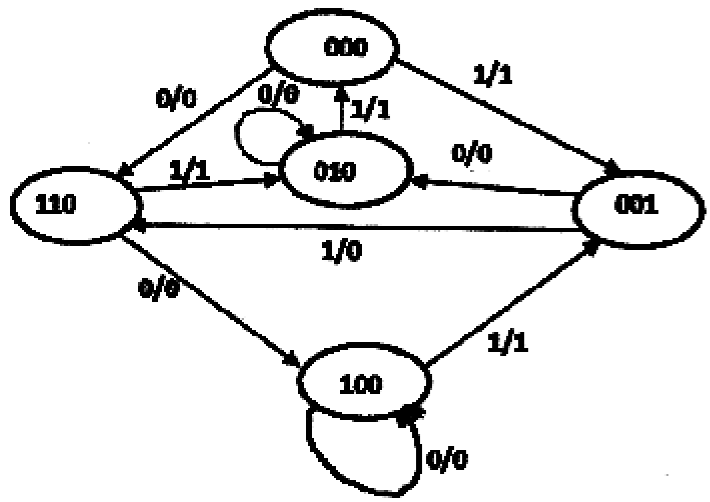
Or

6. (*a*) Describe any *two* modeling styles of VHDL with suitable examples. [8]

(*b*) Write the VHDL code for T flip-flop using synchronous and asynchronous preset and clear input. [8]

SECTION II

7. (*a*) Implement the following state diagram using D flip-flop : [10]



(*b*) Explain Moore circuit with example. Also compare Moore and Mealy circuit. [8]

Or

8. (*a*) Design a sequential circuit using Mealy machine for detecting the sequence ....1011....... [10]
Use JK flip-flop.

(*b*) Explain : [8]

(*i*) State Table

(*ii*) State Diagram

(*iii*) State Assignment

(*iv*) ASM chart.

9. (*a*) Draw and explain briefly working of 2 input CMOS NOR gate. [8]

(*b*) Explain with neat diagrams and compare different types of output configuration in case of TTL family. [8]

Or

10. (*a*) Define and explain : [8]

(*i*) Fan out

(*ii*) Noise margin

(*iii*) Propagation Delay

(*iv*) Figure of Merit.

(*b*) Explain with neat diagrams, interface of TTL gate driving CMOS gate and vice versa. [8]

11. (*a*) Design a BCD to excess-3 code converter and implement it using PAL. [8]

(*b*) Draw circuits of one cell of static and dynamic RAM and explain its working. [8]

Or

12. (*a*) A combinational circuit is defined by the function : [8]

$$F1(A, B, C) = \Sigma m(2, 3, 7)$$

$$F2(A, B, C) = \Sigma m(3, 4, 6)$$

Implement the circuit using PLA.

(*b*) How to obtain 128×4 memory using 32×4 memory chip ? [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-155

S.E. (E&TC) (First Semester) EXAMINATION, 2012

POWER DEVICES AND MACHINES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions form Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw the construction diagram of power BJT and explain its different switching limits. [5]

(*b*) Explain reverse recovery characteristics of a power diode. Derive expressions for t_{rr} and I_{RR}. [8]

(*c*) Compare power MOSFET with power BJT. [5]

P.T.O.

Or

2. (*a*) Draw construction diagram and explain switching characteristics of power MOSFET (n-channel enhancement type). [7]

(*b*) The reverse recovery time of a power diode is 5 μs and rate of fall of diode current is 80 A/μs. If softness factor is 0.5, determine :

(*i*) t_a and t_b

(*ii*) Peak inverse current (I_{RR})

(*iii*) Storage charge (Q_{RR}). [6]

(*c*) Draw and explain Gate Drive Circuit for MOSFET. [5]

3. (*a*) What are different design considerations of gate drive circuit of a SCR ? [5]

(*b*) Compare SCR with TRIAC. [5]

(*c*) Draw and explain two transistor analogy of SCR. Also derive an expression for I_A. [6]

Or

4. (*a*) Design a UJT triggering circuit with the following UJT data : R_{BB} = 5 kΩ, η = 0.72, I_P = 0.6 mA, V_P = 18 V, V_V = 1V, I_V = 2.5 mA, normal leakage current is 4.2 mA. Frequency of pulses is 2 kHz, C = 0.04 μf. [6]

(*b*) Explain different triggering modes of TRIAC with proper layer diagrams. Which *two* modes are more sensitive ? [5]

(*c*) Explain steady state characteristics of SCR. [5]

5. (*a*) Describe the working of single phase fully controlled bridge converter for R–L load with all waveforms. Also derive an expression for average output voltage (V_O). [8]

(*b*) A single-phase semi-converter is operated from 120 V, 50 Hz AC supply. The load resistance is 10 Ω. If the average output voltage is 25% of the maximum possible average output voltage, determine :

(*i*) Firing angle

(*ii*) Average output current

(*iii*) r.m.s. output current. [5]

(*c*) What are the effects of freewheeling diode in full converter for R–L load ? [3]

Or

6. (*a*) Draw and explain single-phase full wave AC voltage controller for R load with waveforms. Derive an expression for its output voltage. [7]

(*b*) A single-phase fully controlled bridge rectifier is given 230 V, 50 Hz supply. The firing angle is 30° and load is highly inductive. Determine :

(*i*) Average output voltage

(*ii*) Power factor

(*iii*) Average output voltage if a freewheeling diode is connected across load. [6]

(*c*) Why are antiparallel SCRs preferred over TRIAC for high power and high frequency applications ? [3]

SECTION II

7. (*a*) Draw and explain step down chopper for R load. Derive the expressions for average and r.m.s. output voltages. [8]

(*b*) A step up chopper has input voltage of 220 V and output voltage of 660 V. If the non-conducting time of chopper is 100 μs, compute :

(*i*) the pulse width of output voltage

(*ii*) if pulse width in (*i*) is made half for constant frequency operation, find the new output voltage. [4]

(*c*) Explain with block schematic working of online UPS. [6]

Or

8. (*a*) Explain 180° mode in three-phase inverters for R load with circuit, waveforms and equivalent circuits. [8]

(*b*) Explain with block schematic working of SMPS. [4]

(*c*) Single phase full bridge inverter is operated from 48 V d.c. supply and is supplying power to pure resistive load of R = 10 Ω, calculate :

(*i*) r.m.s o/p voltage and current

(*ii*) First four harmonics

(*iii*) Output r.m.s. power. [6]

9. (*a*) Explain torque-speed and torque-current characteristics of d.c. shunt motor. [4]

(*b*) Explain construction of a d.c. motor with neat diagram. [6]

(*c*) A 4-pole, lap wound d.c. motor has 540 conductors. Its speed is 1000 r.p.m. The flux per pole is 25 mWb. It is connected to 230 V d.c. supply, armature resistance is 0.8 Ω. Find :

(*i*) Induced e.m.f.

(*ii*) Armature current

(*iii*) Torque developed. [6]

Or

10. (*a*) Draw construction diagram of a.c. motor and explain torque-speed characteristics of 3-phase induction motor. [8]

(*b*) Explain construction, working and characteristics of universal motor. [8]

11. (*a*) Explain construction and working of a.c. and d.c. Servo motors. [8]

(*b*) Draw and explain various types of 3-phase transformer connection along with phasor diagram. [8]

Or

12. (*a*) What are different types of stepper motor ? Explain construction and working of any *one* stepper motor. [6]

(*b*) Explain construction, working of BLDC motor, also draw its characteristics. [6]

(*c*) Explain working of current transformer. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-156

S.E. (E&TC/Ele.) (Second Semester) EXAMINATION, 2012

ENGINEERING MATHEMATICS—III

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) In Section I : attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**. Q. No. **5** *or* Q. No. **6**. In Section II : attempt Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Solve the following (any *three*) : [12]

(*i*) $(D^2 + 6D + 9)\, y = \dfrac{1}{x^3} e^{-3x}$

(*ii*) $D^2 - 2D + 5) \ y = 25x^2 + e^x$

(*iii*) $(D^2 + 1) \ y = x \sin x$

(*iv*) $(D^2 + 3D + 2) \ y = \sin e^x$ (by Variation of Parameter method).

(*b*) Solve the system of equations : [5]

$$(D - 1)\, x + Dy = t$$

Or

2. (*a*) Solve the following (any *three*) : [12]

(*i*) $(D - 1)^3 y = e^x + 5^x$

(*ii*) $(D^2 + 1) y = \sin 2x \,.\, \sin x$

(*iii*) $\dfrac{x\,dx}{y^3 z} = \dfrac{dy}{x^2 z} = \dfrac{dz}{y^3}$

(*iv*) $x^2 \dfrac{d^2y}{dx^2} - 2x \dfrac{dy}{dx} - 4y = x^2 + 2\log x$

(*b*) A circuit consists of an inductance L and condenser of capacity C in series. An alternating e.m.f. E$\sin nt$ is applied to it at time $t = 0$, the initial current and charge on the condenser being zero, find the current flowing in the circuit at any time for $w \neq n$ where [5]

3. (*a*) Prove that an analytic function with constant amplitude is constant. [5]

(*b*) Evaluate :

$$\oint_C \frac{\sin^2 z}{\left(z - \frac{\pi}{6}\right)^3}\, dz$$

where C is $|z| = 1$ by using Cauchy's Integral formula. [6]

(*c*) Find the Bilinear transformation which maps the points 0, 1, 2 from z-plane onto the points $1, \frac{1}{2}, \frac{1}{3}$ of w-plane. [5]

Or

4. (*a*) Determine the analytic function $f(z) = u + iv$ in terms of z

$$\oint_C \frac{z+2}{z^2+1}\, dz$$

if $u = \cosh(x) . \cos y$. [5]

(*b*) Apply Residue theorem to evaluate : [6]

where C is $|z - i| = \frac{1}{2}$.

(*c*) Show that under the transformation : [5]

$$w = \frac{i - z}{i + z}$$

x-axis in z-plane is mapped onto the circle $|w| = 1$.

5. (*a*) Using the Fourier integral representation, show that : [6]

$$\int_0^{\infty} \frac{\sin \pi\lambda \ . \ \sin \lambda x}{1 - \lambda^2} \, d\lambda = \begin{cases} \frac{\pi}{2} \sin x & 0 \le x \le \pi \\ 0 & x > \pi \end{cases}$$

(*b*) Solve the integral equation : [5]

$$\int_0^{\infty} f(x) \cos \lambda x \, dx = e^{-\lambda} \ , \ \lambda > 0$$

(*c*) Find z-transform of the following (any *two*) : [6]

(*i*) $F(k) = 4^k \sin (2k + 3) \qquad k \ge 0$

(*ii*) $F(k) = k5^k \qquad k \ge 0$

(*iii*) $F(k) = 5^k \qquad k < 0$

$\qquad = 3^k \qquad k \ge 0$

Or

6. (*a*) Find inverse z-transform of (any *two*) : [6]

(*i*)

(*ii*) $F(z) = \dfrac{z^2}{\left(z - \frac{1}{2}\right)\left(z - \frac{1}{3}\right)}$

(*iii*) $F(z) = \dfrac{z + 2}{(z - 1)^2}$ (using Inversion Integral Method).

(*b*) Solve the difference equation : [6]

$12 f(k + 2) - 7 f(k+1) + f(k) = 0, \ k \ge 0, \ f(0) = 0, \ f(1) = 3.$

(*c*) Find the Fourier transform of : [5]

SECTION II

7. (*a*) Find the value of y for $x = 0.5$ for the following table of x, y values using Newton's forward difference formula : [5]

x	y
0	1
1	5
2	25
3	100
4	250

(*b*) Use Simpson's $\frac{1}{3}$rd rule to obtain :

$$\int_0^{\pi/2} \left(\frac{\sin x}{x}\right) dx$$

by dividing the interval into four parts. [5]

(*c*) Determine using modified Euler's method, the value of y when $x = 0.1$ given that : [6]

$$\frac{dy}{dx} = x^2 + y \quad , \quad y(0) = 1$$

Or

8. (*a*) The velocity distribution of a fluid near a flat surface is given below : [5]

x	v
0.1	0.72
0.3	1.81
0.6	2.73
0.8	3.47

x is the distance from the surface (mm) and v is the velocity (mm/sec). Use Lagrange's interpolation polynomial to obtain the velocity at $x = 0.4$.

(*b*) Use trapezoidal rule to numerically evaluate : [5]

$$I = \int_0^1 x\, e^{x^2}\, dx$$

by taking $h = 0.1$.

(*c*) Using fourth order Runge-Kutta method, evaluate the value of y when $x = 1.1$ given that :

$$\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}, \quad y(1) = 1$$

take $h = 0.1$. [6]

9. (*a*) If

$$\bar{r} \cdot \frac{d\bar{r}}{dt} = 0$$

then show that $\bar{r}$ has constant magnitude. [4]

(*b*) Find the directional derivative of

$$\phi = e^{2x} \cos yz$$

at the origin in the direction of the tangent to the curve

$$x = a\sin t,\ y = a\cos t,\ z = at \text{ at } t = \frac{\pi}{4}.$$ [5]

(*c*) Prove the following (any *two*) : [8]

(*i*)

(*ii*) $\nabla^2 f(r) = \dfrac{d^2 f}{dr^2} + \dfrac{2}{r} f(r)$

(*iii*) $\nabla^2 \left(\dfrac{\bar{a} \cdot \bar{b}}{r}\right) = 0$

Or

10. (*a*) Find the constants a, b such that, surface :

$$ax^2 - byz = (a + 2)\,x$$

will be orthogonal to the surface :

$$4x^2y + z^3 = 4$$

at the point P(1, –1, 2). [6]

(*b*) Show that :

$$\overline{\mathrm{F}} = (ye^{xy}\cos z)\,\bar{i} + (xe^{xy}\cos z)\,\bar{j} - e^{xy}\sin z\;\bar{k}$$

is irrotational. Find the corresponding scalar function ϕ. [6]

(*c*) Show that :

$$\overline{\mathrm{F}} = \frac{\bar{a} \times \bar{r}}{r^n}$$

is solenoidal. [5]

11. (*a*) Find the work done by the force :

$$\overline{\mathrm{F}} = (x^2 - yz)\,\bar{i} + (y^2 - zx)\,\bar{j} + (z^2 - xy)\,\bar{k}$$

in taking a particle from P(1, 1, 1) to Q (3, –5, 7). [6]

(*b*) Evaluate

$$\iint_s (\nabla \times \overline{\mathrm{F}}) \cdot d\overline{\mathrm{S}}$$

where :

$$\overline{\mathrm{F}} = (x^3 - y^3)\,\bar{i} - xyz\,\bar{j} + y^3\,\bar{k}$$

and the surface S is

$$x^2 + 4y^2 + z^2 - 2x = 4$$

above the plane $x = 0$. [6]

(*c*) Show that :

$$\iint_S \frac{\bar{r}}{r^3} \cdot \hat{n}\, dS = 0$$

using Gauss-Divergence theorem. [5]

Or

12. (*a*) Evaluate $\oint_C \overline{F} \cdot d\bar{r}$ using Green's theorem for : [6]

$$\overline{F} = x^2\, \bar{i} + xy\, \bar{j}$$

over the region R, enclosed by $y = x^2$ and the line $y = x$.

(*b*) Evaluate :

$$\iint_S \left(\nabla \times \overline{F}\right) \cdot d\overline{S}$$

for

$$\overline{F} = y\bar{i} + z\bar{j} + x\bar{k}$$

where S is the surface of the paraboloid :

$$z = 1 - x^2 - y^2, \quad z \geq 0$$ [6]

(*c*) Two Maxwell's equations are

$$\nabla \cdot \overline{B} = 0 \quad , \quad \nabla \times \overline{E} = -\frac{\partial \overline{B}}{\partial t}$$

Given $\overline{B}$ = Curl $\overline{A}$, then prove that :

$$\overline{E} + \frac{\partial \overline{A}}{\partial t} = -\text{ grad V},$$

where V is a scalar point function. [5]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-157

S.E. (E&TC) (Second Semester) EXAMINATION, 2012

INTEGRATED CIRCUITS AND APPLICATIONS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-sheets.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Which are the different configurations of differential amplifiers ? Derive the expressions for Q-point parameters of Dual-Input balanced output differential amplifier. [8]

(*b*) The dual-input balanced output differential amplifier has the following specifications : [8]

$R_c = 2.5\ k\Omega$, $R_E = 4.8\ k\Omega$, $R_{b1} = R_{b2} = R_b = 50\ \Omega$, $+V_{cc} = +10\ V$, $-V_{EE} = -10\ V$, $\beta = 100$, $V_{BE} = 0.8\ V$.

Assume $h_{ie} = 1.1\ k\Omega$.

Calculate :

(1) Q-point values

(2) Voltage gain

(3) Input and output resistance.

Or

2. (*a*) Explain any *two* level shifter circuits used in op-amp used to shift the level. [6]

(*b*) Write short notes on : [10]

(1) Current Mirror

(2) Widlar Current Source.

3 (*a*) An Op-Amp has a slew rate of 5 V/µs. Find the rise time for an o/p voltage of 10 V amplitude resulting from a rectangular pulse input if the op-amp is slew-rate limited [6]

(*b*) Define the following characteristics of an Op-Amp :

(1) CMRR

(2) Input bias current

(3) Slew rate

(4) Input offset voltage. [4]

(*c*) Explain the effect of feedback on closed loop stability of op-amp. [6]

Or

4. (*a*) Explain different types of noises associated with op-amp. Draw noise model of op-amp and give expression for noise voltage. [8]

(*b*) What is the need of frequency compensation ? Explain any *two* methods of frequency compensation. [8]

5. (*a*) Design a practical integrator using Op-Amp IC741C to satisfy the following specifications :

Assume V_{cc} = +15 V.

(1) 3-dB cut-off frequency = 1.5 kHz

(2) D.C. gain = 10

Sketch the frequency response of the circuit. [8]

(*b*) Explain grounded load V to I converter with necessary derivation. [6]

(*c*) Explain the concept of defined non-linearity. [4]

Or

6. (*a*) Design a practical differentiator to differentiate an input signal that varies in frequency from 10 Hz to 500 Hz. Draw its frequency response. [8]

(*b*) Compare the salient features of an integrator and differentiator using Op-Amp. [4]

(*c*) Draw a neat diagram of three inputs inverting summing amplifier using op-amp and obtain expression for output voltage. [6]

SECTION II

7. (*a*) Explain the operation of inverting comparator with appropriate output waveforms. [6]

(*b*) Explain peak detector using op-amp. [6]

(*c*) Design an inverting Schmitt Trigger circuit whose V_{UT} and V_{LT} are $\pm 5V$. Draw input and output waveforms. Assume op-amp saturates at ± 13.5 V. [6]

Or

8. (*a*) Explain the requirements of an instrumentation amplifier. [4]

(*b*) Derive the output voltage of 3 op-amp instrumentation amplifier. [6]

(*c*) Explain the operation of precision full wave rectifier with necessary waveforms. [8]

9. (*a*) Explain the following with reference to DAC : [6]

(1) Linearity

(2) Accuracy

(3) Settling time.

(*b*) Draw the circuit diagram of voltage mode R-2R ladder DAC and explain its working. [6]

(*c*) List various specifications of ADC. [4]

Or

10. (*a*) With the help of neat circuit diagram, explain the operation of Dual Slope ADC. [8]

(*b*) Draw the neat diagram of F to V converter and explain its operation. [8]

11. (*a*) Explain the operation of PLL using a neat block diagram. Define the terms Centre frequency and capture time related to PLL. [8]

(*b*) Write short notes on : [8]

(1) Graphic equalizer

(2) Frequency synthesizer using PLL.

Or

12. (*a*) Calculate output frequency f_o, lock range and capture range of PLL if the timing parameters are $C_T = 0.1\ \mu f$, $R_T = 1\ k\Omega$. The filter capacitor is $10\ \mu f$. [6]

(*b*) Write a short note on Sallen and Key second order active low pass filter. [6]

(*c*) Compare active and passive filters. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-158

S.E. (E&TC) (II Sem.) EXAMINATION, 2012

ELECTROMAGNETICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Derive an expression for electric field intensity $(\bar{E})$ at the general point P due to uniform charge distribution along an infinite line charge with uniform line charge density P_L. [9]

(*b*) Three infinite uniform sheets of charge are located in free space follows 3 nC/m^2 at Z = –4, 6 nC/m^2 at Z = 1 and –8 nC/m^2 at Z = 4.

Find $\bar{E}$ at the point :

(*i*) $P_A = (2, 5, -5)$

(*ii*) $P_B = (4, 2, -3)$

(*iii*) $P_C = (-1, -5, 2)$

(*iv*) $P_D = (-2, 4, 5)$. [9]

Or

2. (*a*) State and prove Gauss's law in differential form and explain what do you mean by $\bar{\nabla} \cdot \bar{D}$. [8]

(*b*) The spherical region $0 \le r \le 10$ cm contains a uniform volume charge density $P_V = 4\ \mu C/m^3$:

(*i*) Find total charge in the region $0 \le r \le 10$ cm.

(*ii*) Find $\bar{D}_r$ in the region $0 \le r \le 10$ cm.

(*iii*) The non-uniform volume charge density $P_V = \dfrac{-3}{r^3 + .001}$ nC/m^3 exists for 10 cm $< r < r_0$.

Find r_0 so that total charge in the region $0 \le r \le r_0$ is zero. [10]

3. (*a*) What is Laplace equation ? Derive expression for parallel plate capacitor using Laplace's equation. [8]

(*b*) Given the potential field in cylindrical co-ordinates $V = \frac{100}{Z^2 + 1} P \cos \phi$ volts and point P at P = 3 m, $\phi = 60°$, Z = 2 m, find values at P for :

(*i*) V

(*ii*) $\bar{E}$

(*iii*) E

(*iv*) $\frac{dV}{dN}$

(*v*) $\hat{a}_N$

(*vi*) P_V in free space. [8]

Or

4. (*a*) Derive the expression for the energy stored per unit volume in an electric field in terms of $\bar{E}$ and $\bar{D}$. [8]

(*b*) An electric dipole located at the origin in free space has a moment :

$$\bar{P} = 3\hat{a}_x - 2\hat{a}_y + \hat{a}_z \text{ nCm}$$

(*i*) Find V at $P_A(2, 3, 4)$.

(*ii*) Find V at $r = 2.5$, $\theta = 30°$, $\phi = 40°$. [8]

5. (*a*) Using the concept of curl, obtain the point form of Ampere's circuital law $\bar{\nabla} \times \bar{H} = \bar{J}$. [8]

(*b*) Calculate the value of the vector current density :

(*i*) In Cartesian co-ordinates at $P_A(4, 3, 4)$ if :

$$\bar{H} = x^2 z \, \hat{a}_y - y^2 x \, \hat{a}_z.$$

(*ii*) In cylindrical co-ordinates at $P_B(1.5, 90°, 0.5)$ if :

$$\bar{H} = \frac{2}{P}\left(\cos(0.2\phi)\right) \hat{a}_\phi.$$

(*iii*) In spherical co-ordinates at $P_C(2, 30°, 20°)$ if :

$$\bar{H} = \frac{1}{\sin\theta} \hat{a}_\theta.$$ [8]

Or

6. (*a*) A circular loop of wire of radius '*a*' lying in *xy* plane with its centre at the origin carries a current I in the $+\phi$ direction. Using Biot-Savart law, find $\bar{H}(0, 0, Z)$ and $\bar{H}(0, 0, 0)$. [8]

(*b*) State and explain the Scalar and Vector magnetic potential. [8]

SECTION II

7. (*a*) Derive the boundary condition at an interface between two magnetic medium with permeability μ_1 and μ_2. [8]

(*b*) There exists a boundary between two magnetic materials at Z = 0, having permittivities $\mu_1 = 4\mu_0$ H/m for region 1 where Z > 0 and $\mu_2 = 7\mu_0$ H/m for region 2 where Z < 0. There exists a surface current of density $K = 60\hat{a}_x$ A/m at the boundary Z = 0. For a field $B_1 = 2\hat{a}_x - 3\hat{a}_y + 2\hat{a}_z$ mT in region 1. Find the value of flux density (B_2) in region 2. [10]

Or

$\in_{r_2}$ $30\hat{a}_x + 50\hat{a}_y + 70\hat{a}_z$

8. (*a*) Derive the boundary condition for electric field at an interface between conductor and free space. [8]

(*b*) A boundary exists at Z = 0 between two dielectrics $\in_{r_1} = 2.5$ region Z < 0 and = 4 region Z > 0. The field in region of is $E_1 =$ V/m. Find :

(*i*) Normal component of E_1

(*ii*) Tangential component of E_1

(*iii*) The angle $\alpha_1 \leq 90°$ between E_1 and normal to the surface

(*iv*) Normal component of D_2

(*v*) Angle α_2 between E_2 and normal to the surface. [10]

9. (*a*) What is Poynting vector ? What is its significance ? Derive the expression for Poynting vector. [8]

(*b*) In a material for which $\sigma = 5$ /m, $\in_r = 1$, the electric field intensity is $E = 250 \sin(10^{10} t)$ V/m, find the conduction current density and displacement current density for given field. Also find the frequency at which they have equal amplitudes. [8]

Or

10. (*a*) Derive the Maxwell's equation for static electric and magnetic field in integral and differential form. [8]

(*b*) Select the value of K such that each of the following pairs of fields satisfies Maxwell's equation in the region where $\sigma = 0$ and $P_V = 0$:

(*i*) $\bar{E} = (Kx - 100t)\hat{a}_y$ V/m, $\bar{H} = (x + 20t)\hat{a}_z$ A/m, $\mu = 0.25$ H/m, $\in = .01$ F/m.

(*ii*) $\bar{D} = 5x\hat{a}_x - 2y\hat{a}_y + Kz\hat{a}_z$ $\mu C/m^2$, $\bar{B} = 2\hat{a}_y$ mT, $\mu = \mu_0$, $\in = \in_0$. [8]

11. (*a*) Explain with neat figures, finite difference method. [8]

(*b*) Describe the basic concept of the finite element method for solving differential equations and outline the steps involved in its implementation. [8]

Or

12. (*a*) Discuss in detail about method of moments. What are its applications ? [8]

(*b*) A uniform line charge P_l = 5 nC/m, lies along the line x = 0, Z = 1 m in free space. The surface Z = 0 is a perfect conductor.

(*i*) Find electric field intensity E at P(1, 2, 3).

(*ii*) Find potential at P if it is taken zero at origin. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-159

S.E. (Electronics/E&TC) (Second Semester) EXAMINATION, 2012

DATA STRUCTURES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*iii*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain linear search and binary search. [4]

(*b*) Write a program to print major and minor diagonal elements of square matrix. [6]

(*c*) Write output of the following program with explanation : [6]

(*i*)

```
void main( )
{
        int a = 10, b = 20, c, d, e, f;
        c = a & b;
        d = a|b;
        e = ~a;
        f = a >>1;
        printf("Value of c=%d, d=%d, e=%d, f=%d", c,d,e,f);
}
```

(*ii*)

```
void main( )
{
    int a=10, b=20
    Swap(&a,&b);
    printf("a=%d, b=%d", a,b);
}
void Swap(int *x, int*y)
{
    int temp;
    temp = *x;
    *x = *y;
    *y = temp;
    printf("x=%d, y=%d", *x, *y);
}
```

Or

2. (*a*) Write an algorithm for insertion sort and write its complexity. [6]

(*b*) What is recursion ? Write a recursive function to find factorial of a given number. [6]

(*c*) Write output of the following program with explanation : [4]

```
void main( )
{
    int a=1;
    int *p;
    p=&a;
    printf(”%d\n”,a);
    printf(”%u\n”,&a);
    printf(”%d\n”,*p);
    printf(”%u\n”,p);
}
```

3. (*a*) Explain with example parameter passing to functions : [6]

(*i*) By value

(*ii*) By reference.

(*b*) What are unions ? Explain its use. Define a union having an array of characters of size 2, one integer and one float as its elements. [6]

(*c*) How can a polynomial be stored using an array ? Explain with example. [6]

Or

4. (*a*) Explain with example : [6]

(*i*) Static memory allocation

(*ii*) Dynamic memory allocation.

(*b*) Explain bitwise operators with example. [6]

(*c*) What is nested structure ? Explain with example. [6]

5. (*a*) Represent the following polynomial using GLL also explain the node structure in GLL. [8]

$$3x^2y^2z + 8xyz + 5x^2y^2 + 8xyz^2 + 3x^2y^2z^2$$

(*b*) Write a C function for the following operations in DLL : [8]

(*i*) Display the complete list

(*ii*) Search an element in the list.

Or

6. (*a*) What is ADT ? Write array as an ADT. [6]

(*b*) Write a C function to delete alternate nodes in a linked list. [6]

(*c*) Write difference between array and linked list. [4]

SECTION II

7. (*a*) Write C function push and pop to implement stack of characters. [6]

(*b*) Convert the following expression into postfix. Show all the steps : [6]

$$a * b + c - d + e.$$

(*c*) Explain advantages of circular queue over linear queue. [4]

Or

8. (*a*) Write a C function insert and delete to implement queue using array. [6]

(*b*) Evaluate the following postfix expression. Show all steps : [6]

ab * c + d − e + and a = 1, b = 2, c = 3,

d = 4, e = 5

(*c*) What is priority queue ? What are the applications of priority queue ? [4]

9. (*a*) Given the following inorder and postorder traversal construct the binary tree : [6]

Inorder — D B F E G A H I C

Postorder — D F G E B I H C A .

(*b*) What is AVL Tree ? Explain the RR, LL, RL and LR rotations with example. [6]

(*c*) Write a non-recursive C function to search an element in BST. [6]

Or

10. (*a*) What is Threaded Binary Tree ? Explain advantages and disadvantages of Threaded Binary Tree. [6]

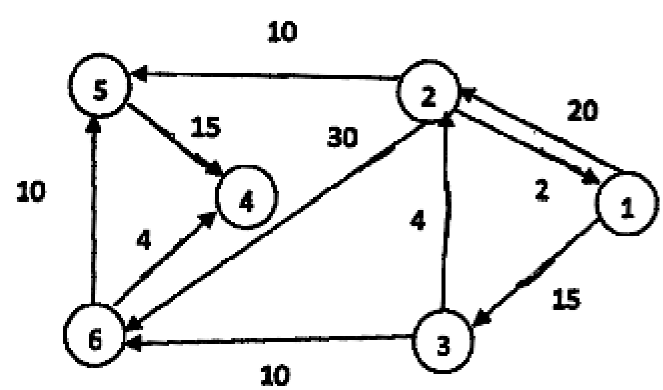
(*b*) Construct BST for the following : [6]

MAR, MAY, NOV, AUG, APR, JAN, DEC,

JUL, FEB, JUN, OCT, SEPT

(*c*) Write and explain non-recursive inorder traversal of Binary Tree. [6]

11. (*a*) For the following construct : [8]



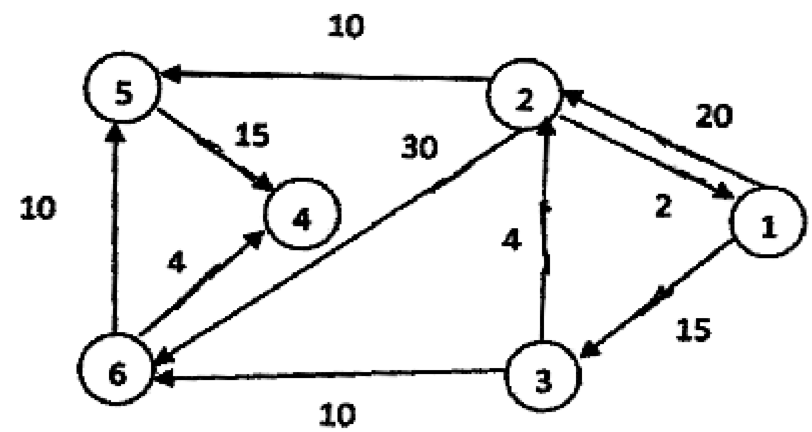
(*i*) Adjacency Matrix

(*ii*) Adjacency List

(*iii*) DFS search

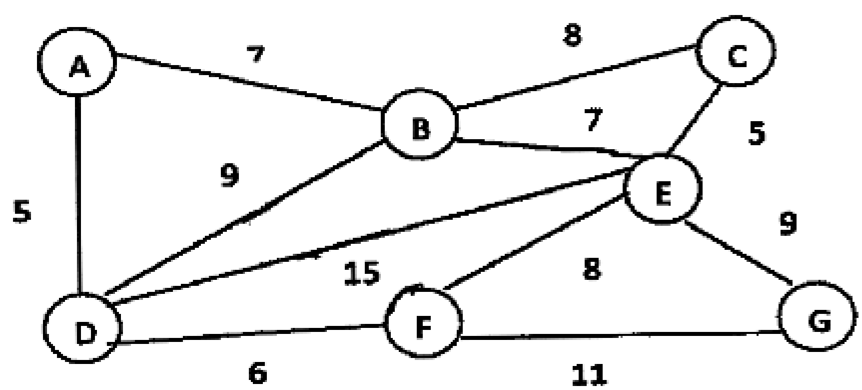
(*iv*) BFS search.

(*b*) Use Dijkstra's algorithm to obtain in non-decreasing order the lengths of the shortest paths from vertex 1 to all remaining vertices in the diagraph. [8]



Or

12. (*a*) Find minimum spanning tree for the following using Prims and Kruskal algorithm. [6]



(*b*) Explain difference between DFS and BFS. [6]

(*c*) Explain the following terms with example : [4]

(*i*) Path

(*ii*) Simple path

(*iii*) Cycle

(*iv*) Loop.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-160

S.E. (Electronics/E&TC) (II Sem.) EXAMINATION, 2012

COMMUNICATION THEORY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Describe VSB (Vestigial Side Band) modulation and its application in detail. [6]

(*b*) Give the equation and draw waveform and spectrum of DSBSC signal for tone modulation. [6]

(*c*) An AM waveform has a form :

$\phi_{AM}(t) = [10(1 + 0.5\cos 2000\pi t + 0.5\cos 4000\pi t) \cdot \cos(20{,}000\pi t)]$.

Find average power content of each spectral component. [6]

Or

2. (*a*) Design a DSBSC modulator to generate a modulated signal $km(t) \cdot \cos \omega_c t$ with the carrier frequency f_c = 300 kHz. The following equipment is available :

(*i*) a signal generator of frequency 100 kHz,

(*ii*) a ring modulator,

(*iii*) a band pass filter tuned to 300 kHz.

Give the block diagram of the modulator. Also find the value of 'k' in $km(t) \cdot \cos \omega_c t$. [8]

(*b*) With the help of block diagram, explain phase shift method of SSB-Generation. State advantages and disadvantages of phase shift method. [6]

(*c*) Determine efficiency and percentage of total power carried by the sidebands of the AM wave for the modulation index = 0.3. Also find the percentage power saving, when transmitted as DSBSC and SSB signal. [4]

3. (*a*) Estimate Bandwidth of FM and PM wave when the modulating signal $m(t)$ is bipolar triangular wave with peak magnitude as 1 V. The period of the signal is 4×10^{-4} s. Also sketch FM and PM waves indicating maximum and minimum frequencies, given that $f_c = 100$ MHz. Assume Bandwidth of $m(t)$ to be the frequency of its third harmonic. Given that $k_f = 2\pi \times 10^5$ and $k_p = 5\pi$. [10]

(*b*) "Phase and frequency modulation are inseparable." Justify the above statement with the help of block diagram and expression. [6]

Or

4. (*a*) Design an Armstrong indirect FM modulator to generate an FM carrier with a carrier frequency of 96 MHz and $\Delta f = 20$ kHz. A narrow band FM generator with $f_c = 200$ kHz and $\Delta f = 10$ Hz, is available. The oscillator is with adjustable frequency in the range 9-10 MHz. A Bandpass filter at any frequency is available and only frequency doublers are available. [10]

(*b*) Derive the equation for Bandwidth of FM wave. Also derive the equation for Bandwidth of NBFM and NBPM. Give their block diagrams. [6]

5. (*a*) Explain with waveforms and block diagram an FM broadcast superhet receiver. [8]

(*b*) A superhet receiver tunes the range from 4 to 10 MHz with an 1F of 1.8 MHz. Find the image frequency range for the receiver. Do any of the image frequency fall in the receiver pass band ? If the RF circuits have a combined Q of 50, find the image frequency rejection ratio. [8]

Or

6. (*a*) Explain the working of Envelope Detector. Distinguish between negative peak clipping and diagonal peak clipping. [6]

(*b*) With the help of equations explain synchronous detection for DSBSC signal. [4]

(*c*) A diode detector load consist of a 0.01 μF capacitor in parallel with a 5 kΩ resistor. Determine the maximum depth of sinusoidal modulation that the detector can handle without diagonal peak clipping when the modulating frequency is :

(*i*) 1000 Hz

(*ii*) 10,000 Hz. [6]

SECTION II

7. (*a*) Derive the Friss formula for noise factor of amplifiers in cascade. [6]

(*b*) Define :

(*i*) Noise temperature

(*ii*) Noise factor

(*iii*) Noise Bandwidth

(*iv*) SNR. [4]

(*c*) An amplifier operating over the frequency range from 450 kHz to 460 kHz has a 100 kΩ input resistor. What is the rms noise voltage at the i/p to this amplifier if the ambient temperature is 17°C. Calculate noise power and power spectral density. [6]

Or

8. (*a*) Explain :

(*i*) Thermal noise

(*ii*) Shot noise. [4]

(*b*) Three amplifiers having the following characteristics :

$F_1 = 9$ dB $G_1 = 48$ dB

$F_2 = 6$ dB $G_2 = 35$ dB

$F_3 = 4$ dB $G_3 = 20$ dB

are connected in tandom. Determine which sequence of combination gives best noise figure referred to the i/p. Calculate overall noise figure. [8]

(*c*) Two resistors of 20 kΩ and 50 kΩ are at room temperature (290 K). For a bandwidth of 100 kHz, calculate the thermal noise voltage generated by :

(*i*) each resistor

(*ii*) two resistors in series

(*iii*) two resistors in parallel. [4]

9. (*a*) Explain the performance of FM system in presence of noise. [8]

(*b*) For a SSB-SC system with channel noise PSD of $S_n(\omega) = 10^{-10}$ and a baseband signal of Bandwidth 4 kHz. The receiver output SNR is required to be at least 30 dB :

(*i*) What must be the signal power received at the receiver input ?

(*ii*) What is Receiver output noise power No. ?

(*iii*) What is the minimum transmitted power S_T if channel transfer function is $H_c(\omega) = 10^{-4}$ over transmission band ? [8]

Or

10. (*a*) Derive SNR at the Receiver for baseband system. Compare its performance with DSB-SC, SSB and AM. [10]

(*b*) If a baseband signal $m(t)$ has a Gaussian PSD, show that PM is superior to FM by a factor of 3 (4.77 dB) when the bandwidth B is taken is 3σ, where σ is the standard deviation of the normalized PSD of $m(t)$. [6]

11. (*a*) Explain in detail principle of Delta Modulation with block schematic and supporting waveforms. [6]

(*b*) Compare PAM, PWM, PPM. [6]

(*c*) Describe with suitable example band-limited and time-limited signal. [6]

Or

12. (*a*) State sampling theorem. Explain aliasing and aperture effect in detail with spectral diagrams. [10]

(*b*) Compare PCM and DM on the basis of :

(*i*) Block diagram

(*ii*) Sampling rate

(*iii*) Bit rate. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-160A

S.E. (E&TC) EXAMINATION, 2012

CONTROL SYSTEMS

(2003 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Solve Q. No. **1** *or* Q. No. **2**.

(*ii*) Solve Q. No. **3** *or* Q. No. **4**.

(*iii*) Solve Q. No. **5** *or* Q. No. **6**.

(*iv*) Solve Q. No. **7** *or* Q. No. **8**.

(*v*) Solve Q. No. **9** *or* Q. No. **10**.

(*vi*) Solve Q. No. **11** *or* Q. No. **12**.

(*vii*) Figures to the right indicate full marks.

(*viii*) Answers to the two Sections should be written in separate answer-books.

(*ix*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Compare :

(*i*) Open and closed loop control systems

(*ii*) Linear and non-linear control systems. [6]

(b) Obtain $\frac{C(s)}{R(s)}$ using block diagram reduction rules. Refer Fig. 1. [10]

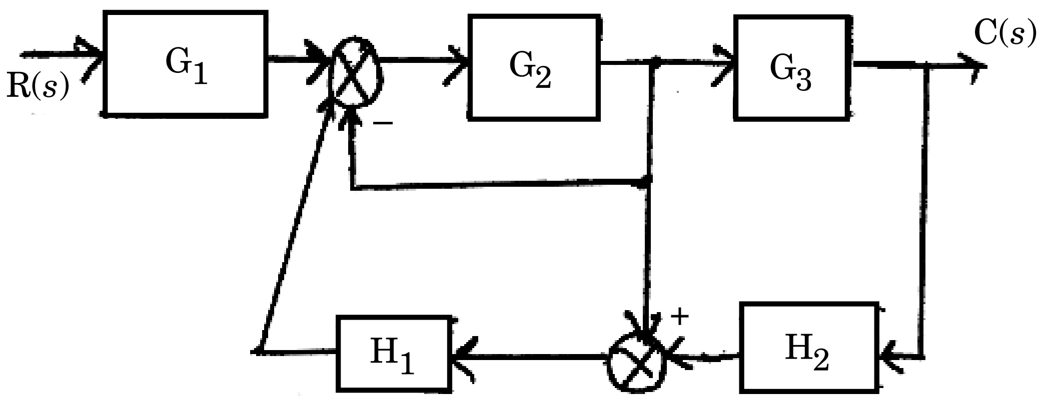


Fig. 1

Or

2. (a) With proper examples explain feedback control system and feedforward control system. [8]

(b) Find the transfer function of the given electrical network using signal flow graph technique. Refer Fig. 2. [8]

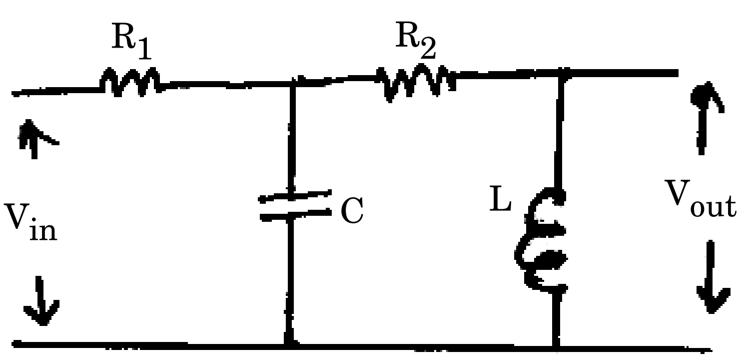


Fig. 2

3. (*a*) Using Routh-Hurwitz criterion, find the stability for the following system whose characteristic equation is given as :

$$s^6 + s^5 + 3s^4 + 3s^3 + 2s^2 + s + 1 = 0.$$

How many roots of this system lie in RHs of s-plane ? [6]

(*b*) The open loop transfer function for unity feedback system is :

$$\frac{K}{s(s+3)(s+6)}$$

Sketch the root locus and determine the value of K for marginal stability and critical damping. [12]

Or

4. (*a*) Write a short note on a standard signals considered for error calculation analysis. [6]

(*b*) Define K_p, K_v, K_a. Derive the formula for each. [6]

(*c*) Find the range of K for the system to be stable :

$$s^3 + 3Ks^2 + (K + 3)s + 4 = 0. \quad [6]$$

5. (*a*) For unity feedback system with open loop transfer function :

$$G(s) = \frac{40(s + 5)}{s(s + 10)(s + 2)}.$$

Determine gain margin, phase margin W_{gc}, W_{pc} using Bode plot. Comment on stability. [12]

(*b*) Sketching the Nyquist path, explain the Nyquist stability criterion. [4]

Or

6. (*a*) Define Gain margin and Phase margin. State their significance. [6]

(*b*) Sketch the Nyquist plot for a system with :

$$G(s)\,H(s) = \frac{10(s + 3)}{s(s - 1)}.$$

Comment on closed loop stability. [10]

SECTION II

7. (*a*) Explain the following :

(*i*) State and State variable.

(*ii*) State vector and State space.

(*iii*) State trajectory.

(*iv*) State transition matrix. [8]

(*b*) Obtain the state transition matrix for the system :

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} -2 & 3 \\ 0 & -3 \end{bmatrix} x(t).$$ [8]

Or

8. (*a*) A feedback system is having closed loop transfer function :

$$\mathrm{T}(s) = \frac{s^3 + 3s + 3}{s^3 + 2s^2 + 3s + 1}.$$

Draw the suitable signal flowgraph. Construct a state model for the system. [10]

(*b*) Define the transition matrix and explain its properties. [6]

9. (*a*) (*i*) Define Transducer. [2]

(*ii*) Explain selection criteria of transducer. [6]

(*b*) Explain working of Photoelectric Tachometer. [8]

Or

10. (*a*) Explain in detail capacitance type level transducer. Explain advantages and disadvantages. [8]

(*b*) What is strain gauge ? What are the different types of strain gauges ? What are their advantages and disadvantages. [8]

11. (*a*) Sketch and comment on output of P, PI, PD and PID controller for a step input. [8]

(*b*) Explain operation of ON-OFF type control system. State its drawbacks and explain how these drawbacks are overcome in continuous controller. [10]

Or

12. Write notes on : [18]

(*i*) Architecture and operating modes of PLC.

(*ii*) Elevator controller using PLC.

(*iii*) Ladder diagram for bottle filling plant.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+1**

Seat No.	

[4262]-160-B

S.E. (Electronics/E&TC) EXAMINATION, 2012

ELECTRONIC CIRCUIT AND APPLICATION

(2003 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain voltage tripler circuit and draw its diagram. [4]

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

(*i*) Clipper

(*ii*) Clamper.

(*c*) Draw and explain CMOS NAND gate. [6]

Or

2. (*a*) Determine output waveform of given circuit (Refer Fig. 1) : [6]

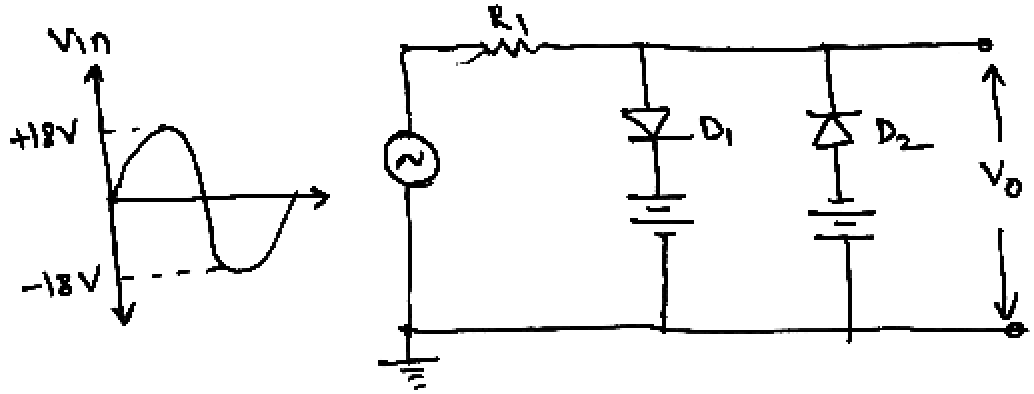


Fig. 1

(*b*) Draw the PSPICE *n*-channel MOSFET model. [6]

(*c*) Explain the effect of frequency on the performance of voltage multiplier circuit. [4]

3. (*a*) Explain the operation of BJT as a switch in display. [6]

(*b*) Write a short note on Snubber circuit for power MOSFET. [6]

(*c*) Explain second breakdown in power transistor. [4]

Or

4. (*a*) Explain with neat diagram anti-saturation control of BJT. [6]

(*b*) The collector junction of transistor dissipates 2 W. The thermal resist from case to air is 20° C/W and junction to case is

8° C/W. The free air temperature is 25°C.

(*i*) What is junction temperature ?

(*ii*) What is case temperature ? [6]

(*c*) Give the comparison between power MOSFET and power BJT. [4]

5. (*a*) Explain operation of transformer coupled class A amplifier with help of D.C. & A.C. load lines. Show that theoretical maximum efficiency of this amplifier is 50%. [8]

(*b*) A sinusoidal signal $V_s = 1.75 \sin (600\ t)$ is fed to power amplifier. The resulting o/p current is :

$I_0 = 15 \sin 600t + 1.5 \sin 1200t + 1.2 \sin 1800t + 0.5 \sin 2400t$

Calculate percentage increase in power due to distortion. [6]

(*c*) Compare class B push-pull and complementary symmetry amplifier. [4]

Or

6. (*a*) A class B push-pull amplifier supplies power to resistive load of 12 Ω. The o/p transformer has turns ratio of 3 : 1 and efficiency of 78.5%, obtain :

(*i*) Maximum power output

(*ii*) Max. power dissipation in each transistor

(*iii*) Max. base and collector current for each transistor.

Assume $h_{fe} = 25$, $V_{cc} = 20$ V. [8]

(*b*) Compare different types of power amplifier based on the following factors :

(*i*) Conduction angle

(*ii*) Position of Q point

(*iii*) Efficiency

(*iv*) Distortion. [6]

(*c*) Explain how even harmonics get eliminated in class B push-pull amplifier. [4]

SECTION II

7. (*a*) Draw the B.J.T. T-model at high frequencies for a Common Base configuration and explain the same. [4]

(*b*) A Single-stage B.J.T. Common-Emitter amplifier gives a voltage gain bandwidth f_H of 2 MHz with a load resistance $R_L = 600\ \Omega$. Assume $h_{fe} = 100$, $g_m = 100$ mA/V, $r_{bb'} = 100\ \Omega$, $C_C = 1$ pF and $f_T = 400$ MHz. Find the value of the source resistance required to give the expected bandwidth. [8]

(*c*) Explain why Stagger Tuning is required. What are its advantages ? [2]

(*d*) What is the effect of Cascading Double Tuned amplifiers on bandwidth ? [2]

Or

8. (*a*) Consider the amplifier shown in Fig. 2 below : [10]

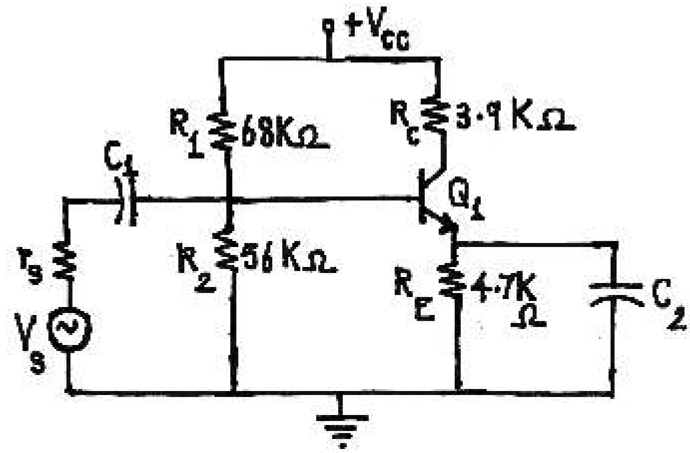


Fig. 2

The B.J.T. Q_1 has the following parameters :

$g_m = 0.2$ A/V, $r_{bb'} = 100\ \Omega$, $r_{b'e} = 1\ k\Omega$, $C_e = 200$ pF, $C_c = 4$ pF, $r_{ce} = 80\ k\Omega$.

Assume that the coupling and bypass capacitors act as perfect short circuits at mid and high frequencies. Draw the hybrid-π equivalent circuit of the amplifier and find :

(*i*) Mid-frequency voltage gain $\left(\dfrac{V_o}{V_s}\right)$

(*ii*) f_β.

(*b*) A Single-Tuned B.J.T. amplifier has an output resistance of 50 kΩ, output capacitance of 15 pF. The input resistance of the next stage is 20 kΩ. The tuned circuit consists of a capacitance of 47 pF in shunt with a series combination of 1 μH inductance and 2 Ω resistance. [4]

Find :

(*i*) Resonant frequency (f_r)

(*ii*) Effective quality factor (Q_{eff})

(*c*) What are the advantages of Double-Tuned amplifier over Single-Tuned amplifier ? [2]

9. (*a*) Consider the feedback amplifier shown in Fig. 3 below : [10]

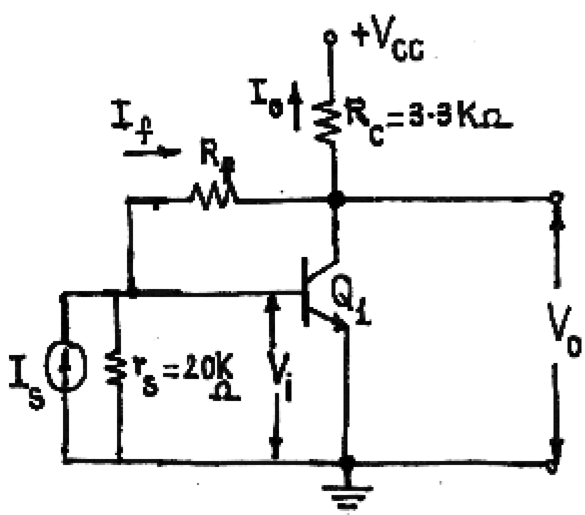


Fig. 3

The B.J.T. Q_1 is having $h_{ie} = 1.2 \text{ k}\Omega$ and $h_{fe} = 80$. Neglect h_{re} and h_{oe}.

(*i*) Identify the feedback topology.

(*ii*) Find the input resistance with feedback

(*iii*) Find the output resistance with feedback.

(*b*) Draw the circuit diagram of a B.J.T. Hartley oscillator. Explain its working. [6]

Or

10. (*a*) Draw the circuit diagram of a B.J.T. Colpitts oscillator. Explain its working. [6]

(*b*) Consider the feedback amplifier shown in Fig. 4 below : [10]

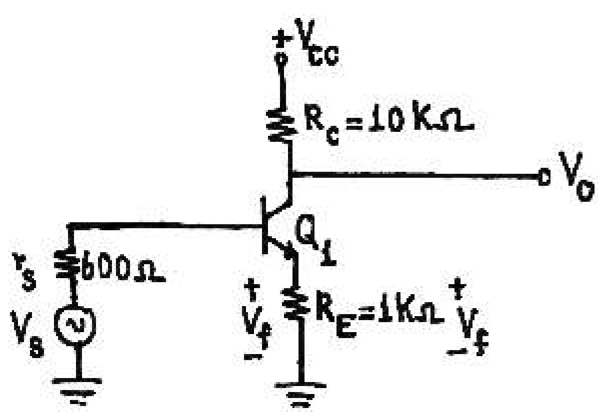


Fig. 4

The B.J.T. Q_1 is having $h_{fe} = 100$ and $h_{ie} = 1 \text{ k}\Omega$.

(*i*) Identify the feedback topology.

(*ii*) Find the input resistance with feedback (R_{if})

(*iii*) Find the transconductance with feedback (G_{Mf})

11. (*a*) For a voltage regulator circuit explain the following mentioned characteristics : [8]

(*i*) Load regulation

(*ii*) Line regulation

(*iii*) Output resistance (R_o)

(*iv*) Temperature stability factor.

(*b*) Consider the Zener diode shunt regulator circuit shown in Fig. 5 below : [6]

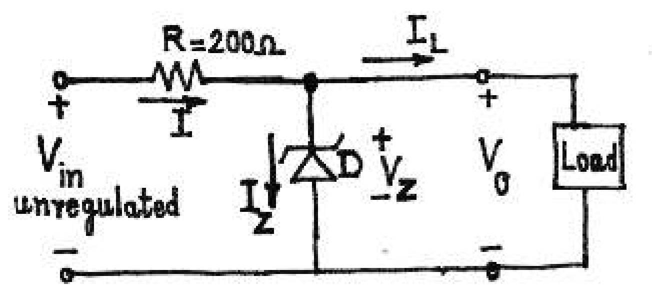


Fig. 5

The Zener diode is having a breakdown voltage of 10 V.

(*i*) Find the unregulated d.c. input voltage ($V_{in\ unregulated}$), when the Zener current I_Z = 15 mA and the load current I_L = 50 mA.

(*ii*) Assuming a constant load, if the input voltage (unregulated) changes to 30 V, find the new Zener current I_Z.

(*c*) Explain the working of a Zener diode shunt regulator. [4]

Or

12. (*a*) Draw the circuit diagram of a B.J.T. series regulator (voltage regulator) and explain its working. [10]

(*b*) Explain how an adjustable positive voltage regulator can be implemented by a three-pin (three-terminal) regulator I.C. LM317, with the relevant circuit diagram. [4]

(*c*) Explain simple current limiting in case of a B.J.T. series regulator with the relevant circuit diagram. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-161

S.E. (Instrumentation & Control)

(First Sem.) EXAMINATION, 2012

FUNDAMENTALS OF INSTRUMENTATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain the basic blocks of Instrumentation system. [10]

(*b*) Define precision. The following set of 10 measurements was recorded during an experiment. Calculate the precision of fourth measurement : [8]

Measurement No.	**Quantity**
1	98
2	102
3	101
4	97
5	100
6	103
7	98
8	106
9	107
10	99

Or

2. (*a*) Define Traceability. The following instruments require calibration. Where should they be calibrated and at what accuracy ? [10]

(*i*) Digital multimeter of 100 ppm accuracy being used by Electronics Regional Test Lab, New Delhi.

(*ii*) Standard resistor of ±1% accuracy being used by BITS, Pilani.

(*iii*) Fluke Voltage Calibrator of 10 ppm accuracy being used by Defence Research Lab, Hyderabad.

(*iv*) K-Type thermocouple of ±1% accuracy being used by Steel Plant, Salem.

(*b*) Explain dynamic characteristics of instruments in detail. [8]

3. (*a*) Explain the construction and working of Electrodynamometer type Wattmeter with neat diagram. [8]

(*b*) The coil of a moving coil voltmeter is 40 mm long and 30 mm wide and has 100 turns on it. The control spring exerts a torque of 240×10^{-6} N-m when the deflection is 100 divisions on full scale. If the flux density of magnetic field in the air gap is 1 Wb/m^2, estimate the resistance that must be put in series with the coil to give 1 V/div. The resistance of the voltmeter coil may be neglected. [8]

Or

4. (*a*) Explain the term 'Standardization' of a DC Potentiometer. Describe the procedure of standardization of a DC Potentiometer. [8]

(*b*) A moving coil ammeter gives full scale deflection with 15 mA and has a resistance of 5 Ω. Calculate the resistance to be connected in :

(*i*) Parallel to enable the instrument to read upto 1 A.

(*ii*) Series to enable it to read up to 10 V. [8]

5. (*a*) Show that the Wheatstone Bridge Sensitivity is directly proportional to applied voltage. [8]

(*b*) A 100 Hz bridge has the following constants :

(*i*) Arm *ab* : $R_1 = 800\ \Omega$ in parallel with $C_1 = 0.5\ \mu F$

(*ii*) Arm *bc* : $R_3 = 1200\ \Omega$ in series with $C_3 = 0.5\ \mu F$

(*iii*) Arm *cd* : $L_4 = 40$ mH in series with $R_4 = 300\ \Omega$.

Find the constant of arm *da* to balance the bridge. Express the result as a pure resistance in series with pure inductance or capacitance. [8]

Or

6. (*a*) Derive an expression to find unknown frequency using Wien Bridge. [8]

(*b*) What are the problems associated with measurement of low resistance ? Explain how these are eliminated in Kelvin Bridge with derivation. [8]

SECTION II

7. (*a*) Explain the working of Digital Multimeter with the help of neat block diagram. What will be the maximum count for 3½ and 4½ digits DMM ? [8]

(*b*) Write a short note on Digital Kilowatt Hour Meter. [8]

Or

8. (*a*) Explain the working of Digital Tachometer with typical specifications. [8]

(*b*) Explain the measurement of Distance using Ultrasonic Principle. [8]

9. (*a*) Explain with waveforms Phase Measurement using CRO in *y-t* and XY mode. [6]

(*b*) What is intensity modulation ? [4]

(*c*) What are the functions of the following controls on CRO front Panel ? Also explain how it is achieved : [8]

(*i*) Intensity

(*ii*) Volt/Div

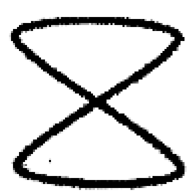
(*iii*) Time/Div

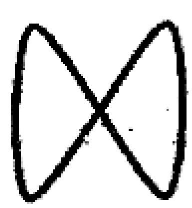
(*iv*) XY mode.

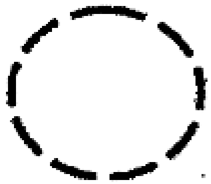
Or

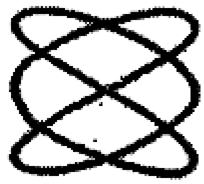
10. (*a*) Explain working of Digital Storage Oscilloscope using block diagram. [8]

(*b*) Calculate the ratio of vertical to horizontal frequencies for an oscilloscope which displays the following Lissajous figures : [4]

(*i*) 

(*ii*) 

(*iii*) 

(*iv*) 

(*c*) Write the standard specifications of Dual Trace Oscilloscope. [6]

11. (*a*) Explain in detail the advantages of Virtual Instrumentation over traditional instruments. [8]

(*b*) What do you mean by the Chart Speed of Strip Chart Recorder ? [4]

(*c*) Write the applications of X-Y recorder. [4]

Or

12. (*a*) Explain the block diagram of function generator in detail. [8]

(*b*) Explain different marking mechanisms used in recorders. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-162

S.E. (Instrumentation and Control Engineering)

(First Sem.) EXAMINATION, 2012

LINEAR INTEGRATED CIRCUITS—I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

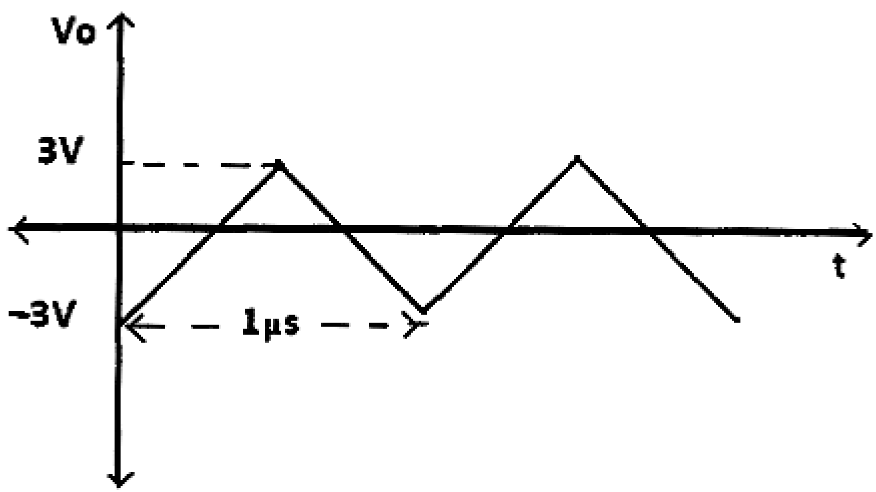
(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) State the assumptions made in the ideal op-amp. Also, explain the implications of these ideal assumptions. [6]

(*b*) A square wave of 1 MHz frequency and 8 V peak to peak amplitude is applied as an input to op-amp voltage follower circuit. The output of voltage follower is as shown in figure. What is the slew rate of op-amp ? Can 741 C op-amp be used in this application ? [8]



(*c*) Explain, why gain of op-amp roll off after certain frequency is reached. [4]

Or

2. (*a*) Define any *five* characteristics of op-amp 741. Write the practical values of the characteristics mentioned in the same. [10]

(*b*) Using a 741 op-amp, what is the break frequency for a non-inverting amplifier with gain of 20 dB ? [6]

(*c*) Draw the high frequency equivalent circuit model of op-amp 741. [2]

3. (*a*) Derive the equation for voltage gain for voltage shunt feedback amplifier. [8]

(*b*) Why open loop op-amp configurations are not used in linear applications ? List out the advantages of negative feedback in amplifier circuits. [6]

(*c*) For the same closed loop gain, the closed loop bandwidth of inverting amplifier is lower than for non-inverting amplifier. State True *or* False. [2]

Or

4. (*a*) Derive the equation for voltage gain for op-amp non-inverting configuration. [8]

(*b*) For a differential amplifier with one op-amp, input resistance is of 1 kΩ and feedback resistance is of 10 kΩ. Calculate output voltage of the circuit where 8.5 V is applied at non-inverting input terminal and 7.0 V is applied inverting input terminal. The supply voltage for circuit is 20 V. Draw the circuit diagram. [8]

5. (*a*) Implement the following equation using op-amp : [10]

$$V_o = 0.1V_1 + V_2 + 10V_3,$$

where, V_1, V_2 and V_3 are inputs and V_o is output of op-amp. Draw the circuit diagram.

(*b*) What are the requirements of good Instrumentation op-amp ? List out any *two* Instrumentation op-amp ICs. [6]

Or

6. (*a*) Explain working of Average Circuit using op-amp for input voltages V_1, V_2 and V_3. [8]

(*b*) State the limitations of basic differentiator. Explain with neat diagram how limitations can be overcome in practical differentiator. [8]

SECTION II

7. (*a*) Design a Wien bridge oscillator for an output frequency of 1 kHz. Draw the circuit diagram. [6]

(*b*) Explain the working of precision full wave rectifier circuit with neat diagram. [10]

(*c*) State the importance of positive feedback in Schmitt trigger circuit. [2]

Or

8. (*a*) Explain the working of precision half wave rectifier circuit with neat diagram. [8]

(*b*) An open loop circuit using op-amp 741 has 6 V peak to peak sine wave input at pin number 3 and 1 V dc signal at pin number 2. The output voltage swing is of ±14 V. Draw the input and output waveforms and also the circuit diagram. [4]

(*c*) Design a Schmitt trigger for the given data :

$$VUT = VLT = 3.5 \text{ V}.$$

Let saturation voltage = ±12 V. [6]

9. (*a*) Explain the working of astable multivibrator using IC555. [8]

(*b*) Define the following terms of voltage regulator ICs with their units : [8]

(*i*) Line regulation

(*ii*) Load regulation

(*iii*) Ripple rejection

(*iv*) Dropout voltage.

Or

10. (*a*) Explain the working of monostable multivibrator using IC555. [8]

(*b*) Explain how square wave can generate using astable multi-vibrator. [4]

(*c*) Write a short note on switching regulator. [4]

11. (*a*) Design an active first order low pass butterworth filter of cut-off frequency 10 kHz. Assume passband gain of 2 and capacitor value as 0.01 μF. Show the calculations and draw the circuit diagram. [10]

(*b*) Compare active and passive filter. [6]

Or

12. (*a*) Draw frequency responses of ideal Low Pass, High Pass and Band Pass and Band Reject filters. [8]

(*b*) Draw practical frequency responses of the above filters. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-163

S.E. (Instrumentation and Control) (I Sem.)

EXAMINATION, 2012

PRINCIPLES OF SENSORS AND TRANSDUCERS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Assume suitable data, if necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) Answer any *three* questions from each Section.

SECTION I

1. Attempt the following :

(*a*) List and explain any *three* different characteristics of measurement system *or* instrument. [5]

(*b*) With neat block diagram explain basic elements of generalized measurement system. [5]

(*c*) What is error ? Explain different types of error and their causes. [8]

Or

2. Attempt the following :

(*a*) Give selection criteria for any transducer. [5]

(*b*) Explain Accuracy and Precision in detail. [5]

(*c*) Define transducer and give its detailed classification. [8]

3. Attempt the following :

(*a*) Explain different types of elastic transducers for measurement of pressure in detail. [8]

(*b*) Explain Gyroscope with neat sketch. [8]

Or

4. Attempt the following :

(*a*) What are the different techniques used for shaft power measurement ? Explain any *one*. [8]

(*b*) With neat sketch explain bimetallic thermometers. [8]

5. Attempt the following :

(*a*) Explain how air bubbler system is used for measurement of density. [8]

(*b*) List different differential type obstruction type flowmeters. Explain Orifice plate in detail with neat sketch. [8]

Or

6. Attempt the following :

(*a*) Explain working and construction details of the Hydrometer. [8]

(*b*) Discuss the working viscosity to displacement converter in detial. [8]

SECTION II

7. Attempt the following :

(*a*) How strain gauge is used for displacement measurement ? Also explain temperature compensation for the same. [8]

(*b*) Explain different types of radiation type transducers for temperature measurement. [8]

Or

8. Attempt the following :

(*a*) With neat diagram explain LVDT in detail and also draw its characteristics. [8]

(*b*) Discuss capacitive type transducer for moisture measurement. [8]

9. Attempt the following :

(*a*) Give working principle and construction details of tachometer with neat sketch. [8]

(*b*) Discuss electromagnetic flowmeter for flow measurement with neat diagram. [8]

Or

10. Attempt the following :

(*a*) Explain Hall-effect transducer with applications. [8]

(*b*) Summarize the different photoelectric transducers and give their applications. [8]

11. Attempt the following :

(*a*) With neat block diagram explain data logger in detail. [9]

(*b*) Discuss self-balancing transducer system with application. [9]

Or

12. Attempt the following :

(*a*) Give details of servo operated transducer system with diagrams. [9]

(*b*) Explain various types of analog and digital readout systems. [9]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-164

S.E. (Instrumentation & Control)

(First Semester) EXAMINATION, 2012

AUTOMATIC CONTROL SYSTEM

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain the concept of Transfer function with its advantages and limitation. Also obtain the Transfer function of R–L–C network shown in Fig. 1. [10]

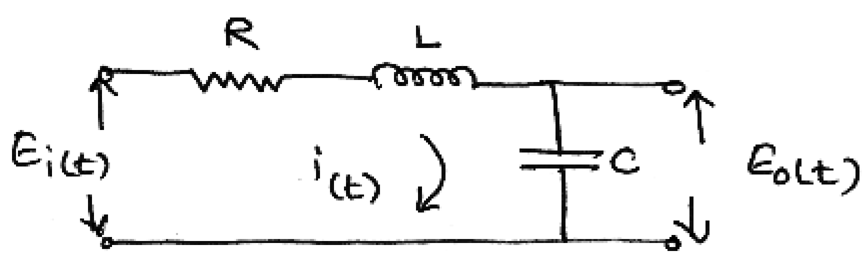


Fig. 1

(*b*) What is Mathematical Modeling of the system ? Also explain the terms :

(*i*) Force to voltage analogy

(*ii*) Force to current analogy. [8]

Or

2. (*a*) Find the Transfer function of given Mechanical system as $Y_2(s)/F(s)$. (Refer Fig. 2) [9]

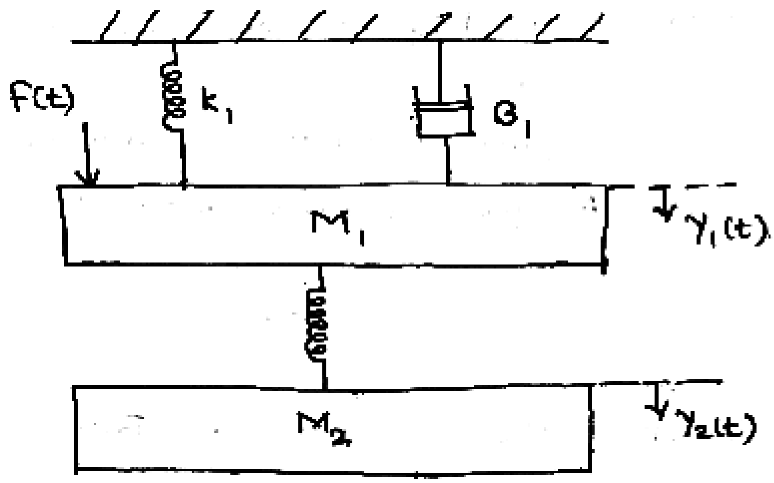


Fig. 2

(*b*) Reduce the block diagram and obtain C(*s*)/R(*s*). (Refer Fig. 3) [9]

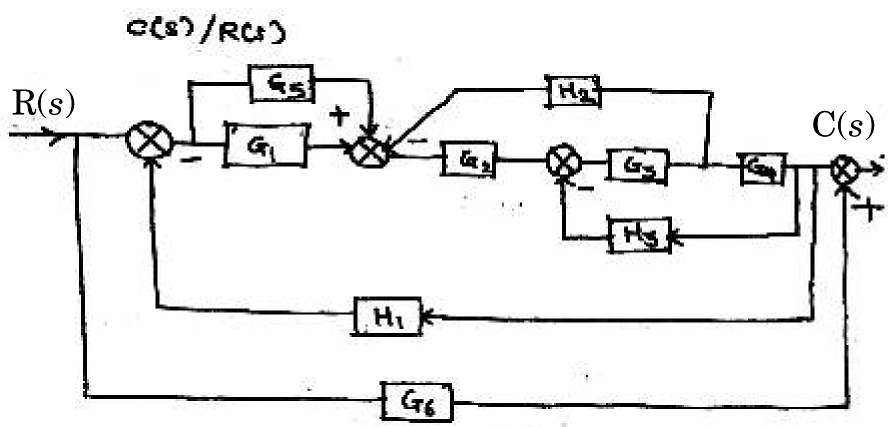


Fig. 3

3. (*a*) What do you mean by control system ? Define the following w.r.t. control system ? [8]

(*i*) Feedback and Feedforward control system

(*ii*) Stable and unstable control system

(*iii*) Linear and Non-linear control system

(*iv*) Time invariant and Time variant control system.

(*b*) Define the following terms with suitable example :

(*i*) Poles of Transfer function

(*ii*) Zeros of Transfer function

(*iii*) Characteristic equation

(*iv*) Order and Type of control system. [8]

Or

4. (*a*) Draw the signal flow graph and find $\frac{C(s)}{R(s)}$ using Mason's gain formula. (Refer Fig. 4) [10]

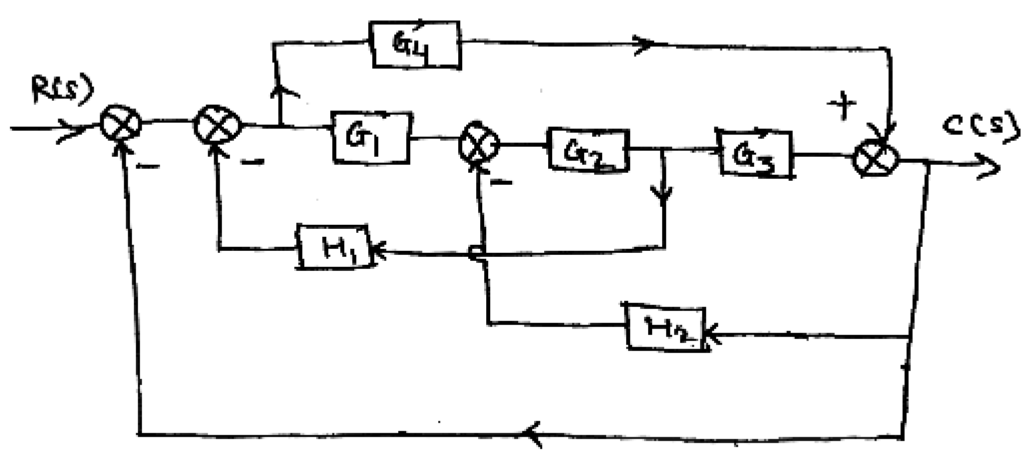


Fig. 4

(*b*) Define the term 'Time Response'. Also give its classification with neat diagram. [6]

5. (*a*) Enlist various frequently used standard test signals. Also give the derivation to obtain k_p, k_v and k_a. [10]

(*b*) Derive the expression for step response of the standard second order system for overdamped case.

Also define the following terms :

(*i*) Damping Ratio

(*ii*) Undamped Natural Frequency of oscillation

(*iii*) Damped frequency of oscillation. [6]

Or

6. (*a*) The unity feedback system has,

$$G(s) = \frac{40(s+2)}{s(s+1)(s+4)}.$$

Determine :

(*i*) Type of the system

(*ii*) All error coefficient

(*iii*) Error for ramp input with magnitude 4. [8]

(*b*) The control system shown in Fig. 5. [8]

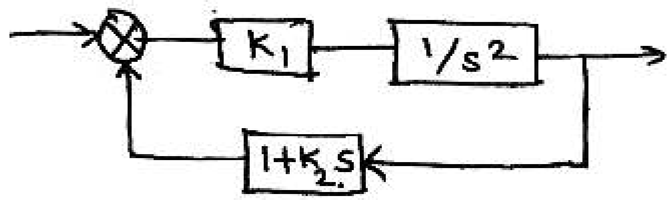


Fig. 5.

Find values of k_1 and k_2 so that

$M_p = 25\%$ and $T_P = 4$ sec. Assume unit step input.

SECTION II

7. (*a*) For the unity feedback system with,

$$G(s) = \frac{k}{(s+1)^3(s+4)}.$$

(*i*) Find the range of k for stability.

(*ii*) Find the frequency of oscillations when system is marginally stable. [10]

(*b*) Define concept of stability. Comment on stability of system whose characteristic equation is,

$$s^5 + s^4 + 2s^3 + 2s^2 + 3s + 5 = 0.$$ [8]

Or

8. (*a*) Sketch the Root locus of the system having,

$$G(s) \cdot H(s) = \frac{k}{s(s^2 + 2s + 2)}$$

and comment on stability.

If there is a addition of pole at $s = -4$ in above system, what will be the effect on system stability ? Explain. [12]

(*b*) Explain the importance of auxiliary equation with suitable example. [6]

9. (*a*) Determine the resonant peak M_r and resonant frequency ω_r for the system whose Transfer function is,

$$\frac{C(s)}{R(s)} = \frac{5}{s^2 + 2s + 5}.$$ [6]

(*b*) A feedback system has,

$$G(s) \cdot H(s) = \frac{100(s + 4)}{s(s + 0.5)(s + 10)}.$$

Draw the Bode plot and comment on stability. [10]

Or

10. (*a*) Discuss the stability of system using Nyquist plot for,

$$G(s) \cdot H(s) = \frac{20}{s(s + 4)(s - 2)}.$$ [10]

(*b*) State and explain Mapping Theorem. [6]

11. (*a*) Define the following : [6]

(*i*) State

(*ii*) State variable

(*iii*) State vector

(*iv*) State space.

(*b*) Obtain the Transfer function of given plant model

$$\dot{x}(t) = A \, . \, x(t) + B \, . \, u(t)$$

$$y(t) = C \, . \, x(t)$$

where,

[10]

$$A = \begin{bmatrix} 0 & -1 & 0 \\ 0 & -1 & 1 \\ 0 & -1 & 10 \end{bmatrix}, \; B = \begin{bmatrix} 0 \\ 1 \\ 10 \end{bmatrix}, \; C = [1 \;\; 0 \;\; 0]$$

Or

12. (*a*) Define various frequency domain specifications. Also co-relate frequency domain specification with time domain specification. [8]

(*b*) Obtain state model using signal flow graph approach of system whose T.F. is

$$\frac{Y(s)}{U(s)} = \frac{5s + 6}{s^2 + 2s + 3}.$$ [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-165

S.E. (Instrumentation & Control) (II Sem.) EXAMINATION, 2012

DIGITAL TECHNIQUES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data if necessary.

SECTION I

1. (*a*) Convert the following : [8]

(*i*) $(37)_{10}$ to binary equivalent

(*ii*) $(214)_{10}$ to Octal

(*iii*) $(111101100)_2$ to Octal

(*iv*) $(1101100010011011)_2$ to Hexadecimal.

(*b*) Perform the following : [4]

Add the Octal numbers $(341)_8$, $(125)_8$, $(472)_8$ and $(577)_8$.

(*c*) Perform the following : [4]

$(69B)_H - (C14)_H$.

Or

2. (*a*) Simplify the following using tabulation method (minterms are given) : [10]

$Y(w, x, y, z) = m_0 + m_2 + m_3 + m_6 + m_7 + m_8 + m_{10} + m_{12} + m_{13}$.

(*b*) Simplify the following using k-map method (minterms are given) : [6]

3. (*a*) Convert the following : [8]

(*i*) SR to JK flip-flop

(*ii*) SR to D flip-flop.

(*b*) Compare RAM, ROM and PROM. [8]

Or

4. (*a*) Convert the following : [8]

(*i*) SR to T flip-flop

(*ii*) T to D flip-flop.

(*b*) Compare EPROM, EEPROM and flash memory. [8]

5. (*a*) Design a non-sequential counter using JK flip-flop for the sequence. Sequence is (0, 4, 7, 2, 3 and 0). [12]

(*b*) Design a 4-bit Ring counter using shift register. [6]

Or

6. (*a*) Compare Ring Counter and Johnson Counter. [6]

(*b*) Compare IC7493 and IC74193. [6]

(*c*) Compare synchronous and asynchronous counter. [6]

SECTION II

7. (*a*) Design 16 : 1 multiplexer using two 8 : 1 multiplexer. [8]

(*b*) Explain use of RBI, RBO, BI, LT pins for IC7447 BCD to seven segment decoder driver. [8]

Or

8. (*a*) Write a short note on PLD. [8]

(*b*) Write a short note on CPLD. [8]

9. (*a*) Write a short note on interfacing of TTL and CMOS IC's. [8]

(*b*) Compare TTL and CMOS with respect to the following : [8]

(*i*) Fan in

(*ii*) Fan out

(*iii*) Propagation delay

(*iv*) Power dissipation.

Or

10. (*a*) What are the different types of TTL outputs ? What are advantages of using TTL Totem pole output ? [8]

(*b*) Compare current sinking and current sourcing. [6]

(*c*) Which IC packages can be plugged into socket ? [2]

11. (*a*) Write a short note on Digital Clock. [9]

(*b*) Design a sequence generator (1101011). [9]

Or

12. (*a*) Write a short note on alarm-annunciator. [9]

(*b*) Design the sequence (0. 7, 5, 3, 10) using IC7476. [9]

Seat No.	

[4262]-166

S.E. (Instru. and Control) (Second Semester) EXAMINATION, 2012

APPLIED ELECTRONICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Your answers will be valued as a whole.

(*vi*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vii*) Assume suitable data, if necessary.

SECTION I

1. (*a*) For the following analog switches, what will be the analog output voltage : [8]

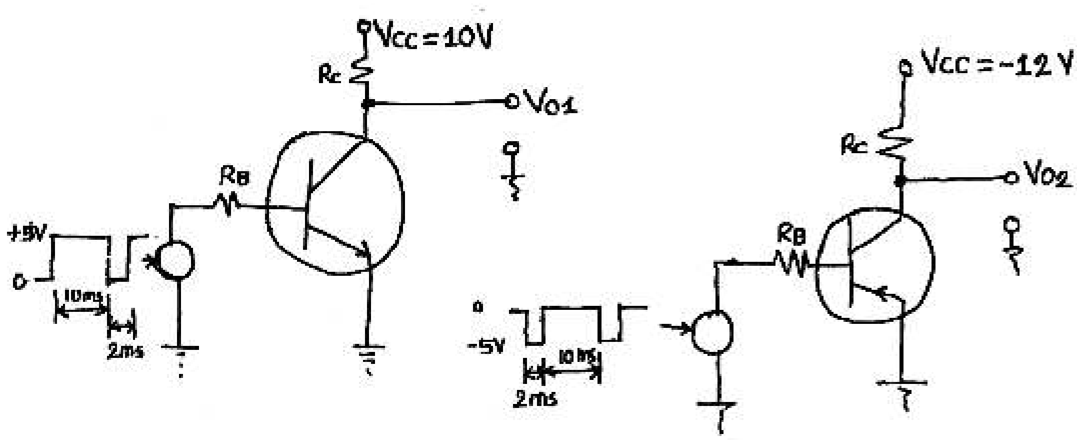


Fig. (a) NPN Switch

Fig. (b) PNP Switch

(*b*) With the help of neat circuit diagram and truth table, how IC 4051 can be used as Analog Multiplexer and Demultiplexer ? [10]

Or

2. (*a*) Draw and explain the block diagram of Digital Ramp type ADC using waveforms. [8]

(*b*) Draw and explain the block diagram of Dual-slope integration type ADC with the help of waveforms. [10]

3. (*a*) Explain the 8-bit binary weighted type DAC, with the help of neat circuit diagram. [8]

(*b*) What will be the analog output voltage of 3-bit binary-weighted type DAC, when the digital input is 101 for the following values of resistor R is equal to 10 kΩ, feedback resistor RF is equal to 1000 Ω, $V_{reference}$ is 5 V. Also draw the circuit diagram. [8]

Or

4. (*a*) Draw and explain 3-bit R-2R ladder type DAC using op-amp circuit. Also write down the output voltage equation. [8]

   (*b*) Find out the analog output voltage for a 4-bit R-2R ladder type DAC, when the digital input is 1010. The value of RF is 10 kΩ and Resistor R is 10 kΩ and reference voltage of 5 V. Also draw the circuit diagram. [8]

5. (*a*) Draw and explain the symbol, construction and characteristics of Silicon Controlled Rectifier. [8]

   (*b*) Draw and explain the working principle of Bidirectional Diode Thyristor with the help of symbol, construction and characteristics. [8]

Or

6. (*a*) How can N-channel E-MOSFET be used as a switch ? Explain with suitable diagram. [8]

   (*b*) Explain the working of TRIAC with the help of symbol, construction and characteristics. [8]

SECTION II

7. (*a*) List out different types of batteries with the help of their electrode material and cell voltage. [8]

   (*b*) Explain the following characteristics of batteries : [10]

   (1) Capacity

   (2) Specific energy

   (3) Charge coefficients

   (4) Gassing voltage

   (5) Self-discharge.

Or

8. (*a*) Explain different charging methods of batteries. [8]

(*b*) Draw and explain with the help of neat circuit diagram adjustable voltage and current regulator charger IC L-200. [10]

9. (*a*) Design voltage to current converter using grounded load techniques for a voltage input of 1 to 5 V and required output current should be 4 – 20 mA. Also draw the circuit diagram. [8]

(*b*) Draw and explain the block diagram of IC 566. [8]

Or

10. (*a*) Design voltage to current converter using floating load techniques for an input voltage of 1 to 10 V and output current should be 4 to 20 mA with the help of neat circuit diagram. [8]

(*b*) Draw and explain the block diagram of IC 4046. [8]

11. (*a*) Explain AM and ASK techniques with the help of neat diagrams. [8]

(*b*) Explain TDM with the help of neat block diagram. [8]

Or

12. (*a*) Explain FM and FSK techniques with the help of neat diagrams. [8]

(*b*) Explain FDM with the help of neat block diagram. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-167

S.E. (Instrumentation & Control) (II Sem.) EXAMINATION, 2012

TRANSDUCERS AND SIGNAL CONDITIONING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Which blocks are required for signal conditioning ? Explain any *three* blocks in detail. [9]

(*b*) Explain optical pyrometer with the help of neat block diagram. [9]

Or

2. (*a*) Discuss with neat circuit diagram how LM 35 can be used in thermocouple signal conditioning circuit for cold junction compensation. [9]

(*b*) Explain different methods to convert resistance into voltage and current with neat sketch. [9]

3. (*a*) Explain charge amplifier in detail. [8]

(*b*) What are the advantages of four arm bridge load cell ? Explain how zero adjustment is done in load cell signal conditioner. [8]

Or

4. (*a*) Explain the working principle of speed pickup along with signal conditioning blocks. [8]

(*b*) Prove that sensitivity increases if we use half and full bridge configuration or quarter bridge configuration. [8]

5. (*a*) With neat sketch discuss the signal conditioning for optical sensor to have voltage as output. [8]

(*b*) Explain the working and signal conditioning of inductive proximity switch. [8]

Or

6. (*a*) Explain stroboscope with neat diagram. [8]

(*b*) What is phase sensitive amplifier/demodulator used for LVDT Signal Conditioner ? Explain the working of same with the help of circuit and timing diagram. [8]

SECTION II

7. (*a*) For certain level measurement system electromechanical level gauge is used to measure level. The output of sensor is 0 to 1 K ohm for the level of 0 to 5 meter design suitable signal conditioning circuit for having output 4 to 20 mA. [9]

(*b*) What technique is used for ultrasonic transducer based level measurement set up ? Explain with neat block schematic. [9]

Or

8. (*a*) Explain the principle of capacitive level sensor ? Explain signal conditioning scheme for the same. [9]

(*b*) What are the advantages of nuclear transducer ? Explain different techniques to measure radiation intensity. [9]

9. (*a*) Explain vertex flow meter with necessary signal conditioning circuit. [8]

(*b*) Expalin turbine flow meter along with necessary signal conditioning schemes. [8]

Or

10. (*a*) Explain principle and signal conditioning scheme of ultrasonic flow meter with the help of block schematic. [8]

(*b*) It is required to measure the flow rate and density of oil flow which sensor can be employed ? Explain it in detail along with signal conditioning blocks. [8]

11. Write short notes on : [16]

(*i*) Piezoelectric microphone

(*ii*) Glass electrode.

Or

12. Write short notes on : [16]

(*i*) Conductivity meter

(*ii*) Vibration measurement.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-168

S.E. (Instrumentation & Control) (II Sem.) EXAMINATION, 2012

PHOTONICS AND INSTRUMENTATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain Snell's law. Calculate the frequency for the wavelength of 50 mm. [6]

(*b*) With suitable diagram, explain scattering and diffraction phenomenon. [6]

(*c*) Draw electromagnetic spectrum showing UV, visible and IR regions with their wavelength ranges expressed in Å. [6]

Or

2. (*a*) Giving the experimental set up for polarization of laser light, explain Malus law. [8]

(*b*) State the relationship between Energy and wavelength of light. Calculate the wavelength of a light having energy of 900 eV and express the same in mm and Å. [10]

3. (*a*) Explain the operating principle, construction, working of gas discharge lamp with neat diagram. [10]

(*b*) Give any *three* radiometric units of a point light source and their equivalent photometric units. [6]

Or

4. (*a*) Classify different types of spectra. Draw the different emission spectra with examples. [8]

(*b*) What do you mean by MSCP and Re-rated MSCP ? For a lamp, rated MSCP and re-rated MSCP are 0.525 and 0.625. If the design voltage is 8 V, calculate the application voltage for the re-rated MSCP condition. [8]

5. (*a*) Estimate the relative population of two energy levels for the light generated with the wavelength of 650 nm at a temperature of 40°C. [6]

(*b*) Write a note on semiconductor laser. Also give its applications. [10]

Or

6. (*a*) Enlist *four* materials used to manufacture LEDs giving their bandgap energy, colour of emission and peak wavelength. [8]

   (*b*) Explain any *four* properties of LASER. [8]

SECTION II

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

   (*a*) Solar cell

   (*b*) CCD

   (*c*) Photomultiplier tube

   (*d*) Phototransistor.

Or

8. (*a*) Compare PN junction photodiode and PIN photodiode. [6]

   (*b*) With neat diagram explain Bolometer. [6]

   (*c*) Give any *three* differences between phototransistor and photomultiplier tubes. [6]

9. (*a*) With ray diagram, explain spherical and aspherical mirrors. [6]

   (*b*) For the measurement of wavelength of laser light with the help of diffraction grating, suggest suitable experimental setup. Also give grating equation. [10]

Or

10. Write short notes on : [16]

   (*a*) Prisms

   (*b*) Beam splitter

   (*c*) Filter

   (*d*) Polarizers.

11. (*a*) Enlist different constructional parts of Abbe's refractometer and mention their functions. [8]

(*b*) Write a note on optical projection system. [8]

Or

12. (*a*) With a neat diagram, explain astronomical telescope. [8]

(*b*) What are the ideal requirements of photographic lenses ? Explain various photographic lenses. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-169

S.E. (Instrumentation & Control) (II Sem.) EXAMINATION, 2012

DRIVES AND CONTROL

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of Logarithmic tables, Slide rule, Mollier charts, Electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) With the help of neat diagram, explain the working principle of D.C. generator. [8]

(*b*) A shunt generator delivers 450 A at 230 V and the resistance of the shunt field and armature are 50 Ω and 0.03 Ω respectively. Calculate the generated emf. [8]

P.T.O.

Or

2. (*a*) Compare generator and motor action with suitable diagrams. [8]

(*b*) Explain in detail the significance of back emf. [8]

3. (*a*) Explain the construction of 3-ϕ induction motor. [8]

(*b*) Explain the necessity of starters in the induction motor. [8]

Or

4. (*a*) Enlist speed control methods of an induction motor. Explain any *one* method. [8]

(*b*) A 4-pole, 3-ϕ induction motor operates from a supply whose frequency is 50 Hz. Calculate : [8]

(*i*) The speed at which magnetic field of the stator is rotating.

(*ii*) The speed of rotor when slip is 0.04.

(*iii*) The frequency of rotor current when slip is 0.03.

(*iv*) The frequency of the rotor currents at standstill.

5. (*a*) What is the step angle of stepper motor ? Explain half-step operation. [9]

(*b*) Explain how synchros are used for error detection ? [9]

Or

6. Write short notes on : [18]

(*a*) A.C. servomotor

(*b*) Permanent magnet stepping motor

(*c*) Universal motor.

SECTION II

7. (*a*) Explain two-transistor model of SCR. [8]

(*b*) Explain an equivalent circuit of UJT. [8]

Or

8. (*a*) Explain in detail construction and operation of TRIAC. [8]

(*b*) Explain in detail construction and operation of IGBT. [8]

9. (*a*) Explain control strategies in D.C. choppers. [8]

(*b*) With a neat diagram, explain the working of full-bridge inverter with resistive load. [8]

Or

10. (*a*) Explain with neat circuit diagram 1-ϕ half-wave controlled rectifier with resistive load. [8]

(*b*) Draw and explain different types of chopper circuits. [8]

11. (*a*) Explain different schemes for D.C. motor speed control. [10]

(*b*) Write a short note on closed loop control of induction motor. [8]

Or

12. Write short notes on : [18]

(*a*) Breaking of induction motor

(*b*) D.C. chopper drive

(*c*) 3-ϕ SCR drive.

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

Seat No.	

[4262]-170

S.E. (Instrumentation & Control) EXAMINATION, 2012

MATERIALS AND PROCESSES FOR SENSORS

(2003 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Discuss the material selection for thermocouple and RTD. [8]

(*b*) What are the requirements of a good conductor material ? Enlist commonly used conductor materials. [8]

Or

2. (*a*) Explain the properties required for strain gauge. [8]

(*b*) Explain the properties and applications of Copper. [8]

3. (*a*) Explain the effect of frequency of dielectric material. [8]

(*b*) Enlist the applications of piezoelectric material. [8]

Or

4. (*a*) Explain the properties of Elastic materials. [8]

(*b*) Explain polarization and magnetostrictive effect. [8]

5. (*a*) Explain the types of Corrosion. [8]

(*b*) What is corrosion rate ? Explain its significance in engineering application. [6]

(*c*) Which are the factors affecting the protectiveness of the oxide film. [4]

Or

6. (*a*) Explain the term service performance of ceramic. [8]

(*b*) Explain properties and uses of the following insulators : [10]

(*i*) Glass

(*ii*) Insulating Resins.

SECTION II

7. (*a*) Discuss effect of temperature on ferromagnetism. [8]

(*b*) Discuss the material selection criteria for LVDT. [8]

Or

8. (*a*) Suggest any *two* materials for the following and justify : [8]

(*i*) Bourdon gauge

(*ii*) Transformer.

(*b*) Give properties and applications of soft magnetic materials. [8]

9. (*a*) What are various requirements of fiber optic materials ? [8]

(*b*) What is meant by biocompatible materials ? Explain their properties. [10]

Or

10. (*a*) Enlist various materials used for Laser and compare the performance of Lasers based on spectral response and optical power. [8]

(*b*) What is radioactivity ? What are various radioactive elements ? Explain various applications of radioactive elements. [10]

11. (*a*) Compare thick and thin film technology. [8]

(*b*) Write a note on types of Stainless Steel. [8]

Or

12. (*a*) What is anodizing ? Explain the setup of anodizing. [8]

(*b*) Write a note on Nanotechnology. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-170A

S.E. (Instrumentation and Control) EXAMINATION, 2012

NETWORK THEORY

(2003 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Using KCL at various, find the value of I_1 shown in Fig. 1. [8]

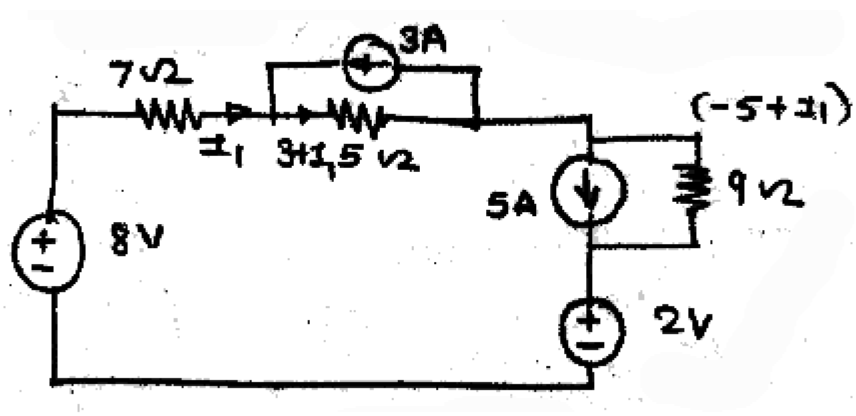


Fig. 1

(*b*) Explain KVL and KCL rules with example. [8]

P.T.O.

Or

2. (*a*) By Mesh Analysis, find the voltage across R in the given network shown in Fig. 2. [8]

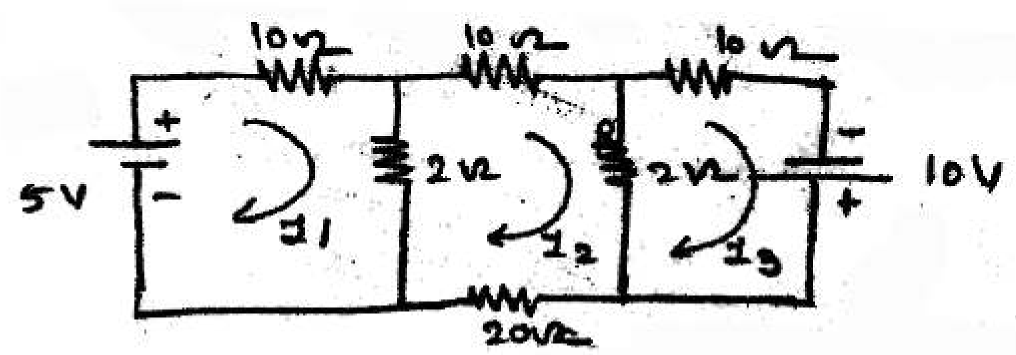


Fig. 2

(*b*) In the given series RL circuit, derive expression for the instantaneous current $i(t)$. Find the voltage across R and L shown in Fig. 3. [8]

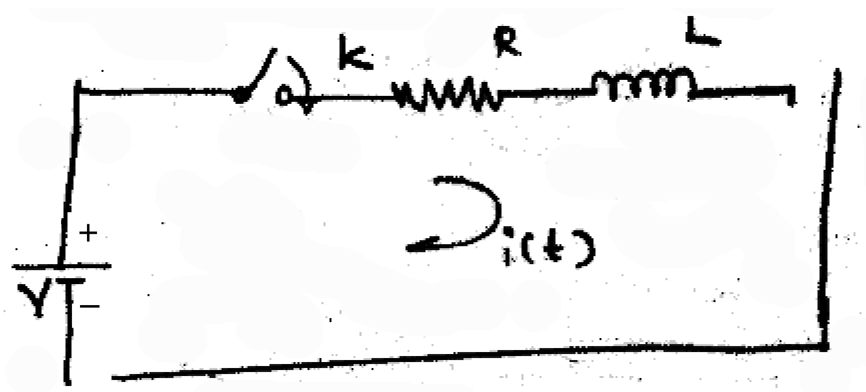


Fig. 3

3. (*a*) The driving point impedance is given by :

$$Z_{LC}(s) = \frac{s\left(s^2 + 4\right)\left(s^2 + 6\right)}{\left(s^2 + 1\right)\left(s^2 + 5\right)}.$$

Obtain the first form of Cauer network. [8]

(*b*) The driving point impedance of a reactive network is given by :

$$Z(s) = \frac{s^4 + 4s^2 + 3}{2s^3 + 3s}.$$

Find the second form of Cauer network. [8]

Or

4. (*a*) Give the properties of driving point impedance. [8]

(*b*) The driving point impedances of a one port reactive network is given by :

$$Z(s) = \frac{4s\left(s^2 + 4\right)}{\left(s^2 + 1\right)\left(s^2 + 16\right)}.$$

Obtain the Foster forms of LC network realisation. [8]

5. (*a*) State and prove Superposition Theorem. [10]

(*b*) Find Norton's equivalent circuit of the given network shown in Fig. 4. Also find power loss in RL. [8]

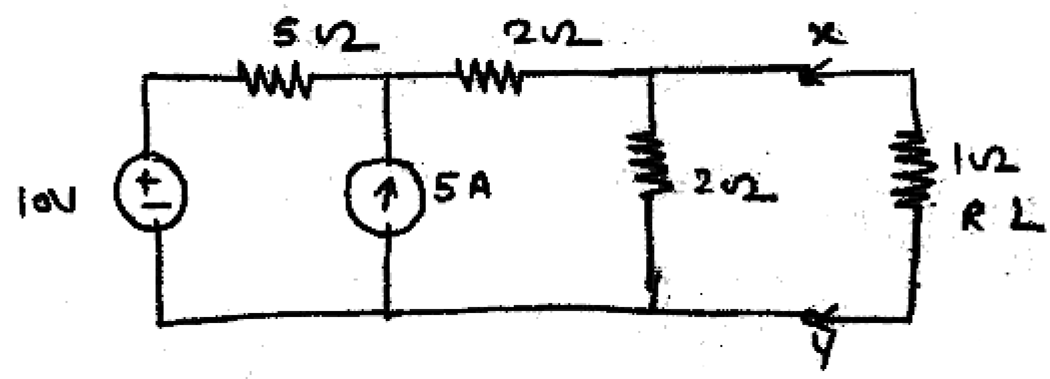


Fig. 4

Or

6. (*a*) State and prove maximum power transfer theorem. [10]

(*b*) Find the current in the 10 Ω resistor using superposition theorem shown in Fig. 5. [8]

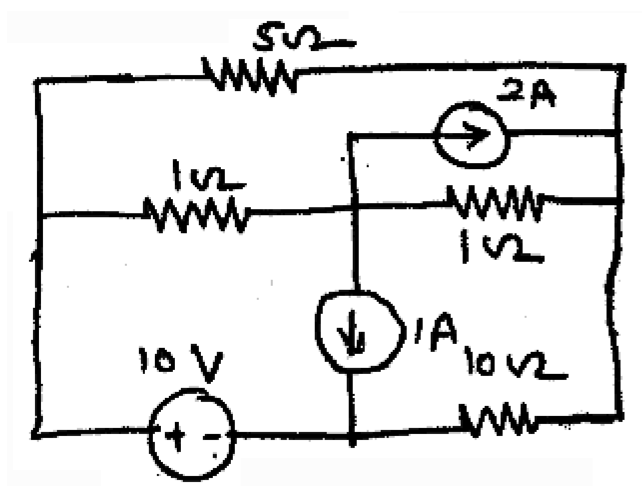


Fig. 5

SECTION II

7. (*a*) Find the driving point admittance of the network shown in Fig. 6. [8]

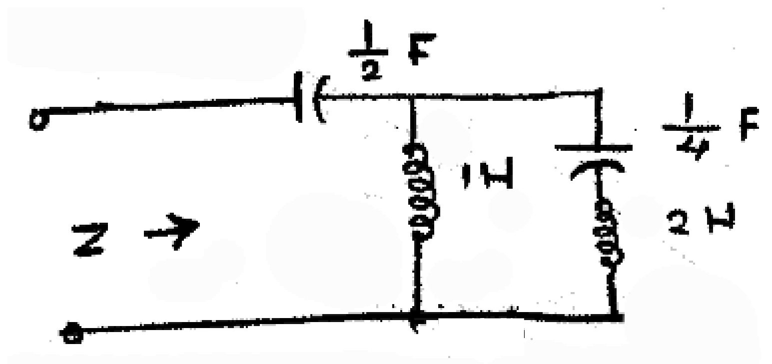


Fig. 6

(*b*) Draw the pole-zero plot of the given network function V(s) and obtain V(t) from the pole zero plot :

$$V(s) = \frac{5s}{(s+5)(s+2)}.$$ [8]

Or

8. (*a*) Define poles and zeros for the network function. Also define various types of network functions. [8]

(*b*) Determine the Network function F(s) if the angle function is :

$$\phi(\omega) = \tan^{-1}\left[\frac{5\omega - \omega^3}{7 - 3\omega^2}\right].$$ [8]

9. (*a*) What is the condition for Reciprocity and prove that $Z_{12} = Z_{21}$ for Z parameter. [8]

(*b*) Define various two-port Network parameters. [8]

Or

10. (*a*) Find transmission parameters of the network shown in Fig. 7. [8]

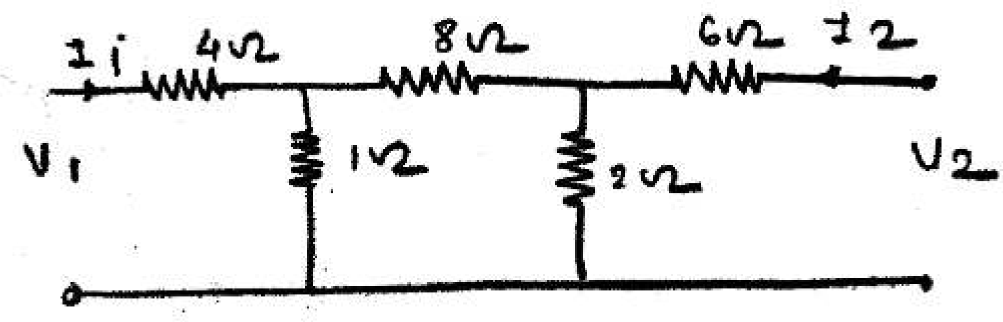


Fig. 7

(*b*) Define H parameter with the help of Network. [8]

11. (*a*) Draw second order Butterworth 10 W pass filter with cut-off frequency of 10 kHz. Draw the necessary circuit using OP-Amp. [10]

(*b*) Design low pass Chebyshev filter with Ripple not more than 2 dB in the pass band having attenuation of 20 dB at $\omega = 4$ rad/sec. [8]

Or

12. (*a*) Convert a high pass filter shown in Fig. 8 into low pass filter with $W_C = 10^6$ rad/sec. RL = 500 Ω. [8]

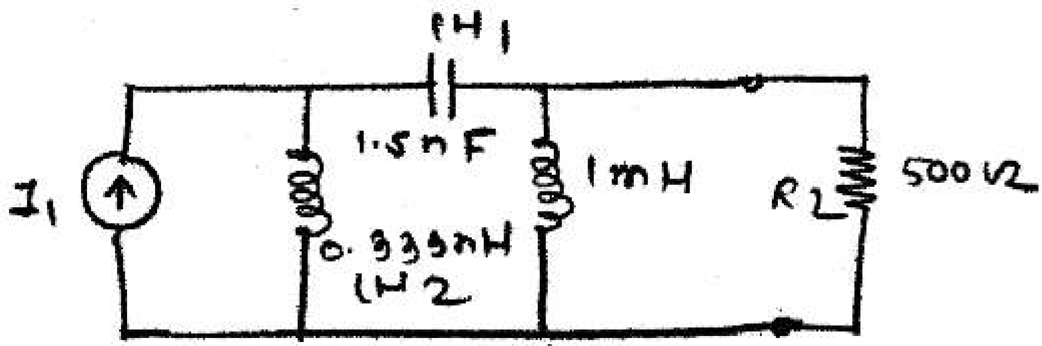


Fig. 8

(*b*) Explain various types of filters. Draw the characteristics for same. [10]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-171

S.E. (Printing) (I Sem.) EXAMINATION, 2012

STRENGTH OF MACHINE ELEMENTS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts and electronic pocket calculator is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define and explain the following terms : [8]

(*i*) Poisson's Ratio

(*ii*) Hooke's Law

(*iii*) Young's Modulus

(*iv*) Shear Modulus.

(*b*) A compound tube is made by shrinking a thin steel tube in a thin brass tube. A_s, A_b be the C/S area and E_s, E_b be the Young's modulus. Show that for any tensile load the extension of compound tube is equal to that of single tube of same length and total C/S area but having Young modulus of $E_s \; A_s + E_b \; A_b/A_s + A_b$. [8]

Or

2. (*a*) Draw stress strain diagram for ductile materials. [8]

(*b*) A steel rod of 3 cm diameter is enclosed centrally in a hollow copper tube of external diameter 5 cm and internal diameter 4 cm. The composite bar is then subjected to axial pull of 45000 N. If the length of each bar is 15 cm, determine :

(*i*) The stress in the rod and the tube

(*ii*) Load carried by each bar

Take E for Steel = 2.1×10^5 N/mm^2 and E for copper = 1.1×10^5 N/mm^2. [8]

3. A cantilever beam AB of length 2 m carries the point loads of 300 N, 500 N, and 800 N at a distance of 0.5 m, 1.2 m and 2 m from end A. It is free at end B. Draw shear force diagram, bending moment diagram. Also indicate the principal value on the diagram. (Refer Fig. 1). [18]

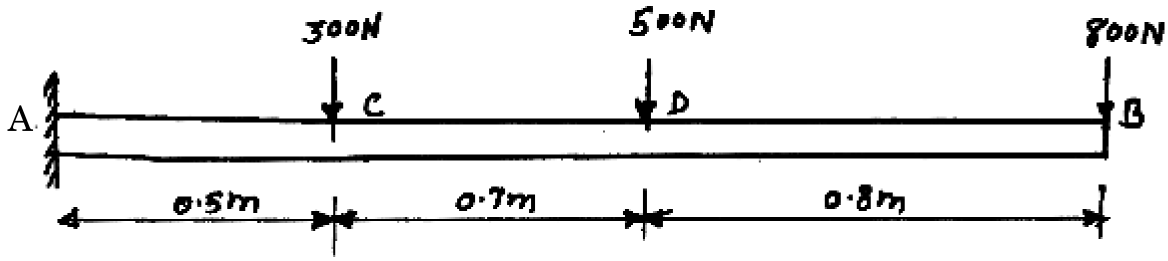


Fig. 1

Or

4. Draw shear force and bending moment diagram for a cantilever beam loaded as shown in Fig. 2. [18]

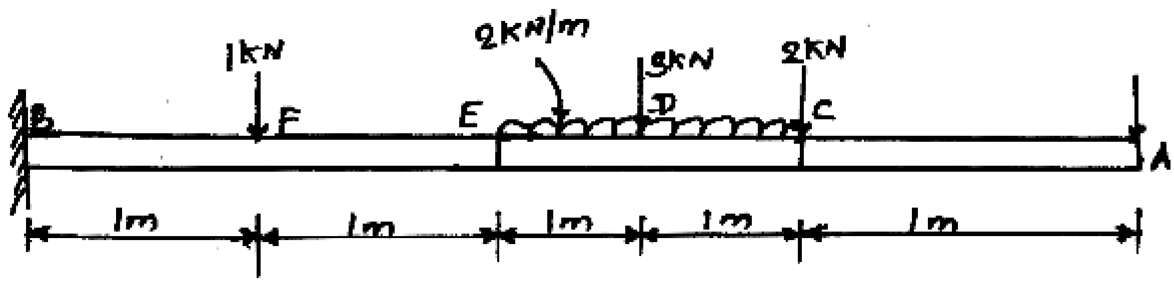


Fig. 2.

5. (*a*) A 250 mm × 150 mm (depth × width) rectangular beam is subjected to maximum bending moment of 750 kN.m.

(*i*) Determine the maximum shear stress in the beam

(*ii*) If the value of E for the beam material is 200 GN/m^2, find Radius for that portion of the beam where bending is maximum. [8]

(*b*) With usual notation derive bending formula. Also state the assumptions made. [8]

Or

6. (*a*) Prove that maximum shear for circular section of a beam is 4/3 times average shear. [8]

(*b*) With usual notation derive shear stress formula. [8]

SECTION II

7. (*a*) A solid circular shaft and a hollow circular shaft whose inside diameter is 3/4 of outside diameter, are of the same material of equal length are required to transmit a given torque. Compare the weights of these two shafts if the maximum shear stress developed in the two shafts are equal. [8]

(*b*) Derive the Torsion formula. Also state the assumption made. [8]

Or

8. (*a*) Compare the crippling load given by Euler and Rankine Formula for a tabular steel strut 2.3 m long having external dia. 38 mm and internal diameter 33 mm. Strut is fixed at one end and hinged at the other end. F_y = 335 MPa. E = 200 GPa, a = 1/7500. [8]

(*b*) Derive an expression for crippling load when one end of column is fixed and other is free. [8]

9. (*a*) Derive an expression for normal and tangential stresses on oblique plane. [8]

(*b*) Explain the procedure for Mohr's circle for determining principal planes and principal stresses. [8]

Or

10. (*a*) A weight of 10 kN falls by 30 mm on a collar attached to a vertical bar 4 m long and 1000 mm^2 in the section. Find instantaneous expansion of the bar. Take E = 210 GPa. Derive the formula you may use. [8]

(*b*) Explain theories of failure. [8]

11. (*a*) An overhanging beam ABC is overhanged at point C. Find the slope over each support at A and B. Find also the maximum upward deflection between the supports and the deflection at the right end.

Take $E = 2 \times 10^5$ N/mm^2 and $I = 5 \times 10^8$ mm^4. [10]

(*b*) Derive an expression for deflection at any section of a simply supported beam with eccentric point load using Macaulay's Method. [8]

Or

12. (*a*) A beam of length 6 m is simply supported at its ends and carries two point loads of 48 kN and 40 kN at a distance 1 m and 3 m respectively from left end. Find :

(*i*) Deflection under each load

(*ii*) Maximum Deflection

(*iii*) The point at which maximum deflection occurs

$E = 2 \times 10^5$ N/mm^2, $I = 85 \times 10^6$ mm^4

Use Macaulay method. [10]

(*b*) Derive the $M = EI d^2y/dx^2$. [8]

Total No. of Questions—**6**]   [Total No. of Printed Pages—**4**

Seat No.	

[4262]-172

S.E. (Printing) (First Semester) EXAMINATION, 2012

BASIC ELEMENTS OF PRINTING TECHNOLOGY

(2008 PATTERN)

Time : Three Hours   **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain 2D and 3D Typefaces. [4]

(*b*) Explain the process of screen stencil preparation methods. [10]

(*c*) Explain the halftone photography. [4]

Or

(*a*) Draw a schematic diagram and explain the working of vertical camera. [10]

(*b*) Draw a typical film structure. [4]

(*c*) Write a short note on DTP technology. [4]

2. (*a*) Write short notes on any *two* : [8]

(*i*) Squeegee shape

(*ii*) Squeegee hardness

(*iii*) Light sensitive material.

(*b*) Explain in detail the Digital printing process. [8]

Or

(*a*) Explain the waterless offset printing process. [8]

(*b*) Draw a schematic diagram of Gravure printing process and explain its working principle. [8]

3. (*a*) List down and explain different finishing techniques. [8]

(*b*) List down the points to be considered while selecting the binding techniques. [8]

Or

(*a*) Explain the following binding techniques (any *two*) : [8]

(*i*) Hard Binding

(*ii*) Soft Binding

(*iii*) Mechanical loose leaf binding.

(*b*) Write short notes on (any *two*) : [8]

(*i*) Spiral Binding

(*ii*) Comb Binding

(*iii*) Wire-O-wire Binding.

SECTION II

4. (*a*) List down and explain the elements of design. [8]

(*b*) Explain in detail the principles of design. [8]

Or

(*a*) Define graphic design. What are the points to be considered while designing any graphic design ? [8]

(*b*) Explain the following divisions of design : [8]

(*i*) Natural design

(*ii*) Conventional design

(*iii*) Decorative design

(*iv*) Geometric design

(*v*) Abstract design.

5. (*a*) Explain the stages of layout with suitable example. [8]

(*b*) Define color. Explain in detail additive and subtractive theory of color with suitable diagram. [8]

Or

(*a*) Explain the dimensions of colour. [6]

(*b*) Write a short note on color symbolism. [6]

(*c*) What is the different color schemes used in graphic design ? [4]

6. (*a*) Explain visualizing 3D effects from 2D effect. [9]

(*b*) Explain the word processing software. State its merits and demerits. [9]

Or

(*a*) List down and explain the native and standard file format used in digital image processing. [6]

(*b*) Write short notes on the following (any *three*) : [12]

(*i*) Image resolution

(*ii*) Screen angle

(*iii*) Digital input devices

(*iv*) Compressed file format

(*v*) Scanner

(*vi*) Vector images and raster images.

Total No. of Questions—**12**]

[Total No. of Printed Pages—**7**

Seat No.	

[4262]-173

S.E. (Printing) (I Sem.) EXAMINATION, 2012

PRINTING DIGITAL ELECTRONICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. Perform the following conversions : [18]

(*i*) $(1263)_{10}$ to BCD, Binary and Octal

(*ii*) $(326)_8$ to decimal, Binary and Excess-3

(*iii*) $(AFB)_{16}$ to Binary, Decimal and BCD.

Or

2. (*a*) Design and draw a circuit for converting 4-bit Binary code to Excess-3 code. Write truth table, draw K-map and its circuit. [10]

(*b*) Write short notes on : [8]

(*i*) Bar code and its applications

(*ii*) ASCII code.

3. (*a*) Using Boolean algebra prove that : [8]

(*i*) $A + \overline{A}B = A + B$

(*ii*) $(A + B).(A + C) = A + BC$

(*b*) The functionality of a hand held machine is expressed as :

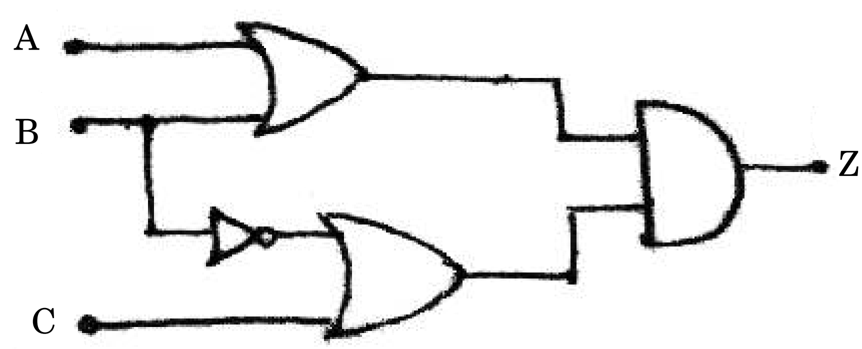
$$f(A, B, C, D) = \sum m(0, 2, 5, 6, 7, 13) + d(8, 10, 15)$$

Minimize using K-map and implement the simplified function using only NAND gates. [8]

Or

4. (*a*) Based on the measurements of three quantities viz. temperature, pressure and volume a decision is to be taken to control a valve connected at point Z in a prototype machine as shown in the following diagram.

Find the Boolean expression for the o/p z. Also tabulate the working of the circuit. [8]



(*b*) Compare TTL, CMOS, and ECL logic families on the basis of the following parameters : [8]

(*i*) Propagation delay

(*ii*) Noise margin

(*iii*) Fan in/Fan out

(*iv*) Power dissipation.

5. (a) Design a full adder using 2 half adders. [4]

(b) Design a half subtractor. [4]

(c) Design a combinational circuit with a 4-bit binary number as input and produces an HIGH output if 2 or more than 2 bits of the number are HIGH. [8]

Or

6. Perform the following operations : [16]

(i) 110011 divided by 11

(ii) Perform BCD addition :

$$(525)_{10} + (525)_{10}$$

and express the result in decimal form.

(iii) Using 2's complement method perform :

$$(156)_{10} - (99)_{10}.$$

(iv) Perform binary addition and express the result in binary :

$$(25)_{10} + (16)_{10}.$$

SECTION II

7. (*a*) Draw and explain clocked RS flip-flop with the help of truth table and timing diagram. [8]

(*b*) Design and explain Mod 2, Mod 3 and Mod 6 counters. Draw timing diagrams. [10]

Or

8. (*a*) Explain 3 modes of operations of shift register IC 7495 using circuit diagram. [8]

(*b*) Design and explain D type flip-flop. [6]

(*c*) Explain the application of counter in paper in printing industry. [4]

9. (*a*) What is DAC ? Explain the working of any *one* type of DAC with a neat diagram. [8]

(*b*) Explain 7 segment LED display. Explain use of decoder driver ICs 7447 and 7448 for LED Display. Draw a neat interfacing diagram. [8]

Or

10. (*a*) Explain PAL and PLA with example. [8]

(*b*) What are memories ? State and explain various types of memories. [8]

11. (*a*) Compare and contrast between Digital Camera and Digital Scanner. [8]

(*b*) Write short notes on (any *two*) : [8]

(*i*) Joystick

(*ii*) Floppy Disk

(*iii*) Keyboard.

Or

12. (*a*) Write short notes on (any *two*) : [8]

(*i*) Printers classification and application

(*ii*) Operation of mouse

(*iii*) Input-Output devices of a computer.

(*b*) State and explain the role of Digital Electronics in the field of printing. [8]

Total No. of Questions—**6**]

[Total No. of Printed Pages—**4**

Seat No.	

[4262]-174

S.E. (Printing) (I Sem.) EXAMINATION, 2012

TECHNOLOGY OF PRINTING MATERIALS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) *All* questions are compulsory.

(*ii*) Assume suitable data, if necessary.

(*iii*) Answers to the two Sections should be written in separate answer-books.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Figures to the right indicate full marks.

SECTION I

1. (*a*) Explain in detail the difference between Gravure printing process and Flexographic printing process along with the schematic diagram. [8]

(*b*) Explain in detail the selection criteria of a metal as an image carrier for Gravure printing process. [8]

Or

(*a*) Explain in detail the difference between Gravure printing process and Offset Lithographic printing process along with the schematic diagram. [8]

(*b*) Explain in detail the selection criteria of a metal as an image carrier for Offset Lithographic printing process. [8]

2. (*a*) Explain the role of various ingredients used in photographic emulsion films. [8]

(*b*) Explain the manufacturing process of Silver halide emulsion films. [8]

Or

(*a*) Explain the role of various ingredients used in fountain solution. [8]

(*b*) Explain in detail the photographic technique of preparing the image carriers for Screen printing process. [8]

3. Explain the type of ink used in Gravure printing process with reference to the following points : [18]

(*a*) General formulation

(*b*) Rheological properties

(*c*) Factors deciding the formulation of an ink.

Or

Explain the type of ink used in Offset printing process with reference to the following points : [18]

(*a*) General formulation

(*b*) Rheological properties

(*c*) Factors deciding the formulation of an ink.

SECTION II

4. (*a*) Explain in detail the significance and method of determining the opacity/transperancy of an ink. [8]

(*b*) Draw a neat diagram of Quadrant scale. Explain the importance of basis weight of paper in printing industry. [8]

Or

(*a*) Explain the significance of determining the dispersion of pigment in an ink and also explain the method of determining the same in brief along with the diagram. [8]

(*b*) Draw a neat diagram of Cobb tester and explain the importance in printing industry. [8]

5. (*a*) State the fibrous material available in nature. Compare the hardwood fibre and softwood fibre with respect to the quality, quantity and cost of paper. [8]

(*b*) State the properties of mechanical, semichemical and chemical pulp with respect to the printing paper. [8]

Or

(*a*) State the qualities of soda pulp, sulphate pulp and sulphite pulp with respect to printing paper. [8]

(*b*) Mention the importance of beating process with the help of graph stating beating time against the strength properties of paper. [8]

6. (*a*) Draw a neat diagram of Uniflow cylinder machine and label the parts. [10]

(*b*) Comment on any *two* : [8]

(*i*) Paper per capita consumption

(*ii*) M.G. finish

(*iii*) Moisture content in paper

(*iv*) Importance of Grain direction in printing

(*v*) BIS standards.

Or

(*a*) State importance of combination of Fourdrinier machine and Multivat cylinder mould machine with line diagram. [10]

(*b*) State the types of fillers used in paper industry with reference to printing. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4262]-175

S.E. (Printing) (II Sem.) EXAMINATION, 2012

ELECTRICAL MACHINES AND UTILIZATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Write short notes on : [8]

(*i*) Armature reaction and

(*ii*) Cummutation

in d.c. machines.

(*b*) A short shunt compound generator supplies a load current of 100 A at 250 V. The generator has the following winding resistances : shunt field 130 Ω, armature 0.1 Ω and the series field 0.1 Ω. Find the e.m.f. generated if the brush drop is 1 V per brush. [8]

Or

2. (*a*) Explain Speed-current and Torque-current characteristics of d.c. motors. [8]

(*b*) A 8 pole Lap wound armature rotated at 350 rpm is required to generate 260 V. The useful flux per pole is 0.05 Wb. If the armature has 120 slots, calculate a suitable number of conductors per slot and hence determine the actual value of flux required to generate the same voltage. [8]

3. (*a*) Derive an expression for rotating magnetic field for synchronous motor. [8]

(*b*) Compare Induction motor and Synchronous motor. [8]

Or

4. (*a*) Explain 'V' and 'Inverted V' curves and their use related to synchronous motor. [8]

(*b*) Explain the following starting methods of 3-phase Induction motors : [8]

(*i*) Auto Transformer Starting

(*ii*) Star-Delta Starting.

5. (*a*) Explain double revolving theory for 1-phase Induction Motor. [10]

(*b*) Explain comparison between individual drive and group drive. [8]

Or

6. (*a*) Explain construction, working and application of a.c. Servo motors with figures. [10]

(*b*) Explain selection of motors depending on load characteristics. [8]

SECTION II

7. (*a*) Explain the reactive power measurement with the help of two wattmeter method. [8]

(*b*) The non-inductive resistance each of 100 Ω are connected in star to a 3-phase 440 V supply. Three identical choke coil connected in delta are also provided from same supply. The reactances of the coils are equal to 100 Ω each. Find the line current and power factor of the system. [8]

Or

8. (*a*) Write a short note on electric encoders and proximity switches. [8]

(*b*) A three-phase 440 V, 50 Hz supply is connected inductive load and synchronous motor. The impedance of each phase of the load is $(1.25 + j\,2.17)$ Ω. The three-phase synchronous motor is over-excited and draws a current of 120 A at 0.87 leading power factor. Calculate :

(*i*) Total active power and

(*ii*) Total reactive power drawn from supply. [8]

9. (*a*) What do you mean by furnace heat ? Explain in detail. [8]

(*b*) Explain applications of dielectric heating in detail. [8]

Or

10. (*a*) Explain in detail temperature control methods for furnace heating. [8]

(*b*) Explain arc heating method in detail. [8]

11. (*a*) Explain flood lighting scheme in detail. [8]

(*b*) Explain energy conservation methods used in printing industry in detail. [10]

Or

12. (*a*) Explain types of lighting schemes used in printing industry. [8]

(*b*) Explain safety precautions used in printing industry. [10]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-178

S.E. (Printing) (II Sem.) EXAMINATION, 2012

MICROPROCESSOR AND MICROCONTROLLER TECHNIQUES IN PRINTING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Differentiate between the following in 8085 microprocessor : [10]

(*i*) I/O mapped I/O and memory mapped I/O

(*ii*) Software and hardware interrupts.

(*b*) Explain working of multiplexed address and data bus AD0-AD7 with example in 8085 microprocessor. [8]

Or

2. (*a*) Draw and explain the block diagram of 8085 microprocessor in detail. [10]

(*b*) Explain 3:8 decoder IC 74138. [8]

3. (*a*) Explain with example all events taking place when 'CALL' instruction executed in 8085 microprocessor. [8]

(*b*) Write a program to exchange 8 bytes stored at locations 2000-2007 and 3000-3007 in memory in 8085 microprocessor. [8]

Or

4. (*a*) Explain all addition and subtraction instructions in 8085 microprocessor. [12]

(*b*) Explain concept of stack memory in 8085 microprocessor. [4]

5. (*a*) Draw pin diagram of 8051 microcontroller and explain different pins in detail. [10]

(*b*) Explain TCON (Timer Control Register) in 8051 microcontroller. [6]

Or

6. (*a*) Explain memory organization in 8051 microcontroller. [8]

(*b*) Explain program status word (PSW) in 8051 microcontroller. [8]

SECTION II

7. (*a*) Explain different addressing modes in 8051 microcontroller with example. [12]

(*b*) Explain the following instructions in 8051 microcontroller with example : [6]

(*i*) DA

(*ii*) ADD A, @Rn.

Or

8. (*a*) Explain the following instructions in 8051 (any *five*) : [10]

(*i*) MOV A, Rn

(*ii*) MUL AB

(*iii*) DIV AB

(*iv*) SWAP A

(*v*) MOV A, data

(*vi*) MOV A, @A+DPTR.

(*b*) Write short notes on : [8]

(*i*) RS 232

(*ii*) IEEE 488.

9. (*a*) Draw and explain block diagram of programmable peripheral device 8255. [10]

(*b*) Explain control word in programmable interval timer IC 8253. [6]

Or

10. (*a*) Draw and explain block diagram of interrupt controller IC 8259. [10]

(*b*) Explain transmitter section of programmable communication interface IC 8251. [6]

11. (*a*) Explain any *one* application of microprocessor 8085 in field of printing. [8]

(*b*) Write program for stepper motor interface with 8085 microprocessor. [8]

Or

12. (*a*) Explain concept of PLC (Programmable logic controller). [8]

(*b*) Explain use of PLC in field of printing. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-179

S.E. (Printing) (II Sem.) EXAMINATION, 2012

THEORY OF PRINTING MACHINES

(2008 PATTERN)

Time : Four Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

UNIT I

1. (*a*) What do you mean by degree of freedom of a kinematic pair ? How are pairs classified ? Give examples. [6]

(*b*) State and explain the inversions of double slider crank chain. [10]

Or

2. (*a*) Define : [6]

(*i*) Kinematic link

(*ii*) Kinematic pair

(*iii*) Inversion

(*iv*) Structure

(*v*) Mechanism

(*vi*) Machine.

(*b*) With neat sketch state and explain Geneva mechanism and give its practical applications. [6]

(*c*) Draw a neat sketch of Ratchet and Pawl arrangement and state its applications. [4]

UNIT II

3. (*a*) What is velocity image ? State why it is known as a helpful device in the velocity analysis of complicated linkages. [4]

(*b*) In the mechanism shown in Fig. 1 the crank OA rotates at 210 rpm clockwise. For the given configuration, determine the acceleration of the slider D and angular acceleration of the link CD. [12]

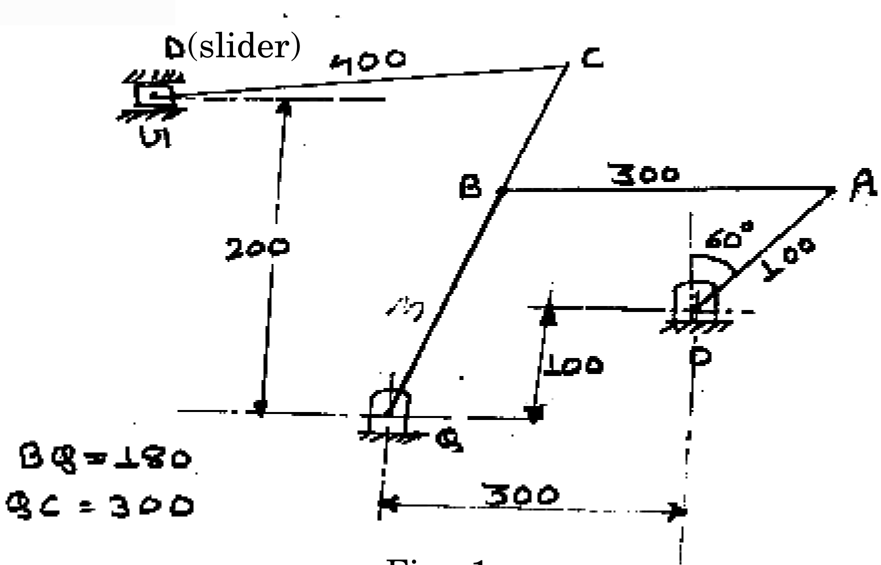


Fig. 1

All dimensions are in mm.

Or

4. (*a*) What are centripetal and tangential components of acceleration ? [4]

(*b*) In the toggle mechanism shown in Fig. 2, the crank OA rotates at 210 rpm counter-clockwise increasing at the rate of 60 rad/s^2. For the given configuration, determine :

(*i*) Velocity of slider D and the angular velocity of link BD

(*ii*) Acceleration of slider D and the angular acceleration of link BD. [12]

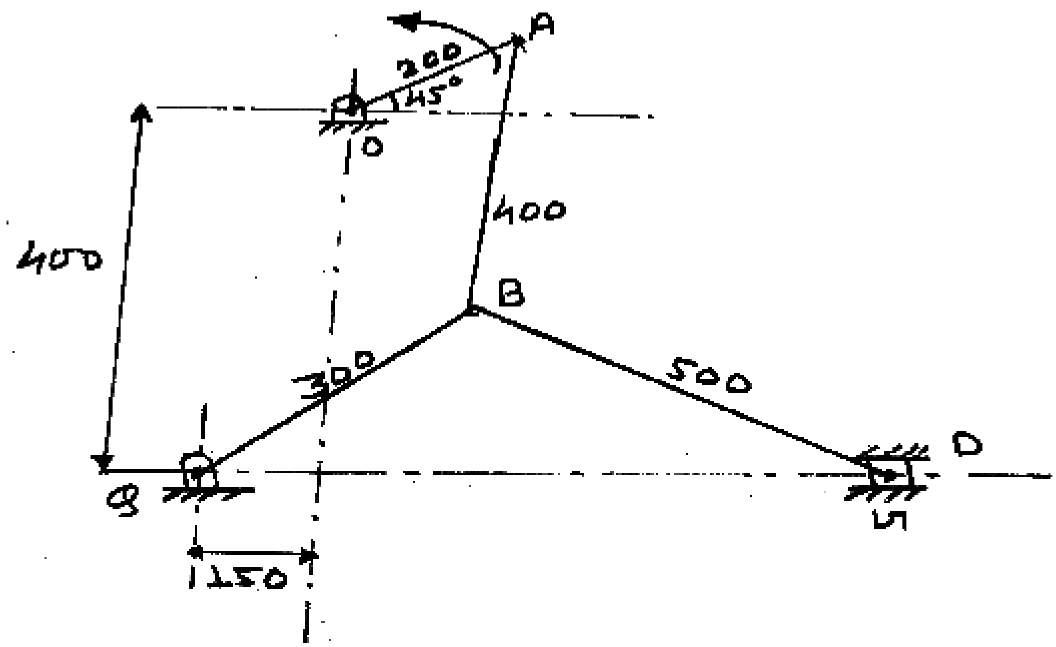


Fig. 2

All dimensions are in mm.

UNIT III

5. As shown in Fig 3, a crank OA, 100 mm long rotates clockwise at 100 rpm. Rod AC, 500 mm long slides in a swivelling pin at B. The end C slides on a swinging link DE. When the angle BOA is 120°, find the angular velocity and angular acceleration of DE. [18]

OA = 100 mm

AC = 500 mm

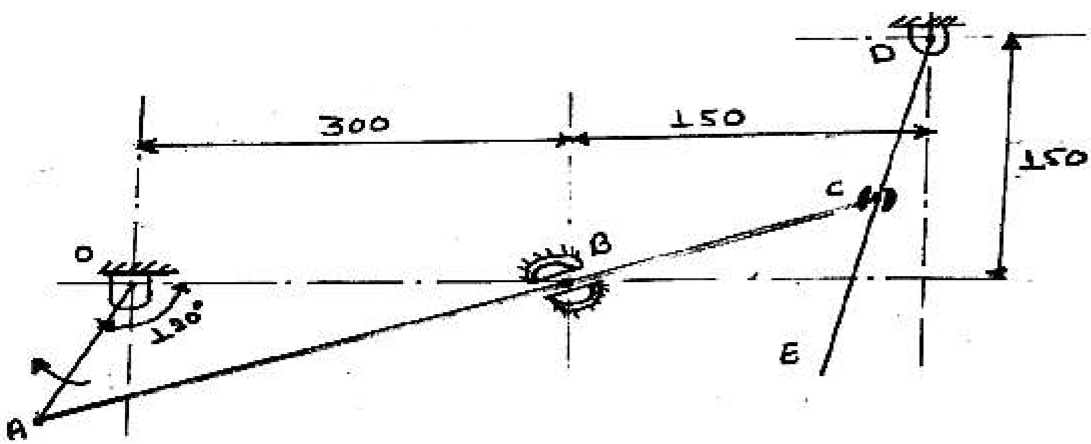


Fig. 3

All dimensions are in mm.

Or

6. The drawing crank OA rotates at 120 rpm in the clockwise direction for the position of the mechanism shown in Fig 4.

Determine the following :

(*i*) The velocity and acceleration of slider D.

(*ii*) The sliding velocity and sliding acceleration of slider A.

The various dimensions are as follows :

OA = 80 mm, OQ = 40 mm, QC = 60 mm, CD = 200 mm. [18]

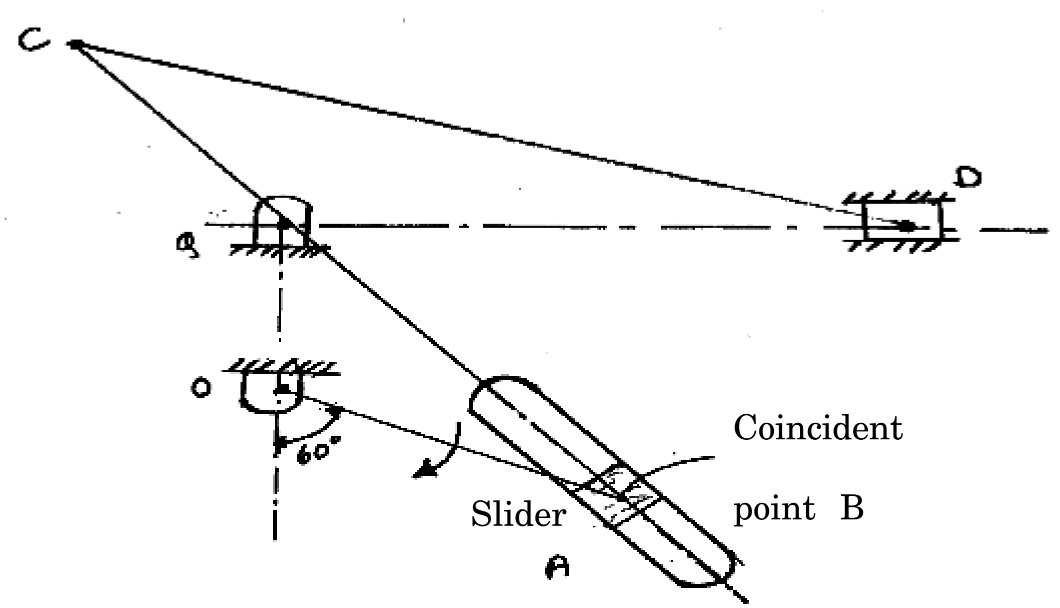


Fig. 4

SECTION II

UNIT IV

7. (*a*) Explain the working of cone clutch with neat sketch. Also state its applications. [8]

(*b*) Differentiate between hydrostatic and hydrodynamic lubrication. Draw relevant sketches. [8]

Or

8. (*a*) Derive the expression for torque transmitting capacity of a single plate clutch with : [8]

(*i*) Uniform Wear Theory

(*ii*) Uniform Pressure Theory.

(*b*) Explain the working of centrifugal clutch with neat sketch. Also state its applications. [8]

UNIT V

9. (*a*) What are various types of brakes ? Describe briefly. [8]

(*b*) A band and block brake is lined with 14 blocks, each subtending an angle of 14 at the drum center. The drum is 500 mm in diameter and the radial thickness of the block is 50 mm. The coefficient of friction between the block and drum is 0.35. The two ends of the band are attached to pins on opposite side of fulcrum of brake-lever at distance of 200 mm and 40 mm respectively. Find the least force required to be applied at the end of the brake-lever at a distance of 500 mm from fulcrum to absorb 75 kW at 500 rpm. [8]

Or

10. (*a*) A simple band brake is operated by a lever 0.5 m long. The brake drum diameter 0.5 m and the band encircles five-eighth of the drum circumference. One end of the band is attached to the fulcrum of the lever while the other end of it is attached at a point on the lever 100 mm from the fulcrum. Determine the maximum braking torque on the brake drum when an effort of 400 N is applied at free end of the lever. Take coefficient of friction between the band and the drum as 0.3. [10]

(*b*) Explain with neat sketch self energizing of brakes. [6]

UNIT VI

11. (*a*) Classify belt drives. [8]

(*b*) Write short notes on : [4+3+3]

(*i*) Law of belting

(*ii*) Initial tension in belt

(*iii*) Difference between slip and creep.

Or

12. (*a*) A flat belt of mass 1.2 kg/m is used to connect two pulleys of 1.5 m diameter each and shafts are parallel. Slipping is found to be at 325 rpm when resisting moment of driven shaft is 1150 N-m. When speed is lowered to 210 rpm the resisting moment on driven shaft is 1465 N-m for slipping. Assuming that belt is obeys Hooke's law and initial tension is constant, find coefficient of friction between belt and pulley. [10]

(*b*) Derive the expression length of belt for open belt drive. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-181

S.E. (Chemical/Printing/Poly/Petroleum/Petro-chemical)

(First Semester) EXAMINATION, 2012

ENGINEERING MATHEMATICS—III

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of electronic pocket calculator is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Solve any *three* : [12]

(*i*) $(D^2 - 4)y = e^{2x} \sin x$

(*ii*) $(D^2 + 2D + 1)y = (1 + e^x)^{-2}$

P.T.O.

(*iii*) $(D^3 + 3D^2 - 4)y = 6e^{-2x} + 4x^2$

(*iv*) $\dfrac{d^2y}{dx^2} + y = \sec x \tan x$

(be method of variation of parameters).

(*v*) $(4x + 1)^2 \dfrac{d^2y}{dx^2} + 2(4x + 1) \dfrac{dy}{dx} + y = 2x + 1.$

(*b*) Solve : [5]

$$\frac{dx}{y+z} = \frac{dy}{z+x} = \frac{dz}{x+y}.$$

Or

2. (*a*) Solve any *three* : [12]

(*i*) $(D^2 + 2D + 5)y = \cos^2 x$

(*ii*) $(D^2 + 4D + 4)y = \dfrac{e^{-2x}}{x+2}$

(*iii*) $\dfrac{d^3y}{dx^3} - \dfrac{d^2y}{dx^2} = 3x + xe^x$

(*iv*) $x^2 \dfrac{d^2y}{dx^2} + x \dfrac{dy}{dx} + y = \sin(\log x^2)$

(*v*) $(D^2 + 4)y = 4 \sec^2 2x$

(by method of variation of parameters).

(*b*) Solve the following system of simultaneous equations : [5]

$$\frac{dx}{dt} - 2x - y = 0$$

$$\frac{dy}{dt} + x - 4y = 0.$$

3. (*a*) A 1.5 kg weight on a spring stretches it 15 cm. When equilibrium is reached the weight is struck so as to give it a downward velocity of 60 cm/sec. Find : [8]

(*i*) The velocity and position of the weight at time t seconds, after the impact.

(*ii*) The velocity and acceleration when the weight is 2.5 cm from the equilibrium position and moving upward.

(*b*) A string of length l fixed at its ends satisfies the wave equation $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$. Find the solution if the string has initial triangular deflection given by :

$$y(x, 0) = \begin{cases} \frac{2k}{l}x, & 0 \leq x \leq \frac{l}{2} \\ \frac{2k}{l}(l - x), & \frac{l}{2} \leq x \leq l \end{cases}$$

and initial velocity is zero. [8]

Or

4. (*a*) The following equations appear in a chemical reaction, involving certain substances :

$$\frac{dx}{dt} = my,$$

$$\frac{dz}{dt} + lz = 0,$$

$$x + y - z = n$$

where l, m, n are constants.

If $x = \frac{dx}{dt} = 0$ at $t = 0$, find the solution for x as a function of time t. [8]

(b) Solve the one-dimensional equation $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$ for function $u(x, t)$, subject to the following conditions : [8]

(i) $u(0, t) = 0$

(ii) $u(l, t) = 0$, for all t

(iii) $u(x, 0) = \frac{u_0 x}{l}$, $0 \le x \le l$

(iv) $u(x, \infty)$ is finite.

5. (a) Find the Fourier transform of the function : [6]

$$f(x) = \begin{cases} \frac{\pi}{2} \cos x, & |x| \le \pi \\ 0, & |x| > \pi \end{cases}.$$

(b) Using Fourier integral representation, show that : [6]

$$\int_0^\infty \frac{\sin \lambda \cos \lambda x}{\lambda} \, d\lambda = \begin{cases} \frac{\pi}{2}, & 0 \le x < 1 \\ \frac{\pi}{4}, & x = 1 \\ 0, & x > 1 \end{cases}.$$

(c) Find the function whose cosine transform is $e^{-\lambda}, \lambda > 0$. [5]

Or

6. (a) Find the Fourier sine transform of : [5]

$$f(x) = \begin{cases} \sin x, & 0 \le x < \pi \\ 0, & x \ge \pi \end{cases}.$$

(*b*) Find the Fourier cosine transform of $f(x) = e^{-x}$ and hence show that : [5]

$$\int_0^{\infty} \frac{\cos mx}{1 + x^2}\, dx = \frac{\pi}{2} e^{-m}.$$

(*c*) Use finite Fourier cosine transform to solve the equation : [7]

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \quad 0 < x < 1, \quad t > 0.$$

Subject to the boundary conditions :

(*i*) $u_x(0, t) = u_x(1, t) = 0, \quad t > 0$

(*ii*) $u(x, 0) = x, \; 0 < x < 1.$

SECTION II

7. (*a*) Obtain Laplace transform of (any *three*) : [12]

(*i*) $te^{-2t}\, u(t-1) - \cosh t\; \delta(t-4)$

(*ii*) $\displaystyle\int_0^t \frac{e^{-4t} \sin 3t}{t}\, dt$

(*iii*) $f(t) = \begin{cases} t, & 0 < t < 1 \\ 0, & 1 < t < 2 \end{cases}$ and $f(t+2) = f(t)$

(*iv*) $\dfrac{1}{2} crt\left(2\sqrt{t}\right).$

(*b*) Using Laplace transform, evaluate : [4]

$$\int_0^{\infty} \frac{\cos 3t - \cos 2t}{t}\, dt.$$

Or

8. (*a*) Obtain Inverse Laplace transform of (any *three*) : [12]

(*i*) $$\frac{3s+1}{(s-1)(s^2+1)}$$

(*ii*) $$\log\left(\frac{s+3}{s+2}\right)$$

(*iii*) $$\frac{(s+2)^2}{(s^2+4s+8)^2}$$

(*iv*) $$e^{-\pi/2^s}\frac{s+7}{s^2+2s+2}.$$

(*b*) Use convolution theorem to find the Inverse Laplace transform of : [4]

$$\frac{1}{(s-2)^4(s+3)}.$$

9. (*a*) Show that the vector field $\overline{F} = (y^2\cos x + z^2)\overline{i} + (2y\sin x)\overline{j} + 2xz\overline{k}$ is conservative and find scalar field ϕ such that $\overline{F} = \nabla\phi$. [6]

(*b*) If directional derivative of $\phi = ax^2y + by^2z + cz^2x$ at (1, 1, 1) has maximum magnitude 15 in the direction parallel to $\frac{x-1}{2} = \frac{y-3}{-2} = \frac{z}{1}$, find the values of a, b, c. [6]

(*c*) Apply Stokes' theorem to calculate $\int_C 4y\,dx + 2z\,dy + 6y\,dz$, where 'C' is the curve of intersection of $x^2 + y^2 + z^2 = 6z$ and $z = x + 3$. [6]

Or

10. (*a*) Evaluate $\iint\limits_{S} \left(x\bar{i} + y\bar{j} + z^2\bar{k}\right) \bullet \overline{dS}$, where S is the curved surface of the cylinder $x^2 + y^2 = 4$, bounded by the planes $z = 0$ and $z = 2$. [7]

(*b*) Establish the vector indentities (any *two*) : [6]

(*i*) $\nabla^2 f(r) = \dfrac{d^2 f}{dr^2} + \dfrac{2}{r}\dfrac{df}{dr}$

(*ii*) $\nabla\left(\dfrac{\bar{a}.\bar{r}}{r^n}\right) = \dfrac{\bar{a}}{r^n} - \dfrac{n\left(\bar{a}\,.\,\bar{r}\right)}{r^{n+2}}\,\bar{r}$

(*iii*) $\nabla \times \left[\bar{a} \times \left(\bar{b} \times \bar{r}\right)\right] = \bar{a} \times \bar{b}$

(*c*) Find the work done in moving a particle once round the ellipse $\dfrac{x^2}{25} + \dfrac{y^2}{16} = 1,\ z = 0$ under the field of force given by :

$$\bar{F} = (2x - y - z)\,\bar{i} + \left(x + y - z^2\right)\bar{j} + (3x - 2y + 4z)\,\bar{k}.$$

Is the field conservative ? [5]

11. (*a*) If the velocity of an incompressible fluid at (x, y, z) is given by :

$$\bar{q} = \frac{3xz}{r^5}\,\bar{i} + \frac{3yz}{r^5}\,\bar{j} + \frac{3z^2 - r^2}{r^5}\,\bar{k}$$

where $r = \sqrt{x^2 + y^2 + z^2}$,

then determine the streamlines of motion. [5]

(*b*) Sovle $\dfrac{dy}{dt} + 4y(t) + 5\displaystyle\int_0^t y(t)\,dt = e^{-t}$, $y(0) = 0$ using Laplace transform. [5]

(*c*) The transfer function of a second order system is given as $G(s) = \dfrac{10}{s^2 + 1.6s + 4}$. Determine its properties such as overshoot, $y(t)_{max}$, period of oscillation. [6]

Or

12. (*a*) Using the Laplace transform, solve the D.E. [5]

$$x'' + 3x' + 2x = t\,\delta(t-1) \text{ for which } x(0) = x'(0) = 0.$$

(*b*) Two non-interacting tanks are connected in series. The time constants are $\tau_2 = 1$ and $\tau_1 = 0.5$; $R_2 = 1$. Find the response of level in tank 2 if a unit-step change is made in the inlet flow rate to tank 1. [5]

(*c*) Obtain the equation of streamlines in case of steady motion of fluid defined by : [6]

$$\overline{q} = (y - xz)\,\overline{i} + (yz + x)\,\overline{j} + (x^2 + y^2)\,\overline{k}.$$

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-182

S.E. (Chem.) (First Semester) EXAMINATION, 2012

CHEMISTRY—I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What is LCAO approximation ? Discuss the Additive and Subtractive Overlap. [6]

(*b*) Draw the resonating structures of : [6]

(*i*) Naphthalene

(*ii*) Phenoxide ion

(*iii*) Benzaldehyde.

(c) Give reasons : [6]

(i) Formic acid is stronger than acetic acid.

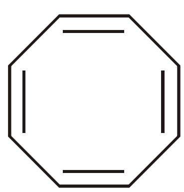
(ii) γ-chlorobutyric acid is a weaker acid than α-chlorobutyric acid.

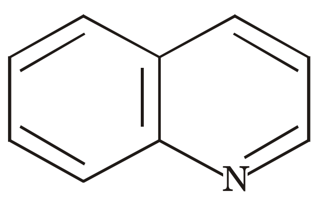
(iii) Pyrrole is weaker base than pyridine.

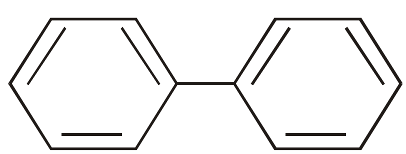
Or

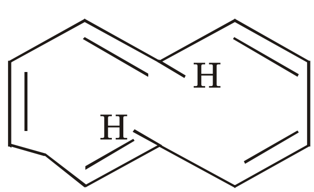
2. (a) Draw M.O. diagram for nitrogen molecule and calculate its bond order. [6]

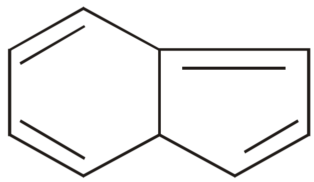
(b) Explain aromaticity of the following compounds : [6]

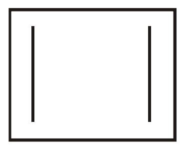
(i) 

(ii) 

(iii) 

(iv) 

(*v*) 

(*vi*) 

(*c*) What are carbonium ions ? Discuss the orbital structure and relative stability of 1°, 2° and 3° carbonium ions. [6]

3. (*a*) Give mechanism of Friedel-Crafts' acylation and give limitations of Friedel-Crafts' reactions. [6]

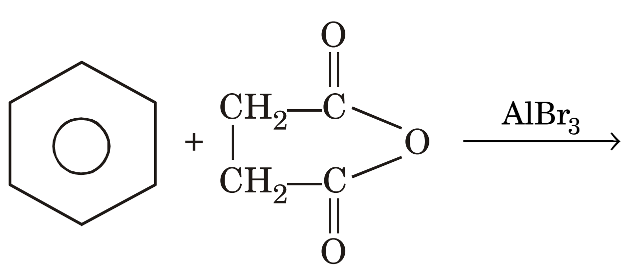
(*b*) Explain why $-NO_2$ is deactivating and *m*-directing. [6]

(*c*) Complete the following reactions : [4]

(*i*) $2CH_3I + Na_2S \longrightarrow$

(*ii*) $C_6H_5NH_2 + H_2SO_4 \longrightarrow$

(*iii*) C_6H_5OH + Bromine water $\longrightarrow$

(*iv*) 

Or

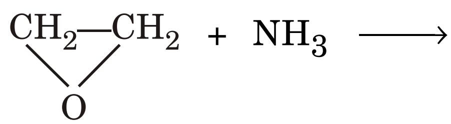
4. (*a*) Explain the following : [4]

(*i*) Saytzeff rule

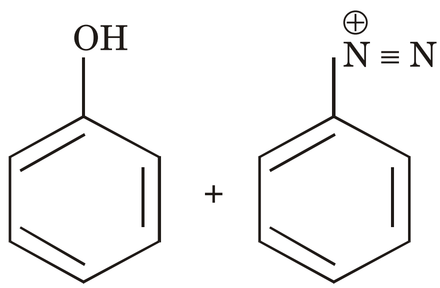
(*ii*) Hofmann rule.

(*b*) Discuss the mechanism and stereochemical changes taking place in the S_N1 and S_N2 mechanism. [6]

(*c*) Predict the product : [6]

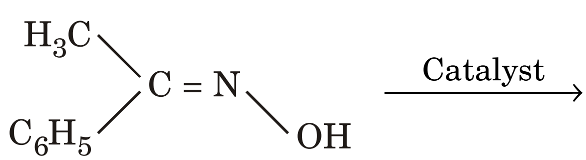
(*i*) 

(*ii*) $C_6H_5NH_2 + CH_3COCl \longrightarrow$

(*iii*) 

(*iv*) $CH_3CHO + BrCH_2COOC_2H_5 \longrightarrow$

(*v*) $Cl_2CHCF_3 \xrightarrow[\text{Base}]{\text{EICB}}$

(*vi*) 

5. (*a*) Explain the variation of $\wedge_0$ with dilution. [4]

(*b*) What is Kohlrausch's law ? Discuss its applications. [6]

(*c*) Define ion selective electrode. Explain construction and application of gas sensing electrode. [6]

Or

6. (*a*) What are conductometric titrations ? Describe briefly the different types of conductometric titrations. [6]

(*b*) Discuss the instrumentation in flame photometry. [4]

(*c*) What is the relationship between specific conductance and equivalent conductance ? The resistance of N/2 solution of an electrolyte is 45 Ω. Calculate equivalent conductance of solution if the electrodes in the cell are 2.2 cm apart and have an area of 3.8 cm^2. [6]

SECTION II

7. (*a*) Anthracene dimerises and produces fluorescence in benzene solvent when irradiated with light of frequency ν. Given the frequency of fluorescence is $\nu' > \nu$.

(*i*) $A + h\nu \xrightarrow{K_1} A^*$ (excitation)

(*ii*) $A^* + A \xrightarrow{K_2} A_2$ (dimerisation)

(*iii*) $A^* \xrightarrow{K_3} A + h\nu'$ (fluorescence)

Derive the rate law and find quantum yield. [6]

(*b*) Derive integrated equation for the first order reaction. [4]

(*c*) Show that time required for a first order reaction to complete 99.9% reaction is approximately 10 times its half life period. [4]

(*d*) Define Stark-Einstein law. [2]

Or

8. (*a*) Derive Arrhenius equation. [4]

(*b*) The rate constant of a 2nd order reaction is 5.7×10^{-5} dm^3 mol^{-1} s^{-1} at 25°C and 1.64×10^{-4} dm^3 mol^{-1} s^{-1}. Calculate E_a and A. [4]

(*c*) Derive the rate law for the following photochemical reaction :

$$H_2(g) + Cl_2(g) \xrightarrow{h\nu} 2HCl(g)$$

Mechanism suggested is,

(*i*) $Cl_2 + h\nu \qquad 2Cl$

(*ii*) $Cl + H_2 \xrightarrow{K_2} HCl + H$

(*iii*) $H + Cl_2 \xrightarrow{K_3} \frac{1}{2}Cl_2 + HCl$

(*iv*) $Cl \text{ (at the wall)} \xrightarrow{K_4} \frac{1}{2}Cl_2$. [8]

9. (*a*) Give the construction, reaction, characteristics and applications of nickel cadmium cell. [6]

(*b*) Describe the instrumentation of HPLC. [6]

(*c*) Explain any *one* detector used in gas chromatography. [4]

Or

10. (*a*) Write a note on PEMFC. [6]

(*b*) Describe briefly the principle, technique and application of column chromatography. [6]

(*c*) Explain applications of gas chromatography. [4]

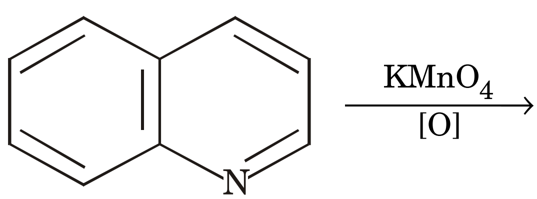
11. (*a*) Write a short note on diazotisation and coupling in azo dyes. [6]

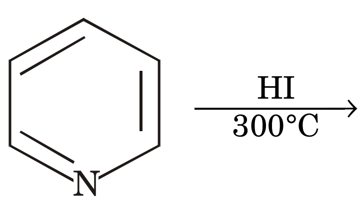
(*b*) Describe the method of synthesis for the following dyes : [6]

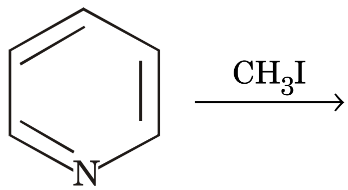
(*i*) Crystal violet

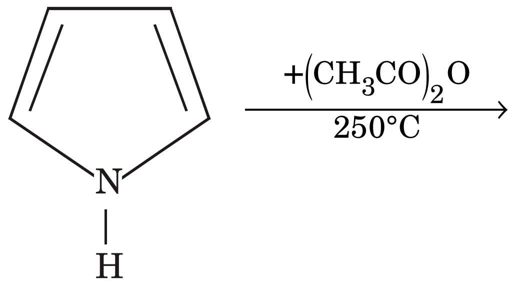
(*ii*) Methyl orange.

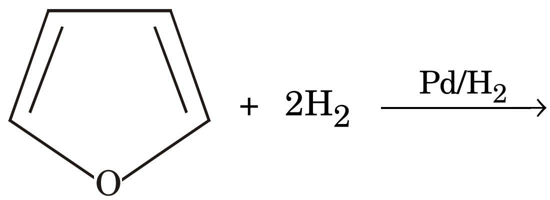
(*c*) Complete the reactions : [6]

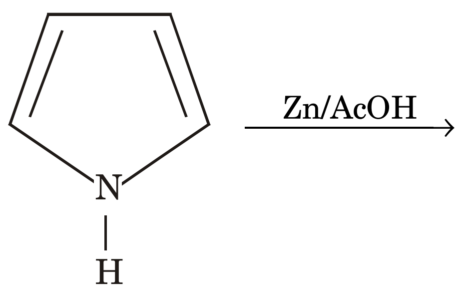
(*i*) 

(*ii*) 

(*iii*) 

(*iv*) 

(*v*) 

(*vi*) 

Or

12. (*a*) Write a short note on the Otto Witts theory of colour. [6]

(*b*) Describe the Skraup synthesis. [6]

(*c*) Explain why electrophilic substitution reactions takes place preferentially at position 2 and/or 5 in furan. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-183

S.E. (Chemical) (I Sem.) EXAMINATION, 2012

CHEMICAL ENGINEERING FLUID MECHANICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Discuss the following : [12]

(*i*) Laminar and turbulent flow

(*ii*) Steady and unsteady flow

(*iii*) Path line and streak line

(*iv*) Rotational and irrotational flow.

(*b*) Certain liquid has the kinematic viscosity 5.00 stokes and specific gravity 2.00. Calculate its dynamic viscosity. [4]

Or

2. (*a*) Define the following and give their SI units : [8]

(*i*) Vapour pressure

(*ii*) Specific gravity

(*iii*) Kinematic viscosity

(*iv*) Specific volume.

(*b*) What is rheology ? How are fluids classified according to their rheological behaviour ? [8]

3. (*a*) Derive a general equation for the variation of pressure due to gravity from point to point in a static fluid. [8]

(*b*) Give practical application of the following : [4]

(*i*) Differential manometer

(*ii*) Pitot tube.

(*c*) Prove that product of slope of equipotential line and stream line is – 1. [4]

Or

4. (*a*) Define stream line, path line and equipotential line. Give *one* practical example of : [6]

(*i*) Uniform flow

(*ii*) Turbulent flow

(*iii*) Unsteady flow.

(*b*) At what depth below the free surface of oil having a density of 900 kg/m^3 will the pressure be equal to 2 bar ? [5]

(*c*) In case of U tube differential mercury manometer shown in Fig. Show that the difference of pressure head between two points is equal to the X where height of deflection of mercury column in X : [5]

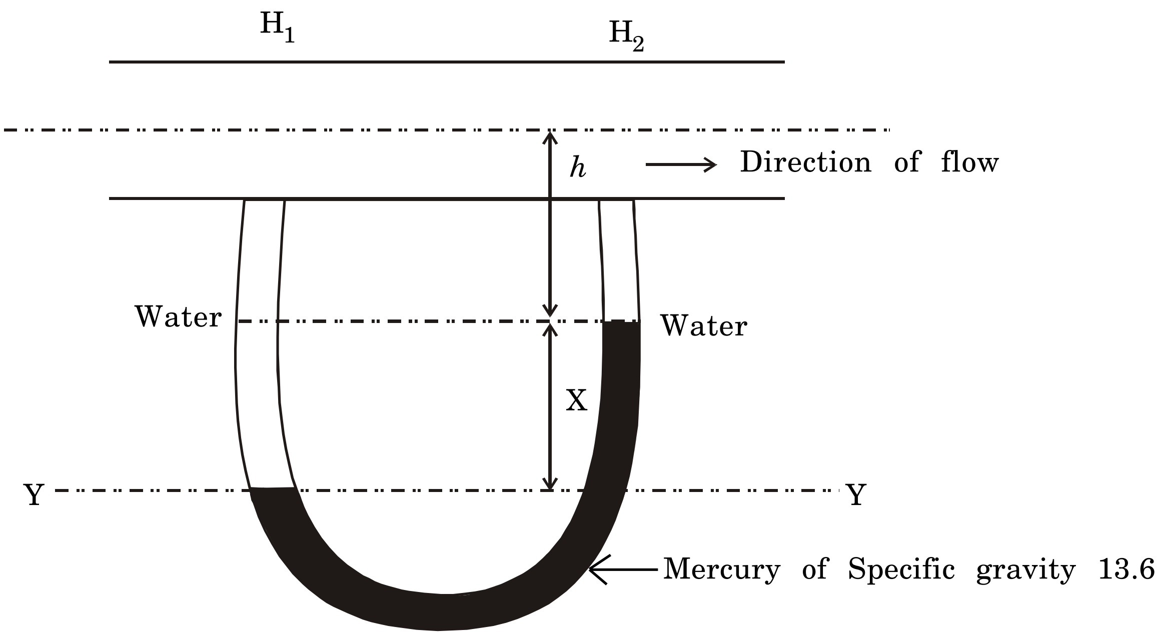


Fig.

5. (*a*) For laminar flow through inclined circular pipe, show that : [10]

$$\frac{U_{max}}{u} = 2.$$

(*b*) Oil of dynamic viscosity 1.5 poise and specific gravity 0.9 flows through 920 mm diameter, 20 m long vertical pipe. The pressures at the section 1 and 2 of the pipe are 6 bar and 200 kPa respectively. Find the direction and rate of flow through the pipe. [8]

Or

6. (*a*) For laminar flow through horizontal circular pipe, show that : [10]

$$u = \left[1 - \left(\frac{r}{r\omega}\right)^2\right].$$

(*b*) Derive Hagen Poisuille equation and state the important assumptions. [8]

SECTION II

7. (*a*) The drag force F on a partially submerged body depends upon relative velocity (V) between body and fluid, characteristics linear dimension L, fluid density ρ, height of surface roughness K, viscosity μ and acceleration due to gravity. Obtain an expression for drag force using Buckingham's π-theorem. [10]

(*b*) Explain growth of boundary layer on flat plate. [8]

Or

8. (*a*) What are model laws ? State the importance of the following model laws : [8]

(*i*) Froude's model law

(*ii*) Reynold's model law

(*iii*) Mach model law.

(*b*) Distinguish between fundamental quantities and derived quantities. [6]

(*c*) What is dimensional analysis ? What is its utility ? [4]

9. (*a*) Derive an expression for minimum fluidization velocity. [8]

(*b*) Draw a neat sketch and explain the working of a packed bed column. [8]

Or

10. (*a*) For Stokes law region, show that : [8]

$$C_D = \frac{24}{Re}.$$

(*b*) It is observed that as Rep reaches its critical value, C_D for the sphere drops from 0.50 to a value of 0.20, due to turbulence. If the driving power remains the same, what will be corresponding % increase in speed with such change ? [8]

11. (*a*) Briefly explain the methods of selecting a pump for a given application. [8]

(*b*) State advantages of welded joints over other pipe joints. [4]

(*c*) Distinguish between full bore flowmeters and insertion type flowmeters. [4]

Or

12. (*a*) An orifice plate with a 150 mm diameter is installed in a 3000 mm diameter pipeline which carries oil of specific gravity 0.85. A mercury U tube manometer connected to the orifice-meter shows reading of 200 mm. Assuming $C_d = 0.6$, find the discharge. [8]

(*b*) What is cavitation in pumps ? What is its significance ? [4]

(*c*) Write short notes on safety valves and relief valves. [4]

Seat No.	

[4262]-184

S.E. (Chemical) (First Semester) EXAMINATION, 2012

CHEMICAL ENGINEERING MATERIALS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain Engineering and true stress-strain curves and derive the relationship between Engineering and True stress-strain values. [8]

(*b*) Explain Necking and derive the condition for necking. [8]

Or

2. (*a*) Define the following terms : [8]

(*i*) Toughness

(*ii*) Strain Hardening

(*iii*) Resilience

(*iv*) Hardness.

(*b*) A hydraulic press exerts a total load of 3.5 MN. This load is carried by two steel rods, supporting the upper head of the press. If the safe stress is 8.5 MPa and $\in$ = 210 kN/mm^2, find : [8]

(*i*) Diameter of the rods

(*ii*) Extension in each rod in a length of 2.5 m.

3. (*a*) Define Hardness. What are the different Hardness tests ? Explain Brinell and Vicker's Hardness test in detail. [10]

(*b*) Explain in detail the different non-ferrous alloys. [6]

Or

4. (*a*) Explain in detail the *two* methods for indexing lattice planes. [8]

(*b*) Define Atomic packing factor and calculate it for : [8]

(*i*) Simple cubic structures

(*ii*) Body-centered cubic structures

(*iii*) Face-centered cubic structures.

5. (*a*) Distinguish between insulation and refractories. [4]

(*b*) Draw Fe-Fe_3 equilibrium diagram. Explain various reactions involved and different phases observed. [14]

Or

6. (*a*) Explain the various Aluminium alloys. [3]

(*b*) Write short notes on the following methods of fabrication : [15]

(*i*) Rolling

(*ii*) Welding

(*iii*) Bending

(*iv*) Central punching

(*v*) Revetting.

SECTION II

7. (*a*) Define and explain the following terms : [12]

(*i*) Galvanic corrosion

(*ii*) Wet corrosion

(*iii*) Fretting corrosion

(*iv*) Erosion corrosion.

(*b*) What do you understand by Electrochemical series of metal ? Differentiate between Electrochemical series and Galvanic series ? [4]

Or

8. (*a*) Explain in detail the different methods for prevention of corrosion. [10]

(*b*) Find out the nature of film when chromium oxidizes to chromium oxide. The atomic weight of chromium and oxygen is 52 and 16 respectively. Density of chromium and chromium oxide is 7.2 gm/cm^3 and 10.28 gm/cm^3 ? [6]

9. (*a*) Explain the correlation between polymer structure and mechanical properties. [4]

(*b*) What is stereoisomerism ? Does this affect the properties of a polymer ? [4]

(*c*) Define and explain the following terms : [8]

(*i*) Vulcanization of rubber

(*ii*) Teflon in engineering

(*iii*) Stress relaxation

(*iv*) Fibre reinforced plastic.

Or

10. (*a*) Explain the factors affecting the properties of polymers. [4]

(*b*) Differentiate between Thermoplastic and Thermosetting polymers. [6]

(*c*) Explain polymerization. Describe addition and condensation polymerization. [6]

11. (*a*) Explain crystalline and non-crystalline ceramics with examples and state their applications. [9]

(*b*) Explain in detail the applications of the following ceramics : [9]

(*i*) Zirconia

(*ii*) Silicon nitride

(*iii*) Clays.

Or

12. Explain the following terms : [18]

(*i*) Glass

(*ii*) Mechanical properties of ceramics

(*iii*) Refractories

(*iv*) Silicates

(*v*) Cement

(*vi*) Borosilicates.

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-185

S.E. (Chemical) (I Sem.) EXAMINATION, 2012

PROCESS CALCULATIONS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Draw neat sketches wherever necessary.

(*iii*) Use of logarithmic tables, slide rule, Mollier charts, calculator and steam tables is allowed.

(*iv*) Assume suitable data, if necessary.

SECTION I

1. (*a*) The flow rate of sodium chloride solution through a pipe is reported as 15 kg/sec. The density of solution is 1.150 gm/cm^3, calculate the volumetric flow rate in cubic feet per minute. [4]

(*b*) The potential energy of a body at a height of 18 m is 2.16 kJ. If the body is moving at a velocity of 54 m/sec, what is its kinetic energy ? [6]

(c) The gas mixture has the following composition by volume : Hydrogen 35.2%, Methane 14.8%, Ethylene 12.8%, Carbon dioxide 1.5%, Carbon monoxide 33.9%, and Nitrogen 1.8%. Find the molar volume of this gas mixture at 330 K and 101.3 kPa. [6]

Or

2. (a) A portland cement sample contained 20.7% SiO_2 by weight derived from two silicate compounds, $SiO_2.2CaO$ and $SiO_2.3CaO$ that are present in the cement in the mole ratio 3 : 4. Determine the percent by weight of each silicate compound in the cement ? [8]

(b) An aqueous solution of H_2SO_4 contains 18% H_2SO_4. The density of solution is 1152 kg/m^3. Determine :

(i) mole % of H_2SO_4 in the solution

(ii) molarity

(iii) molality and

(iv) normality of the solution. [8]

3. (a) Acetone is recovered from acetone-air mixture containing 25% acetone by volume, by scrubbing with water. Assume that air is insoluble in water; determine the % of acetone that is absorbed in water if the gas mixture leaving the scrubber analyzes 5% acetone. [6]

(*b*) The average molar mass of a flue gas sample is calculated by two different engineers. One engineer use the correct molar mass of 28 for N_2 and determines the average molar mass to be 30.08, the other engineer, using an incorrect value of 14, calculate the average molar mass to be 18.74 :

(*i*) Calculate the volume % of N_2 in the flue gases.

(*ii*) If the remaining components of the flue gases are CO_2 and O_2, calculate the volume percentage of each of them. [10]

Or

4. 1500 kg of mixed acid of composition 40% H_2SO_4, 45% HNO_3, and 15% H_2O is to be produced by strengthening waste acid of composition 30% H_2SO_4, 36% HNO_3, and 34% H_2O by weight. Concentrated sulphuric acid of strength 95% and concentrated nitric acid containing 80% are available for this purpose. How many kilograms of waste acid and concentrated acids are to be mixed together ? [16]

5. A gas mixture consisting of 65% N_2, 35% SO_3 by volume is admitted to an absorption column at a rate of 4500 kg/hr. It is contacted with a stream of 50% H_2SO_4 flowing countercurrent to the gas stream at the rate of 5000 kg/hr. The gases leave at 101.3 kPa. Water lost with the exit gases exerts a partial pressure of 25 kPa. If the concentrated acid leaving the bottom of the column contained 75% H_2SO_4, what % of entering SO_3 is absorbed and converted to acid ? [18]

Or

6. A mixture of pure carbon dioxide and hydrogen is passed over a nickel catalyst. The temperature of the catalyst bed is 588 K and the reactor pressure is 2 MPa g. The analysis of the gases leaving the reactor showed CO 57.1%, H_2 41.1%, CH_4 1.68% and CO 0.12% (by volume) on a dry basis. The reactions taking place in the reactor are :

$$CO_2 + 4H_2 = CH_4 + 2H_2O$$

$$\text{and} \quad CO_2 + H_2 = CO + H_2O$$

Find :

(*a*) the conversion of CO_2 per pass

(*b*) yield of CH_4 in terms of CO_2 reacted and

(*c*) the composition of the feed. [18]

SECTION II

7. (*a*) Pure methane is heated from 30 C to 250 C at atmospheric pressure. Calculate heat added per kg of methane.

$C_p = 19.249 + (52.113 \times 10^{-3})T + (11.973 \times 10^{6} T^2)$ kJ/kmol K. [4]

(*b*) Calculate the energy required to dissociate one kilogram of sodium bicarbonate.

$$2NaHCO_{3\ (s)} = Na_2CO_{3\ (s)} + CO_{2\ (g)} + H_2O_{(g)}$$

Given Data : Std Heat of formation at 298 K

	Component		**ΔH_f kJ/kg**
(*i*)	$Na_2CO_{3\ (s)}$	—	10666.68
(*ii*)	$NaHCO_{3\ (s)}$	—	11319.81
(*iii*)	$H_2O_{(g)}$	—	13424.82
(*iv*)	$CO_{2(g)}$	—	8943.51

[6]

(*c*) Define :

(*i*) Heat of Reaction

(*ii*) Heat of Formation and

(*iii*) Adiabatic Reaction Temperature. [6]

Or

8. A pilot plant reactor was charged with 50 kg of naphthalene and 200 kg of sulphuric acid (98% by weight). The reaction was carried out for 3 hrs. and the reaction goes to completion. The product distribution was found to be 18.6% mono-sulphonate naphthalene (MSN) and 81.4% di-sulphonate naphthalene(DSN).

(*i*) Calculate the quantities of MSN and DSN naphthalene in product.

(*ii*) Complete analysis of product. [16]

9. (*a*) A saturated mixture of CO_2 – water vapour comes out from the cooler at 120 kPa, 40°C before it is compressed. Find the absolute humidity in the mixture.

The vapour pressure of water at 40°C is 7.375 kPa. [8]

(*b*) Define :

(*i*) Dry Bulb Temperature

(*ii*) Wet Bulb Temperature

(*iii*) Relative Humidity

(*iv*) Absolute Humidity

(*v*) Dew Point. [10]

Or

10. (*a*) An aqueous solution of ethyl alcohol containing 8.6% alcohol is fed at the rate of 0.015 kmol/sec. to a continuous distillation column. The product (distillate) is a solution containing 95.5% alcohol. The waste solution from the column carries 0.1% of alcohol. All percentages are by mass. Calculate the mass flow rates of top and bottom products in kg/hr and the percentage loss of alcohol. [10]

(*b*) A dryer is fed with wet solid to reduce the moisture content from 80% to 15%. The product leaving the dryer is sent to oven to reduce the moisture content to 2%. If 1000 kg of wet solid is fed to the dryer, find out the weight of the products leaving the dryer and oven. Also determine the amount of water removed in dryer and in oven. [8]

11. Explain briefly : [16]

(*a*) Types of fuels.

(*b*) Tests for Proximate Analysis.

(*c*) Calorific values of fuels.

(*d*) Adiabatic Flame Temperature.

Or

12. A gas mixture consisting of 80% ethane and 20% oxygen is burned in an engine with 100% excess air. 80% of the ethane goes to CO_2, 10% to CO and 10% remains unburned.

Calculate the composition of the exhaust gases on :

(*i*) wet basis and

(*ii*) dry basis. [16]

Total No. of Questions—**12**]   [Total No. of Printed Pages—**8**

Seat No.	

[4262]-186

S.E. (Chemical) (II Sem.) EXAMINATION, 2012

CHEMISTRY—II

(2008 PATTERN)

Time : Three Hours   **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain briefly the different types of adsorption isotherms. [6]

(*b*) What are zeolites ? Explain the important properties of zeolites. [6]

P.T.O.

(*c*) Give mechanism for the following metal co-ordination catalysed reactions : [6]

(*i*) Wacker process

(*ii*) Photolysis of water.

Or

2. (*a*) Explain adsorption theory for heterogenous catalysis. [6]

(*b*) Write a short note on enzyme catalysis. [6]

(*c*) Give the assumptions of Langmuir adsorption theory and explain the isotherm. [6]

3. (*a*) How does glucose react with : [6]

(*i*) Bromine water

(*ii*) Hydroxylamine

(*iii*) Conc HCl.

(*b*) Write a short note on starch and starch based products. [4]

(*c*) Explain the primary, secondary and tertiary structures of proteins. [6]

Or

4. (*a*) Draw the open chain and ring structure of glucose. [4]

(*b*) Describe briefly the mechanism of enzyme action. [6]

(*c*) Predict the product : [6]

(*i*) $NH_2CH_2COOH + NaOH \longrightarrow$

(*ii*) $2NH_2CH_2COOH \xrightarrow[200°C]{\Delta}$

(*iii*) $NH_2CH_2COOH + NH_2CH(CH_3)COOH \longrightarrow$

(*iv*) $NH_2CH_2COOH + Ba(OH)_2 \longrightarrow$

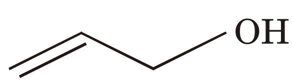
(*v*) $CH_3CHNH_2COOH + HNO_2 \longrightarrow$

(*vi*) $NH_2CH_2COOH + C_2H_5OH \longrightarrow$

5. (*a*) Derive the Lambert-Beer's law. Enlist the deviations from Lambert-Beer's law. [6]

(*b*) Describe the instrumentation in IR spectroscopy. [6]

(*c*) How will you distinguish between the following pairs : [4]

(*i*) 

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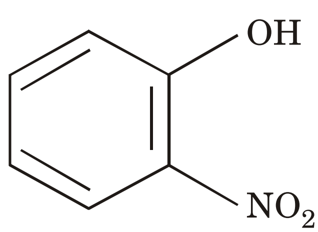
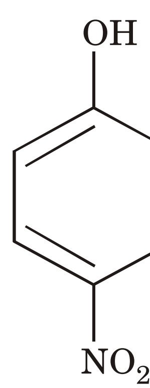
(*ii*) 

and 

Or

6. (*a*) Define the following terms : [4]

(*i*) Chromophore

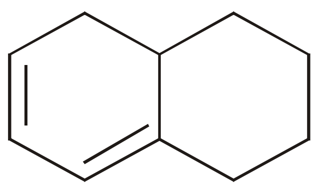
(*ii*) Auxochrome

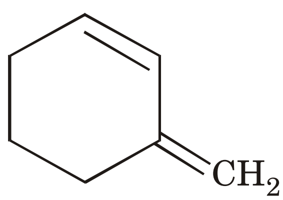
(*iii*) Hyperchromic shift

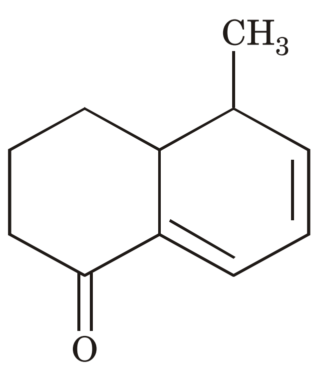
(*iv*) Hypsochromic shift.

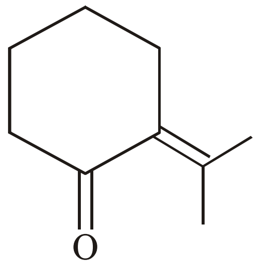
(*b*) Explain the terms B-band, R-band, K-band and E-band for UV spectroscopy. [6]

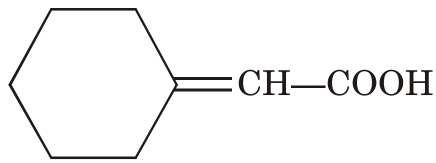
(*c*) Using Woodward-Fieser rules calculate λ_{max} for the following compounds : [6]

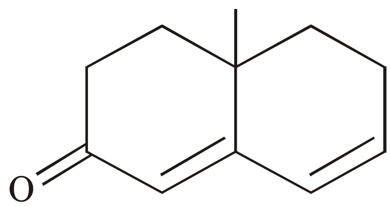
(*i*) 

(*ii*) 

(*iii*) 

(iv) 

(v) 

(vi) 

SECTION II

7. (a) Explain giving reason why : [6]

(i) Cuprous is diamagnetic while cupric ion is paramagnetic in nature.

(ii) Generally transition elements formed coordination complex.

(b) Find coordination number and charge on the central metal of the following complexes : [6]

(i) $\left[Fe(CN)_6\right]^{-3}$

(ii) $\left[CoCl_4\right]^{-2}$

(iii) $\left[Ni(CO)_4\right]$.

(*c*) On the basis of valence bond theory explain the structure of $[MnCl_4]^{-2}$. [4]

Or

8. (*a*) Explain using CFT why $[CoF_6]^{-3}$ is paramagnetic and $[Co(NH_3)_6]^{+3}$ is diamagnetic for an octahedral complex. [6]

(*b*) Calculate CFSE for the octahedral complex containing d^3, d^6, d^{10} electrons in low spin state. [6]

(*c*) Using IUPAC nomenclature name the following complex : [4]

(*i*) $[Pt(NH_3)_6]Cl_4$

(*ii*) $Li[AlH_4]$.

9. (*a*) Explain the following efficiency parameters for reactions : [6]

(*i*) Percent conversion

(*ii*) Reaction selectivity

(*iii*) Reaction yield.

(*b*) Give the traditional and green pathway for the synthesis of : [6]

(*i*) Carbaryl

(*ii*) Ibuprofen.

(*c*) Calculate atom economy and environmental load factor for the following reactions : [4]

(*i*) $CH_3—CH_2—Cl + NH_3 \rightarrow CH_3—CH_2—NH_2 + HCl$

(*ii*) $CH_3—\overset{\overset{\displaystyle O}{||}}{C}—OCH_3 + NaOH \rightarrow CH_3—\overset{\overset{\displaystyle O}{||}}{C}—ONa + CH_3—OH$

(Given : Atomic Weight of C = 12, H = 1, N = 14, O = 16, Cl = 35.5, Na = 23)

Or

10. (*a*) What is biotechnology ? Explain the various organisms involved in biotechnology. [6]

(*b*) Explain chemical synthesis through biotechnology of the following : [6]

(*i*) Glucose production

(*ii*) Acetone production.

(*c*) Explain the working of membrane bioreactor. [4]

11. (*a*) What are the sources of waste water generation in paper mill ? Describe the methods for its treatment with flow sheat. [6]

(*b*) Draw general layout of municipal waste water treatment plant and explain the various treatment. [6]

(*c*) Write notes on : [6]

(*i*) B.O.D.

(*ii*) Ultrafiltration.

Or

12. (*a*) What are the sources of waste water generation in textile industry ? Explain the treatment of textile industry waste water with layout. [6]

(*b*) If 25 ml of sewage water sample was refluxed with 10 ml of 0.25 N $K_2Cr_2O_7$ solution in presence of dil. H_2SO_4, Ag_2SO_4 and $HgSO_4$. The unreacted dichromate required 6.5 ml of 0.1 N ferrous ammonium sulphate (FAS). 10 ml of the same $K_2Cr_2O_7$ solution and 25 ml of distilled water under the same conditions as the sample, required 27 ml of 0.1 N FAS. Calculate the C.O.D. of the sewage water sample. [6]

(*c*) Explain : [6]

(*i*) Incineration method for the treatment of hazardous waste.

(*ii*) Reverse Osmosis.

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-187

S.E. (Chemical) (II Sem.) EXAMINATION, 2012

HEAT TRANSFER

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* question from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) State and explain : [9]

(*i*) Fourier's law of heat conduction.

(*ii*) Newton's law of cooling.

(*iii*) Stefan-Boltzmann's law of radiation.

(*b*) By dimensional analysis derive the following relationship for free convection heat transfer process : [9]

$$\mathrm{Nu} = c[\mathrm{Gr}^a \ \mathrm{Pr}^b]$$

where :

Nu = Nusselt number

Gr = Grasshoff number

Pr = Prandtl number

a, b, and c are numerical constants.

Or

2. Write short notes on : [18]

(*i*) Thermal equilibrium

(*ii*) Dimensional homogeneity

(*iii*) Significance of Reynolds number

(*iv*) Significance of Nusselt number.

3. (*a*) Explain critical heat flux in pool boiling. [4]

(*b*) Distinguish between filmwise and dropwise condensation. Which of these two gives higher heat transfer coefficient ? Why ? [4]

(*c*) A horizontal square plate of 0.64 m side is maintained at 70°C and exposed to atmospheric air at 30°C. Calculate the heat transfer in watts from lower surface using the following data and correlation :

(*i*) Pr. of air = 0.7

(*ii*) $\nu = 17.95 \times 10^{-6}$ m²/s

(*iii*) $k = 0.0283$ W/mK

(*iv*) β to be considered at average temperature.

$$Ra_L = Gr_L \ Pr.$$ [8]

Or

4. (*a*) With the help of diagrams, discuss 'Laminar flow heat transfer in a circular pipe' in detail. [8]

(*b*) Calculate the heat transfer coefficient for fluid flowing through tube having inside dia. 40 mm at a rate of 5500 kg/hr. Assume that fluid is being cooled.

Data :

Properties of fluid at mean bulk temperature :

Viscosity of flowing fluid = 0.004 $(Ns)/m^2$

Density of flowing fluid = 1.07 gm/cm^2

Thermal conductivity of flowing fluid = 0.256 (W/mK). [8]

5. (*a*) Define 'condensation'. What is the effect of non-condensable gases on condensation ? Give at least *five* differences between dropwise and film condensation. [10]

(*b*) A large vertical plate 4 m high is maintained at a temperature of 60°C and exposed to air at 10°C. Estimate the heat transfer if the plate is 7 m wide.

Data :

The properties of air at mean film temperature are :

Thermal conductivity (k) = 0.02685 w (m.k)

Kinematic viscosity (ν) = 16.5×10^{-6} m^2/sec.

Prandtl number (Pr) = 0.7

Coefficient of thermal expansion (β) = 3.25×10^{-3} K^{-1}

Use appropriate equation from the following set of equation :

$\overline{Nu}_L = 0.59\ (Ra_L)^{1/4}$ for laminar flow and

$\overline{Nu}_L = 0.10\ (Ra_L)^{1/3}$ for turbulent flow

where $\overline{Nu}_L$ = Av. Nusselt number for a plate of length L.

Ra_L = Rayleigh number of plate of length L. [8]

Or

6. Write short notes on : [18]

(*a*) Pipe insulation

(*b*) Thermal conductivity

(*c*) Pool boiling

(*d*) Thermal resistance.

SECTION II

7. (*a*) A thermoflask with evaluated space reduces the heat losses from surface. The surfaces are facing each other and their emissivity is 0.02. If the content of flask are at 385 K and ambient temperature 298 K, compute the heat losses from flask by radiation. [8]

(*b*) What important considerations are taken into account while designing the heat exchangers ? [4]

(*c*) Compare single pass and multi-pass shell and tube heat exchanger. [4]

Or

8. (*a*) For concurrent double pipe heat exchanger prove that : [8]

$$Q = UA\ (LMTD)$$

(*b*) A countercurrent double pipe heat exchanger has oil in the tube, being cooled from 140°C to 100°C with the help of water at 30°C, which gets heated to 70°C, if the water side coefficient is 25 W/m^{2}K, oil side is 10 W/m^{2}K and a fouling coefficient of 0.2 W/m^{2}K. Neglect resistance due to tube walls and calculate the heat transfer area for a water flow rate of 10 kg/s. Heat capacity of water is 4.18 kJ/kgK. [8]

9. (*a*) Find consistency and also have analytical check when there is no flow or fluid is stagnant for correlation of heat transfer. Coefficient for flow over a single sphere is given below :

$Nu_D = 2.0 + (0.25 + 3 \times 10^{-4} \; Re_D{}^{1.6})^{1/2}$. [8]

(*b*) What is burnout and what is its implication ? Explain about burnout heat flux. [8]

Or

10. (*a*) What is vapour recompression ? What are the different methods of recompression ? [8]

(*b*) What is Nusselt's equation for laminar film condensation on vertical and horizontal pipe ? What are the assumptions that you have made while deriving this equation ? [8]

11. (*a*) Explain triple effect evaporator with forward feed arrangement. [9]

(*b*) A continuous single effect evaporator concentrates 9072 kg/hr. of 1.0 wt% salt solution entering at 311.0°K to a final concentration of 1.5 wt%. The vapor space of the evaporator is at 101.325 kPa and the steam supplied is saturated at 143.3 kPa U = 1704 W/m^{2}K. Calculate the amount of vapor and liquid product and heat transfer area required. Assume that since it is dilute, the solution has the same boiling point as water. [9]

Or

12. Write short notes on :

(*a*) Graphite heat exchanger

(*b*) Multiple effect evaporator

(*c*) Fouling factor

(*d*) Boiling point rise in single effect and multiple effect evaporation system. [18]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-188

S.E. (Chemical) (II Sem.) EXAMINATION, 2012

PRINCIPLES OF DESIGN

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer to two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

SECTION I

1. (*a*) Distinguish between process design and mechanical design of plant with suitable example. [6]

(*b*) Distinguish between codes and standards. State the engineering aspects covered in standard specifications. [6]

(*c*) A short timber post of rectangular section has one side of the section twice the other. When the post is loaded axially with 10 kN force, it contracts by 5 mm for 1 m length. Calculate sectional dimensions for the post if E = 12 GPa. Also calculate the stress induced in the section. [6]

Or

2. (*a*) A solid circular steel bar of 25 mm diameter is subjected to an axial tensile force of 25 kN. Calculate change in length and diameter of the bar if E = 2×10^5 MPa and μ = 0.3. [6]

(*b*) A tie bar of 25 mm diameter carries an axial force of 50 kN It is attached to a rigid bracket by means of 4 bolts, each of which can be stressed upto 90 MPa. Find suitable diameter for the bolt. Also calculate tensible stress induced in the bar. [6]

(*c*) Define the following terms for a ductile material : [6]

(*i*) Young's modulus of elasticity

(*ii*) Bulk modulus of elasticity

(*iii*) Rigidity modulus of elasticity

(*iv*) Poisson's ratio

(*v*) Factor of safety

(*vi*) Percent elongation.

3. (*a*) A beam ABCD 7 m long is simply supported at B and C with overhangs AB&CD each of 1 m length. Beam carries point load of 4 kN at A, UVL over portion BD (having intensity 6 kN/m at B and 0 kN/m at D) :

(*i*) Calculate support reactions

(*ii*) Calculate SF and BM values at critical points

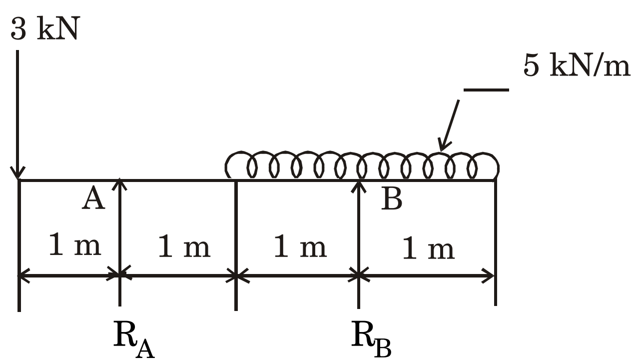
(*iii*) Sketch SFD and BMD

(*iv*) Find maximum sagging and hogging BM along with their positions. Also find point of contraflexure if any. [10]

(*b*) A timber beam 100 mm × 150 mm deep is simply supported over span of 4 m. Find maximum UDL that beam can carry if bending stress in compression is not exceed 80 MPa. [6]

Or

4. (*a*)



For the beam shown in figure :

(*i*) Calculate support reactions R_A and R_B.

(*ii*) Calculate SF and BM values at critical points.

(*iii*) Sketch SFD and BMD

(*iv*) Find maximum sagging and hogging BM with their positions.

(*v*) Find point of contraflexure if any. [10]

(*b*) Find power transmitted by a shaft of 40 mm diameter running at 200 r.p.m., if τ_{max} = 240 MPa with F.S. = 3. [6]

5. (*a*) A line shaft is driven to transmit 300 kW at 300 r.p.m. by means of motor placed vertically below it. The pulley is overhang from the shaft at 500 mm from the bearing as shown in figure. The pulley is 1 m in diameter and has belt tensions in the ratio 1.5 : 1. The allowable crushing and shear stress in the material of shaft is 80 and 40 MPa respectively.

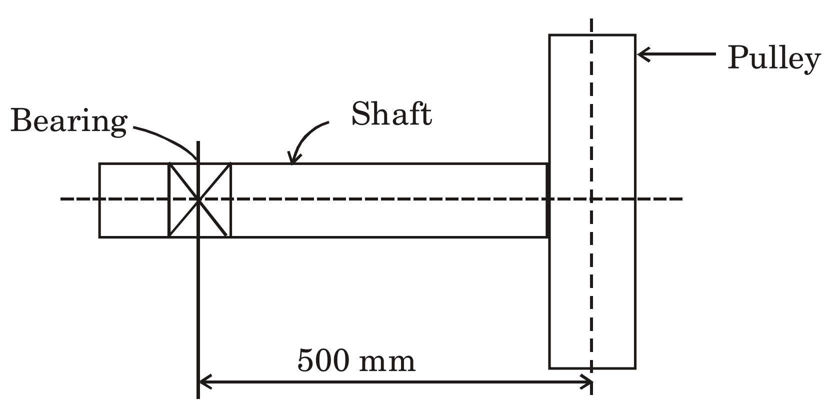
(*i*) Find torque transmitted by the shaft

(*ii*) Find belt tensions

(*iii*) Find maximum bending moment along the shaft

(*iv*) Calculate equivalent TM and BM.

(*v*) Calculate shaft diameter based on both equivalent BM and TM and choose the safe diameter. [10]



(*b*) A shaft is required to transmit 200 kW power at 200 r.p.m. Maximum permissible twist in a length of 15 diameter is 1° and maximum permissible shear stress is 50 MPa :

(*i*) Find torque transmitted by the shaft

(*ii*) Find shaft diameter based on strength criteria

(*iii*) Find shaft diameter based on stiffness criteria

(*iv*) Choose the safe diameter. [6]

Or

6. Design a muff coupling used to connect two shafts transmitting 40 kW at 400 r.p.m. The material of shaft and key have allowable crushing and shear stress values 80 MPa and 40 MPa respectively. while the material of the coupling has permissible shear stress of 15 MPa.

(*i*) Calculate the maximum torque acting on the shaft which exceeds by 20% over the average value.

(*ii*) Calculate shaft diameter using torsion equation.

(*iii*) Calculate diameter and length of sleeve using standard proportions. Also calculate shear stress induced in it. Comment on safety in shear.

(*iv*) Calculate length, width and thickness of a square key. Also calculate shear and crushing stress induced in key. Comment on safety of key in shear and crushing. [16]

SECTION II

7. (*a*) With neat figures explain the following types of flat belt drives : Quarter turn belt drive, Compound belt drive, Cone pulley drive. State applications/advantages of each drive. [6]

(*b*) A flat belt drive transmits power between driver pulley (ϕ 400 mm) and the driven pulley (ϕ 200 mm). If the belt slip reduces the velocity ratio by 30%, find the % slip at each drive, both of which are equal in magnitude. Also find power transmitted if the driver pulley rotates at 300 r.p.m. and ratio of driving tensions is 2 : 1. [6]

(*c*) The main bearing of a steam engine is 120 mm in diameter and 200 mm in length which supports load of 20 kN at 200 r.p.m. Find heat generated in the bearing with the following data : [6]

$$\frac{c}{d} = 0.001, \quad Z = 0.02 \text{ kg-m/s}$$

Or

8. (*a*) Define the following terms for rolling contact bearings (along with the formulae) static equivalent load, dynamic equivalent load, life of bearing, reliability of bearing. [6]

(*b*) A 100 mm long journal bearing supports a load of 3 kN on 50 mm diameter shaft. The bearing has diametral clearance of 0.1 mm and viscosity of oil is 0.02 kg/m-s at the operating temperature. If the bearing can dissipate heat of 100 J/s, determine maximum safe speed of shaft. [12]

9. (*a*) Explain construction of the following joints with neat sketches : [8]

(*i*) Flanged pipe joints

(*ii*) Hydraulic joint.

(*b*) A 100 mm × 20 mm thick plate is joined with another plate by a single transverse and double parallel fillet welds. Find the length of each weld and their strengths, if :

$\sigma_t = 75$ MPa and .

Also find maximum force that can be applied to the plates. [8]

Or

10. (*a*) Explain construction of knuckle joint and its applications. List

$\tau = 50$ MPa $\sigma_t = 60$ MPa

various parts of the joint and give standard proportions of dimensions of the parts. [8]

(*b*) A seamless steel pipe carries 1000 m^3 of steam per hour at 2.5 N/mm^2 pressure and velocity 20 m/s :

(*i*) Calculate inner diameter and wall thickness of pipe, if

.

(*ii*) Calculate dimensions of a circular flanged pipe joint to be fitted on the pipe, if C = 9 mm (Find number and diameter of bolts, width, thickness and OD of flange. [8]

11. (*a*) Distinguish between thin and thick pipes. Sketch stress distribution in both the cases. [8]

(*b*) What is economic pipe diameter ? State the expressions for diameters of the pipes to be used for the following service :

(*i*) Gases driven by centrifugal compressor

(*ii*) Natural gas pipeline

(*iii*) Carbon steel pipe

(*iv*) Stainless steel pipe. [8]

Or

12. (*a*) With neat sketch explain construction and working of :

(*i*) Gate valves

(*ii*) Globe valves. [8]

(*b*) Explain construction and working of the following positive displacement pumps :

Piston pump, plunger pump, diaphragm pump. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+2**

Seat No.	

[4262]-189

S.E. (Chemical) (Second Semester) EXAMINATION, 2012

CHEMICAL ENGINEERING THERMODYNAMICS–I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) One mole of an ideal gas is compressed in a piston cylinder assembly from the initial state of 0.1 MPa and 300 K till its volume is reduced to 1/15 of the original volume. The process of compression can be approximated as a polytropic process with $n = 1.2$. Determine the final temperature and pressure of the gas. Also calculate the work done on the gas and the heat interaction. [8]

(*b*) Water at 366.65 K is pumped from a storage tank at the rate of 3.15×10^{-3} m^3/s. The motor for the pump supplies work at the rate of 1.5 kW. The water goes through a heat exchanger giving up heat at the rate of 700 kW and is delivered to a second storage at an elevation 15 m above the first tank. Calculate the enthalpy of the water delivered to the second tank ? Enthalpy at 366.65 K is 391.6 kJ/kg. [10]

Or

2. (*a*) Nitrogen gas is confined in a cylinder and the pressure of the gas is maintained by a weight on the piston. The mass of the piston and the weight together is 50 kg. The acceleration due to gravity is 9.81 m/s^2 and the atmospheric pressure is 1.01325 bar. Assume frictionless piston. Determine :

(*i*) The force exerted by atmosphere, the piston and the weight on the gas if piston is 100 mm in diameter.

(*ii*) The pressure of the gas. [9]

(*b*) Explain phase rule. How many degrees of freedom has each of the following systems ?

(*i*) Liquid water in equilibrium with its vapor.

(*ii*) Liquid water in equilibrium with a mixture of water vapor and nitrogen.

(*iii*) A liquid solution of alcohol in water in equilibrium with its vapor. [9]

3. (*a*) One mole of a gas which obeys the relation PV = RT is initially at 300 K and 0.1 MPa. The gas is heated at constant volume till the pressure rises to 0.5 MPa and then allowed to expand at constant temperature till the pressure reduces to 0.1 MPa. Finally the gas is returned to its original state by compressing at constant pressure. Calculate the work done by the gas in each of the processes and also estimate the net work done by the gas. R = 8.314 J/mol.K. [10]

(*b*) A particular gas obeys the relation

$$\left(P + \frac{a}{V^2}\right)(V - b) = RT$$

where a, b, c are constants. Suppose the gas is allowed to expand reversibly and at constant temperature from V_1 to V_2, calculate the work done by the gas. [6]

Or

4. An ideal gas initially at 600 K and 10 bar undergoes a four step mechanically reversible cycle in a closed system. In step 1-2, pressure decreases isothermally to 3 bar, in step 2-3, pressure decreases at constant volume to 2 bar, in step 3-4, volume decreases at constant pressure and in step 4-1, the gas returns adiabatically to its initial state. Calculate Q, W, ΔE and ΔH for each step of cycle. Take $C_p = \frac{7}{2}$ R and $C_v = \frac{5}{2}$ R. [16]

5. It is desired to carry out the following reaction at 800°C. Estimate the standard enthalpy change of the reaction at 800°C if the standard enthalpy change at 298 K is – 41.116 kJ [16]

$$CO + H_2O \rightarrow CO_2 + H_2$$

$Cp° = a + bT + cT^2 + dT^3 + eT^{-2}$ J/mol°K T is in K.

The constants in the heat capacity equation are as follows :

Compound	***a***	***b* × 10³**	***c* × 10⁶**	***d* × 10⁹**	**e × 10⁻⁵**
CO	28.068	4.631	—	—	–0.258
H_2O	28.850	12.055	—	—	1.006
CO_2	45.369	8.688	—	—	–9.619
H_2	27.012	3.509	—	—	0.690

Or

6. (*a*) Ethylene gas and steam at 593 K and atm. pressure are fed to a reaction process in an equimolar mixture :

$$C_2H_4(g) + H_2O(g) \rightarrow C_2H_5OH(l)$$

Liquid ethanol exits the process at 298 K. What is the heat transfer associated with this overall process per mole of ethanol produced ? Use the following data : [10]

	ΔH_{f298} J/mol	A	$B \times 10^3$	$C \times 10^6$	$D \times 10^{-5}$
$C_2H_4(g)$	52510	1.424	14.394	–4.392	—
$H_2O(g)$	–241818	3.470	1.45	—	0.121
$C_2H_5OH(l)$	–277690	3.518	20.00	–6.002	—

(*b*) Calculate the std. enthalpy change at 298.15 K for the reaction : [6]

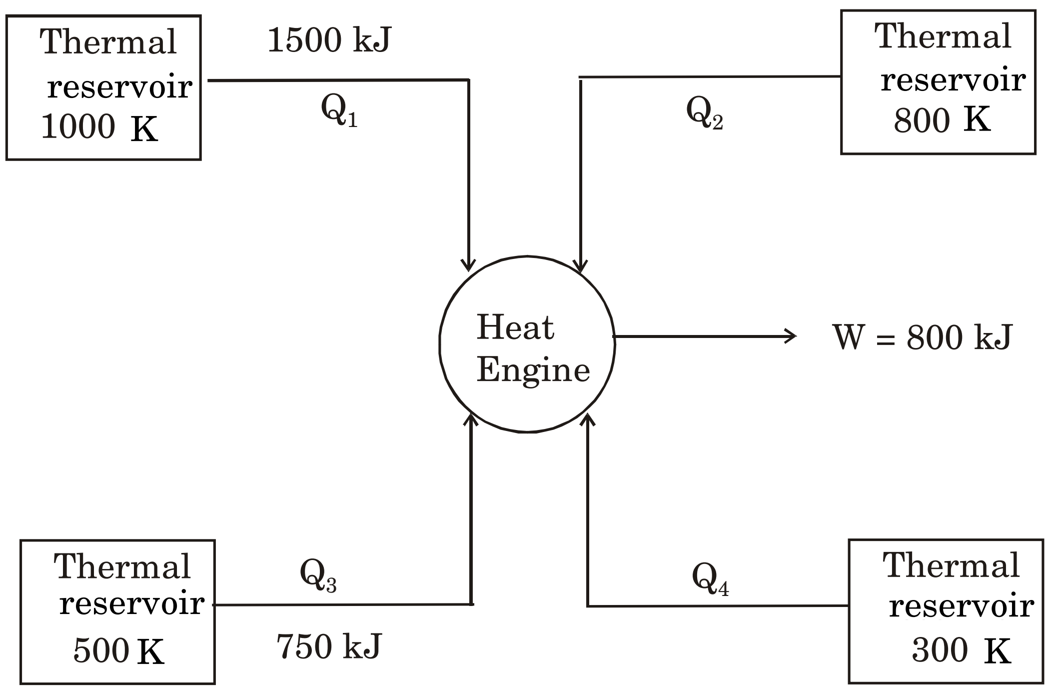
$$C_4H_{10}(g) + \frac{13}{2} O_2(g) \rightarrow 4CO_2(g) + 5H_2O(g)$$

from the following standard enthalpies of formation at 298 K :

Compound	$C_4H_{10}(g)$	$CO_2(g)$	$H_2O(g)$
ΔH°_{f298} (kJ)	–74.943	–393.978	–241.997

SECTION II

7. (*a*) A reversible heat engine operates with four thermal reservoirs. Determine the heat interactions Q_2 and Q_4 : [8]



(*b*) A rigid vessel of 0.06 m^3 volume contains an ideal gas C_v = (5/2) R at 500 K and 1 bar.

(*i*) If heat in the amount of 15 kJ is transferred to the gas, determine its entropy change.

(*ii*) If the vessel is fitted with stirrer that is rotated by a shaft so that work in the amount of 15 kJ is done on the gas, what is the entropy change of the gas if the process is adiabatic ? What is ΔS_{total} ? What is the irreversible feature of the process ? [10]

Or

8. (*a*) A certain mass of air initially at 480 kPa and temperature of 190°C is expanded adiabatically to 94 kPa. It is then heated at constant volume until it attains its initial temperature when the pressure is found to be 150 kPa. State the type of compression necessary to bring back the system to its original pressure and volume. Determine :

(*i*) Adiabatic expansion index

(*ii*) Work done per kg of air.

(*iii*) Change in entropy for all the steps. [12]

(*b*) Write a note on thermodynamic temperature scale. [6]

9. (*a*) Explain residual properties. Derive the following fundamental residual property relation for 1 mol of a substance for closed thermodynamic system : [8]

$$\frac{dG^R}{RT} = V^R \frac{dP}{dT} - H^R \frac{dT}{RT^2}.$$

(*b*) State the defining equations for E, H, G and A. Using principles of 1st and 2nd law of thermodynamics derive the following property relations :

(*i*) $dE = TdS - PdV$

(*ii*) $dH = TdS + Vdp$

(*iii*) $dG = VdP - SdT$

(*iv*) $dA = -PdV - SdT$. [8]

Or

10. (*a*) The equation of state of a certain substance is given by the expression :

$$V = \frac{RT}{P} - \frac{C}{T^3}$$

and the specific heat is given by $Cp = A + BT$, where A, B and C are constants. Derive the expressions for changes in internal energy, enthalpy and entropy for :

(*i*) An isothermal process

(*ii*) An isobaric process. [10]

(*b*) Explain the terms volume expansivity, isothermal compressibility and adiabatic compressibility. [6]

11. (*a*) Linde process is used for air liquefaction. The high pressure gas leaving the compressor is at 120 bar and is cooled to 306 K (516 kJ/kg) before it is sent through the heat exchanger where it exchanges heat with low pressure gas leaving the separator at 2 bar. A 14 K approach is desired at the hot end of the exchanger so that the low pressure gas leaving the exchanger is at 292 K (526 kJ/kg). Enthalpy of saturated liquid and saturated vapor at 2 bar are 121 kJ/kg and 314 kJ/kg respectively. Determine :

(*i*) The fraction of the air liquefied during expansion.

(*ii*) Temperature of the air on the high pressure side of the throttle valve. [10]

(*b*) What are the properties of refrigerant which are required to be considered during choice of it for certain application ? [6]

Or

12. (*a*) Explain air refrigeration cycle. [8]

(*b*) A house has a winter heating requirement of 30 kJ/s and a summer cooling requirement of 60 kJ/s. Consider a heat pump installation to maintain the house temperature at 20°C in winter and 25°C in summer. This requires circulation of the refrigerant through exterior exchanger coils at 30°C in winter and 5°C in summer. Underground coils provide the heat source in winter and the heat sink in summer. For a year round ground temperature of 15°C the heat transfer characteristics of the coils necessitate refrigerant temperature of 10°C in winter and 25°C in summer. What are the minimum power requirements for winter heating and summer cooling ? [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4262]-190

S.E. (Chemical Engg.) (II Sem.) EXAMINATION, 2012

MECHANICAL OPERATIONS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Your answers will be valued as a whole.

(*vi*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vii*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Why there is a need of size reduction in chemical process Industries ? [4]

(*b*) Explain closed circuit grinding and open circuit grinding with the help of flow sheets. [8]

(*c*) How is the particle size measured ? Explain the various techniques used for particle size measurement. [6]

Or

2. (*a*) How is the screen analysis performed on standard screen series ? Explain in detail. [8]

(*b*) A material is crushed in a Blake Jaw Crusher such that the average size of particles is reduced from 50 mm to 10 mm with the consumption of energy of 13.0 kW/(kg/s). What would be the consumption of energy needed to crush the same material of average particle size 75 mm to an average size of 25 mm :

(*i*) Assuming Rittinger's Law applies

(*ii*) Assuming Kick's Law applies

Which of these results would be regarded as being more realistic and why ? [10]

3. (*a*) Define the following terms (any *two*) : [4]

(*i*) Sphericity and shape factor

(*ii*) Screen Effectiveness

(*iii*) Angle of Repose.

(*b*) Describe with a neat sketch the working of rag and flight conveyors. [6]

(*c*) Describe with neat sketch construction of Bucket Elevators. List advantages, disadvantages and applications. [6]

Or

4. Write short notes on : [16]

(*i*) Screw Conveyor

(*ii*) Pneumatic Conveyors

(*iii*) Belt Conveyor

(*iv*) Storage of Solids.

5. (*a*) What is the necessity of mixing and agitation in chemical industries ? Explain the difference between mixing and agitation with suitable examples. [6]

(*b*) Describe with neat sketches "Prevention of swirling and vortex formation". [10]

Or

6. (*a*) Describe with neat sketch, construction and working of Banbury Mixer and Muller Mixer. [8]

(*b*) Draw the sketches of flow patterns with propeller and turbine impeller. [4]

(*c*) Discuss in brief on "Power Consumption of Impellers". [4]

SECTION II

7. (*a*) What are the various factors which affect the rate of filtration ? Derive an expression to calculate the rate of filtration. [10]

(*b*) Describe with a neat sketch the working of plate and frame filter press. [6]

Or

8. (*a*) A rotary filter operating at 2 rpm, filters 1000 lit/min. operating under the same vacuum neglecting the resistance of the filter cloth, at what speed must the filter be operated to give a filtration rate of 2000 lit/min. [10]

(*b*) State factors to be considered while selecting filtration equipment and enlist characteristics of filter media. [6]

9. (*a*) Describe with neat sketches and examples : [8]

(*i*) Aggregate fluidization

(*ii*) Particulate fluidization.

(*b*) Calculate the settling velocity of glass spheres having a diameter of 1.554×10^{-4} m in water at 293.2 K. The slurry contains 60 wt% solid. The density of the glass spheres is 2467 kg/m^3, density of water 998 kg/m^3 and viscosity of water is 1.005×10^{-3} Pa.s. [10]

Or

10. (*a*) Distinguish between Free settling and Hindered settling. [4]

(*b*) Explain mechanism of sedimentation and classify equipments used for sedimentation. [6]

(*c*) What is minimum fluidization ? Derive expression for it. [8]

11. Write short notes on : [16]

(*i*) Scrubbers

(*ii*) Gravity settling tank

(*iii*) Fabric filters

(*iv*) ESP.

Or

12. (*a*) Explain Jigging separation technique with neat diagram. [6]

(*b*) Explain froth floatation with neat diagram. [6]

(*c*) Explain capacity and effectiveness of screen. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-191

S.E. (Polymer/Petroleum/Petro-chemical Engg.)

(I Sem.) EXAMINATION, 2012

ENGINEERING CHEMISTRY—I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) State Huckel rule. Explain aromaticity of cyclopentadienyl anion and annulene on the basis of Huckel rule. [6]

(*b*) Explain Inductive effect with suitable example. [6]

(*c*) Explain : [4]

(*i*) Aniline is weaker base than aliphatic amines.

(*ii*) Formic acid is stronger acid as compared to acetic acid.

Or

2. (*a*) Explain structure of carbonium ion, carbanion and free radical. [6]

(*b*) Explain : [6]

(*i*) Electrophile

(*ii*) Homolytic fission

(*iii*) Nucleophile.

(*c*) Explain : [4]

(*i*) Amides are found to be neutral

(*ii*) Phenols are acidic than alcohols.

3. (*a*) Explain Friedel-Craft alkylation and acylation of benzene. [6]

(*b*) Explain hydration and dimerisation of alkenes with suitable example. [6]

(*c*) Explain aldol condensation shown by acetaldehyde. [4]

Or

4. (*a*) Predict the product (any *three*) : [6]

(*i*) Tert. butyl alcohol $\xrightarrow[90^\circ]{20\%\ H_2SO_4}$

(*ii*) Sodium propanoate $\xrightarrow{\text{Electrolysis}}$

(*iii*) Ethyl acetate $\xrightarrow{\text{Sodium ethoxide}}$

(*iv*) Ethyl bromide $\xrightarrow{\text{Aqu. NaOH}}$

(*b*) Explain mechanism of Beckmann rearrangement shown by benzophenone. [6]

(*c*) Explain nitration of nitrobenzene. [4]

5. (*a*) Explain the following terms with suitable example : [6]

(*i*) Enantiomers

(*ii*) Distereoisomers.

(*b*) Write a note on Skraup synthesis of quinoline. [6]

(*c*) Explain the geometrical isomerism shown by 2-butene and 1, 2-dimethyl cyclopropane. [6]

Or

6. (*a*) Explain conformations of methyl cyclohexane. [6]

(*b*) Explain main reactions shown by Furan. [6]

(*c*) Explain nucleophilic substitution in pyridine. [6]

SECTION II

7. (*a*) What is meant by 'vapour pressure' of a liquid ? Define : [6]

(*i*) boiling point and

(*ii*) freezing point

of a liquid on the basis of vapour pressure.

(*b*) Explain how critical constants can be determined experimently. [6]

(*c*) Calculate pressure exerted by one mole of methane in a 250 ml container at 300°K using van der Waals' equation and ideal gas equation : [4]

a = 2.253 lit.^{2} atm. mole^{-2}, b = 0.0428 lit. mol^{-1}

R = 0.0821 lit. atm. mole^{-1} . K.

Or

8. (*a*) Explain Andrew's experiment for carbon dioxide. [6]

(*b*) Derive kinetic gas equation for ideal gases. [6]

(*c*) Calculate rms, average and most probable velocities for carbon dioxide molecule at 27°C (M = 44). [4]

9. (*a*) Define 'batteries'. Give their classification with *one* example each. [6]

(*b*) Write a short note on lead acid battery. [6]

(*c*) What are the advantages and disadvantages with H_2-O_2 fuel cell ? [5]

Or

10. (*a*) Represent Li-ion battery. Give charging and discharging mechanism of it. [6]

(*b*) Explain construction and working of Zn-MnO_2 battery. Give reactions also. [6]

(*c*) Give applications of secondary batteries in modern technology. [5]

11. (*a*) Show that boiling point elevation is a colligative property of dilute solution of a non-electrolyte. [6]

(*b*) Give experimental method of determination of boiling point of solvent and solution. [6]

(*c*) A solution of $Ca(NO_3)_2$ having concentration 20 g/500 ml boils at 100·158°C. Molal boiling point elevation constant for water is 0.52. Calculate degree of dissociation of $Ca(NO_3)_2$. M = 164. [5]

Or

12. (*a*) What is Raoult's law ? Explain it with the help of graph. [6]

(*b*) Derive the equation $\alpha = \dfrac{i-1}{v-1}$ for solution of electrolyte. What is meant by dissociation of an electrolyte ? [6]

(*c*) Find osmotic pressure of 0.5 N solution of NaCl at 27°C. Find factor '*i*', if observed osmotic pressure is 20 atm. [5]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8**

Seat No.	

[4262]-192

S.E. (Poly./Petro) (I Sem.) EXAMINATION, 2012

ENGINEERING MATERIALS SCIENCE AND TECHNOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Use of electronic pocket calculator is allowed.

(*v*) Figures to the right indicate full marks.

SECTION I

1. (*a*) What are smart materials ? Explain with *one* example and its application. [5]

(*b*) What are liquid crystal polymers ? What are their properties and applications ? [5]

(*c*) How does "ionic bond" differ from "covalent bond" ? [6]

Or

2. (*a*) What is ASTM grain size number ?

Two specimens of identical chemical composition are tested for grain size under 100X magnification. The first specimen is found 32 grains/inch^2 and the second was 64 grains/inch^2. Which will have higher fatigue strength ? What will be their ASTM grain size numbers ? [5]

(*b*) What is the effect of "grain boundaries" on different mechanical properties of materials ? [5]

(*c*) Why does the hardness of crystalline material increase when it is plastically deformed ? [6]

3. (*a*) Define "Component" and "Phase". Draw phase equilibrium diagram for pure iron. Indicate the triple points in the diagram. Applying Gibb's phase rule, calculate degree of freedom at any *one* triple point. [6]

(*b*) Draw Fe-Fe_3C phase equilibrium diagram. Label all the phases. Indicate eutectic and eutectoid points. Draw micro-structure of eutectoid composition. [6]

(*c*) Draw micro-structure of any *one* alloy used for plain bearing of an automobile engine. What is the main characteristic requirement of a bearing material ? [4]

Or

4. (*a*) Draw micro-structure of an annealed cartridge brass. What is the significance of two parallel lines observed in some grains ? [5]

(*b*) Draw micro-structure of a "cermet". Explain its properties and applications. [6]

(*c*) What is tempering heat treatment ? Draw a micro-structure of 0.6% C tempered steel. [5]

5. (*a*) Classify the materials on the basis of their response to magnetic fields. Explain in brief any *one* of them, with its applications. [6]

(*b*) Explain with the help of a diagram, the function of a "Ruby laser" and Xenon flash lamp. What are its applications ? [6]

(*c*) What is Creep ? How can creep strength be increased ? Draw micro-structure of crack developed due to heavy creep load. [6]

Or

6. (*a*) What is true strain ?

A cylindrical metal tensile specimen has a diameter of 10 mm and original length of 50 mm after the tensile test, the diameter in the necked region of the specimen is 7 mm. Calculate ductility and true strain at fracture. [6]

(*b*) What are thermal stresses ?

Ceramic enamel is to be applied to an alloy steel plate. The ceramic has fracture strength of 45 MPa and the modulus of elasticity of 90 GPa. Its coefficient of thermal expansion is $9 \times 10^{-6}/°C$. Design maximum temperature change that can be allowed without cracking ceramic. Assume coefficient of thermal expansion of alloy steel is $11 \times 10^{-6}/°C$. [6]

(*c*) What is specular reflection of light ? Explain any *one* application with sketch.

A light travels through a silica glass of refractive index 1.6 in a filter lens of refractive index 2.4 at a normal incidence in a microscope. The lenses are cemented together. How much light is reflected at the internal surface ? [6]

SECTION II

7. (*a*) Select the composite material for the following components and justify your selection (any *three*) : [9]

(*i*) ATM Card Strip

(*ii*) Overhead contact of an electric railway engine

(*iii*) Rock drill tips

(*iv*) Boeing 787 Aeroplane body and wings.

(*b*) Compare the stiffness of unidirectional continuous fibre strengthened composite when load is applied in longitudinal and transverse direction with respect to the fibre alignment. A continuous and aligned glass fibre reinforced composite consists of 35% volume of glass fibres having modulus of elasticity 70 GPa. Remaining Epoxy resin displays a modulus of elasticity 5.5 GPa. Compute stiffness of composite in iso-stress and iso-strain conditions. [7]

Or

8. (*a*) What is the principle of fibre strengthening in a typical fragmented fibre reinforced composite ?

In a discontinous glass fibre reinforced composite, the shear yield strength of the polyester resin matrix is 15 MPa. The critical fibre length by design is 3 mm and is having diameter of 25 microns. Comment on the UTS of the glass fibre. [5]

(*b*) What are carbon-carbon composites ? What are their properties and applications ? [5]

(*c*) Explain fibre architecture with sketch, which helps to make composite strong in all directions within the plane. Why such composites are weak in direction normal to the fibre planes ? [6]

9. Justify the following statements (any *four*) : [16]

(*i*) Stainless steel welded joint may corrode when immersed in marine water.

(*ii*) Annealed steel has more corrosion resistance than hardened steel.

(*iii*) Welding is always better joining technique for steel water tank than mechanical fastening.

(*iv*) Oil film is maintained on plane bearings in automobile engines.

(*v*) Zinc coated steel sheets are used as a roof of workshop shade.

Or

10. (*a*) Comment on severity of attack on Aluminium in Oxygen and Chlorine containing gaseous environments.

The densities for Al, Al_2O_3 and $AlCl_3$ are 2.7 gm/cm^3, 3.8 gm/cm^3 and 2.44 gm/cm^3 respectively. The atomic weights for Al, O and Cl are 26.98, 16 and 35.45 AMU respectively. [6]

(*b*) During corrosion tests a current density of 1.72 A/m^2 was measured for a steel sample immersed in organic waste water. Calculate weight loss of the same storage tank per year. Its total exposed area is 180 m^2. The atomic weight is 55.85 g/mol and the valence of the metal is 2. Faraday's constant is 96,500 C/mol. [6]

(*c*) Why do the strength and stiffness of Polyethylene seriously degrade when exposed to direct sunlight for a long period ? [4]

11. (*a*) Explain method of manufacturing of automobile tyre. [6]

(*b*) What are the different methods of powder manufacturing ? Explain any *one* with sketch. [6]

(*c*) Explain how the "Pre-stressed Cement Concrete" is manufactured. [6]

Or

12. Write short notes on the following (any *three*) : [18]

(*i*) Surface Hardening treatments

(*ii*) Welding operation

(*iii*) Sintering process

(*iv*) Forming of glass sheet from molten glass.

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-193

S.E. (Polymer/Petroleum/Petrochemical)

(First Sem.) EXAMINATION, 2012

CHEMICAL PROCESS CALCULATIONS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) The permeability of sand is 1×10^{-4} cm/s. If crude oil is spilled on sandy soil, how long in hours will the oil take to reach a water well 150 m away ? [8]

(*b*) A solution of caustic soda in water contains 20% NaOH (by weight) at 333 K. The density of the solution is 1.196 kg/l. Find the molarity, normality and molality of the solution. [8]

Or

2. (*a*) Explain with formulae, four scales used in Chemical industry for measuring specific gravity of a solution. [8]

(*b*) A weight of 1.1 kg of CO_2 occupies a volume of 33 litre at 300 K. Using the van der Waals equation of state, calculate the pressure. Given : For CO_2, van der Waals constants are :

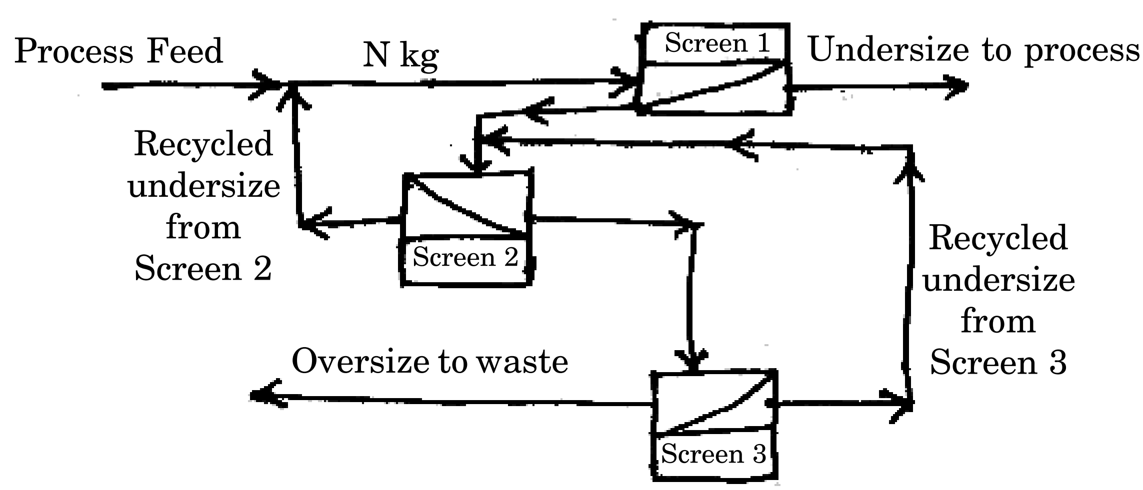
$a = 360\ [(\mathrm{m}^3)^2 \cdot \mathrm{kPa}]/(\mathrm{kmol})^2$ and $b = 4.3 \times 10^{-2}\ \mathrm{m}^3/\mathrm{kmol}$. [8]

3. (*a*) In a Petrochemical industry, a double effect evaporator system concentrates weak liquor containing 9% (by weight) solids to produce a lye containing 21% (by weight) solids. Calculate the amount of water evaporated for 9000 kg of feed in the evaporator. [8]

(*b*) A sample of coal from Andrew Yules Colliery, West Bengal, is found to contain 67.2% carbon and 22.3% ash (by weight). The refuse obtained at the end of the combustion is analyzed to contain 7.1% carbon and the rest ash. Compute the % of the original carbon remaining un-burnt in the refuse. [8]

Or

4. In a Polymer industry, a three-stage cascade screening system is employed to remove the oversize foreign particles from dilute slurries. If E_1, E_2 and E_3 are the functions indicating fractions of foreign particles (i.e. efficiency of each screen/100) removed in the three screens respectively, develop a general relationship for the overall efficiency of the system involving two recycle operations. [16]



5. (*a*) Define Conversion, Yield and Selectivity. [6]

(*b*) Monochloroacetic acid (MCA) is manufactured in a semibatch reactor by the action of glacial acetic acid with chlorine gas at 373 K in the presence of PCl_3 catalyst. MCA thus formed will further react with chlorine to form dichloroacetic acid (DCA). To prevent the formation of DCA, excess acetic acid is used. A small scale unit which produces 5000 kg/d MCA requires 4536 kg/d of chlorine gas. Also, 263 kg/d of DCA is separated in the crystallizer to get almost pure MCA product. Find the % conversion, % yield of MCA and selectivity. [12]

Or

6. Methanol is produced by the reaction of :

$$CO + 2H_2 \rightarrow CH_3OH$$

The side reaction is :

$$CO + 3H_2 \rightarrow CH_4 + H_2O$$

At a pressure of 6.9 MPa a and a temperature 574.6 K, the conversion per pass is 12.5%. Of this, 87.5% is reached by reaction I and rest by II. The fresh feed contains 32% CO (by mole) and 68% H_2 (by mole). The stream leaving the reactor passes through a condenser and a separator. The CO and H_2 leaving this unit are recycled. The methane leaves as a gas and the liquid mixture of methanol and water passes to a distillation column for the concentration of methanol. Compute :

(*a*) the analysis, mole % and weight % of the hot gaseous stream leaving the reactor,

(*b*) the methanol content, weight % of the liquid stream,

(*c*) the recycle ratio, and

(*d*) the methane purged. [18]

SECTION II

7. (*a*) Explain bubble point and dew point determination using flash calculations with neat sketch of phase envelope. [8]

(*b*) Vapor pressures of A and B in a mixture the following Raoult's law are :

$$\ln P_A^{Sat} = 14.27 - \frac{2945}{t + 224};$$

$$\ln P_B^{Sat} = 14.20 - \frac{2973}{t + 209}.$$

If the bubble point of a mixture of A and B is 76°C at a total pressure of 80 kPa, find the composition of the first vapour that form. [8]

Or

8. Assuming the validity of Raoult's law, perform the following calculations for Benzene (1)/Toluene (2) :

(*a*) Given : $x_1 = 0.33$, T = 100°C, find y_1 and P.

(*b*) Given : $y_1 = 0.33$, T = 100°C, find x_1 and P.

(*c*) Given : $x_1 = 0.33$, P = 120 kPa, find y_1 and T. [16]

Component	**A**	**B**	**C**
Benzene	13.8594	2773.78	220.07
Toluene	14.0098	3103.01	219.79

9. (*a*) Write in brief on various forms and types of energy. [8]

(*b*) Pure methane is heated from 303 K to 523 K at atmospheric pressure. Calculate the heat added per kmol methane.

Given : $a = 19.2494$; $b = 52.1135 \times 10^{-3}$; $c = 11.973 \times 10^{-6}$;

$d = -11.3173 \times 10^{-9}$. [8]

Or

10. Toluene is heated from 290 K to 350 K at the rate of 0.25 kg/s. Calculate the heat required to be added to toluene by using two sets of constants and compute the % difference : [16]

	a	$b \times 10^{+3}$	$c \times 10^{+6}$	$d \times 10^{9}$
Set I	1.8083	812.223	–1512.67	1630.01
Set II	–56.276	1768.423	–5192.623	5497.39

11. (*a*) With formulae, explain the determination of latent heat of vaporization using Watson and Riedel equations. [8]

(*b*) For o-xylene, calculate :

(*i*) latent heat of vaporization at 298 K using Watson equation, and

(*ii*) latent heat of vaporization at T_B using Riedel equation.

Given : P_C = 3730 kPa; T_C = 630.3 K; T_B = 417.5 K;

λ = 36819 kJ/kmol at 417.5 K. [10]

Or

12. Calculate the heat of formation of ethylene gas at 298.15 K using the given heat of combustion data. The standard heat of formation of ethylene gas is 52.5 kJ/mol. Comment on any difference generated.

Given : Heat of combustion of Carbon = –393.51 kJ/mol

Heat of combustion of H_2 gas = –241.82 kJ/mol

Heat of combustion of ethylene = –1323.1 kJ/mol. [18]

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-194

S.E. (Polymer/Petroleum/Petrochemical) (First Sem.)

EXAMINATION, 2012

MOMENTUM TRANSFER

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Attempt Q. No. **1** *or* **2**, Q. No. **3** *or* **4**, Q. No. **5** *or* **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of electronic calculators is allowed.

(*v*) Draw neat sketch wherever necessary.

SECTION I

1. (*a*) Explain the significance of study of momentum transfer in Petroleum, Petrochemical and Polymer process industry. Justify with *two* suitable exmaples of each field. [6]

(*b*) Distinguish between : [6]

(*i*) Newtonian and Non-Newtonian fluids

(*ii*) Adhesion and Cohesion

(*iii*) Dynamic and Kinematic viscosity.

(*c*) For water at 20°C, convert a kinematic viscosity of 0.01 cm^2/sec to Centi-stoke, Pa-sec, poise and centipoise. [4]

Or

2. (*a*) Explain what you mean by momentum transfer in a fluid. A fluid with viscosity 0.018 g/cm.s, is flowing through two parallel flat plates separated by a distance of 0.6 cm, at 273 K. The velocity of lower plate is 8 cm/s, while upper plate velocity is stationary. Calculate the shear stress and velocity gradient. [8]

(*b*) Draw the rheological diagram and show various types of fluids in it. Give at least *two* examples of each. [8]

3. (*a*) State Pascal's Law. Starting from basic principles derive the hydrostatic equation. [6]

(*b*) Explain the velocity potential function and stream function. Derive the Laplace equation for both functions. [6]

(*c*) For a given velocity vector, $V = 3xyi + 4yzj + 6(zx - t^2)k$, determine the velocity at (1, 1, 1) at time 2 seconds, acceleration at (1, 1, 1) at time 1 second and Rotation at (1, 1, 1) at time 3 seconds. [6]

Or

4. (*a*) In a two-dimensional incompressible flow, the velocity components are $u = 2x$; $v = (1 - 2y)$ find the stream function and the velocity potential function. [4]

(*b*) With a neat diagram show absolute pressure, positive and negative gauge pressures, standard atmospheric pressure with the gauge pressure. Convert pressure of 2000 Pa into GPa absolute. [6]

(*c*) Define the following types of flows with suitable examples : [8]

(*i*) Steady and Unsteady flow

(*ii*) Laminar and Turbulent flow

(*iii*) Rotational and Irrotational flow

(*iv*) Uniform and Non-uniform flow.

5. (*a*) Derive Euler's equation of motion and hence obtain the Bernoulli equation from it. Explain the 4 modifications to the Bernoulli equation with examples. [8]

(*b*) A 30 cm throat diameter and 50 cm inlet diameter venturimeter is installed in a vertical pipe carrying water. The flow is in upward direction. The difference between the levels of throat and inlet is 80 cm. The water-mercury differential manometer gives deflection of 17.5 cm of mercury. Find the discharge of water. Take coefficient of discharge of meter as 0.98. [8]

Or

6. (*a*) Explain principle and construction of Venturimeter. Derive the expression for flow rate through venturimeter. [8]

(*b*) A pipeline carrying oil of specific gravity 0.87 changes in diameter from 200 mm at position 1 to 500 mm diameter at position 2 which is 4 meters at higher level. If the pressures at 1 and 2 are 100 kN/m^2 and 60 kN/m^2 respectively and the discharge is 0.2 m^3/sec, determine the loss of energy in terms of head and justify the direction of flow. [8]

SECTION II

7. (*a*) Draw Moody's diagram and explain variation of friction factor f in laminar, transition and turbulent flow regimes. Explain the use of Moody's chart in flow through pipe calculations. [8]

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

(*i*) Hydraulic diameter

(*ii*) Equivalent length

(*iii*) No slip condition

(*iv*) Hydrodynamic rough boundary.

Or

8. (*a*) Derive the expression for shear stress distribution in steady laminar flow through a circular pipe. [8]

(*b*) Oil having specific gravity 0.8 is pumped through a horizontal pipe 150 mm diameter and 2000 m long at the rate 20 lit/sec. The pump requires 7 kW at 70% efficiency. Taking friction factor = 64/Re, determine the viscosity of oil. [8]

9. (*a*) Explain with neat sketch : [8]

(*i*) Momentum thickness

(*ii*) Energy thickness

(*iii*) Displacement thickness.

(*b*) Discuss applications of multiphase flows in process industry. Give the expression for Ergun's equation and Darcy's law and give its application. [8]

Or

10. (*a*) What is boundary layer ? Give the importance of boundary layer theory in heat and mass transfer operations. [8]

(*b*) Explain with the help of neat sketch various multiphase flow regimes in vertical pipe. What is the flow regime map ? [8]

11. (*a*) Explain the following with significance : [8]

(*i*) Euler No.

(*ii*) Mach No.

(*iii*) Weber No.

(*iv*) Froude No.

(*b*) What is NPSH ? [2]

(*c*) Draw a neat labelled sketch of a centrifugal pump and explain the function of each part. Also show the basic pump heads on the sketch. [8]

Or

12. (*a*) Give the utility of Dimensional Analysis. What are repeating variables ? Explain the detailed procedure of dimensional analysis using Buckingham's π method. [9]

(*b*) A centrifugal pump delivers 0.3 kg/s of water through a pipe of 30 mm diameter and 50 m long in horizontal direction and up through vertical height of 9 m. The control valve and the pipe fittings equivalent to 50 pipe diameters. The frictional loss of head in the suction pipe is 0.5 m. Determine the power required by the pump. The efficiency of the pump is 60 percent. Density of water = 1000 kg/m^3, Viscosity of water = 10^{-3} Ns/m^2. The friction factor is given by $f = 0.046\ (\mathrm{Re})^{-0.2}$. [9]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+3**

Seat No.	

[4262]-195

S.E. (Polymer/Petroleum/Petrochemicals) (First Sem.)

EXAMINATION, 2012

STRENGTH OF MATERIALS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Your answer will be valued as a whole.

(*vi*) Use of electronic pocket calculator is allowed.

(*vii*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define Volumetric stress and Volumetric strain. Derive the expression for the relationship between them in terms of Poisson's Ratio. [6]

(*b*) Define Modulus of Elasticity and Modulus of Rigidity. Derive the relationship between them. [4]

(*c*) A gun metal rod, 20 mm diameter, passes centrally through a steel tube of 25 mm and 30 mm internal and external diameters. They are rigidly connected together at the ends at room temperature. Find the stresses in each metal, when the common temperature rises by 100°C. Take :

Coefficient of expansion per °C for steel = 12×10^{-6}

Coefficient of expansion per °C for gun metal = 20×10^{-6}

Modulus of Elasticity for gun metal = 100 GPa

Modulus of Elasticity for steel = 200 GPa. [8]

Or

2. (*a*) If the load W falls freely through a distance '*h*' before it strikes the rigid collar attached to the bottom of an uniform bar with cross-section A. Then derive the expression for maximum instantaneous stress and maximum instantaneous elongation of the bar. [6]

(*b*) For a member having solid circular cross-section diameter is '*d*' at one end and it linearly increases to D at other end over a length 'L'. Find its change in length under the action of axial load 'P'. [6]

(*c*) A metal bar 250 mm long 50 mm × 50 mm in cross-section is subjected to a pull of 30 kN in the direction of its length. Calculate the change in volume, if Poisson's ratio = 0.25 and Young's Modulus = 200 GPa. [6]

3. (*a*) Derive the expression on an oblique plane of a body subjected to direct stresses in two matually perpendicular directions accompanied by a simple shear stress. [8]

(*b*) A hollow steel shaft of 300 mm external diameter and 200 mm internal diameter has to be replaced by a solid alloy shaft. Assuming the same values of polar modulus for both, calculate the diameter of latter and work out the ratio of their torsional rigidity. Take modulus of rigidity of steel is 2.4 times the modulus of rigidity for alloy. [8]

Or

4. (*a*) A point in a strained material is subjected to a compressive stress of 80 N/mm^2 and a shear stress of 56 N/mm^2. Determine graphically, the minimum and maximum intensity of direct stresses. [8]

(*b*) Find the maximum torque, that can be applied safely to a shaft of 500 mm diameter. The permissible angle of twist is 1.5 degree in a length of 7.5 m and the shear stress is not to exceed 42 N/mm^2. Take Shear Modulus = 84.4 GPa. [8]

5. (*a*) Derive the expressions for longitudinal stress and circumferential stress for thin cylinder. Also find longitudinal strain and circumferential strain. [8]

(*b*) A spherical shell of 120 mm diameter has to be withstand the pressure of 40 MPa. If the permissible tensile stress is 80 MPa, calculate the thickness of the shell. [8]

Or

6. (*a*) A pipe of 500 mm internal diameter and 80 mm thickness contains a fluid at a pressure of 15 MPa. Find the maximum and minimum hoop stress across the section. Also draw radial pressure and hoop stress variation over the thickness of shell. [8]

(*b*) Calculate the increase in volume enclosed by a boiler shell 2.4 m in length and 1.0 m in diameter, when it is subjected to an internal pressure of 1.6 N/mm^2. The wall thickness is such that the maximum tensile stress in the shell is 21.5 N/mm^2 under this pressure. Take E = 210 GPa and Poisson's ratio = 0.28. [8]

SECTION II

7. (*a*) A beam with internal hinge at B is loaded as shown in Fig. 1. Draw the shear force diagram and bending moment diagram for the beam. [10]

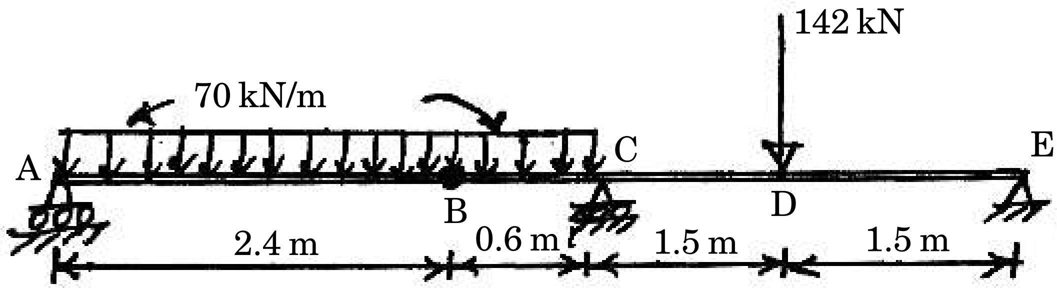


Fig. 1

(*b*) Derive the part of the equation for bending $\frac{F}{Y} = \frac{E}{R}$ with usual notations. [6]

Or

8. (*a*) The SFD of a beam subjected to loading is shown in Fig. 2. Draw the loading diagram for the beam and also the corresponding BMD. Assume that no couples act on the beam. [8]

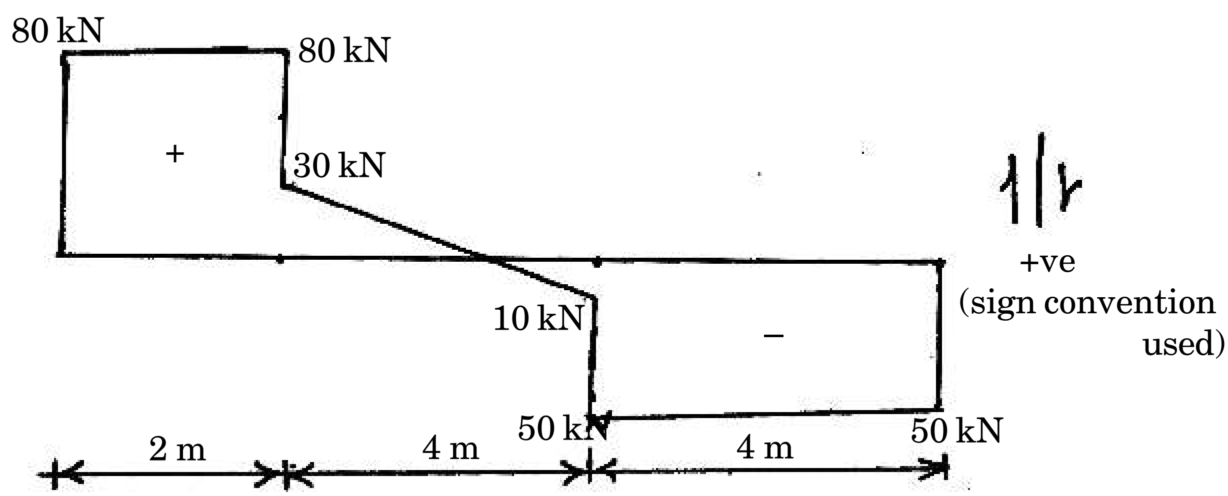


Fig. 2

(*b*) Find the width '*b*' of the flange for the cross-section of beam shown in Fig. 3. Such that bending compressive stress is three times the bending tensile stress when subjected to sagging BM. [8]

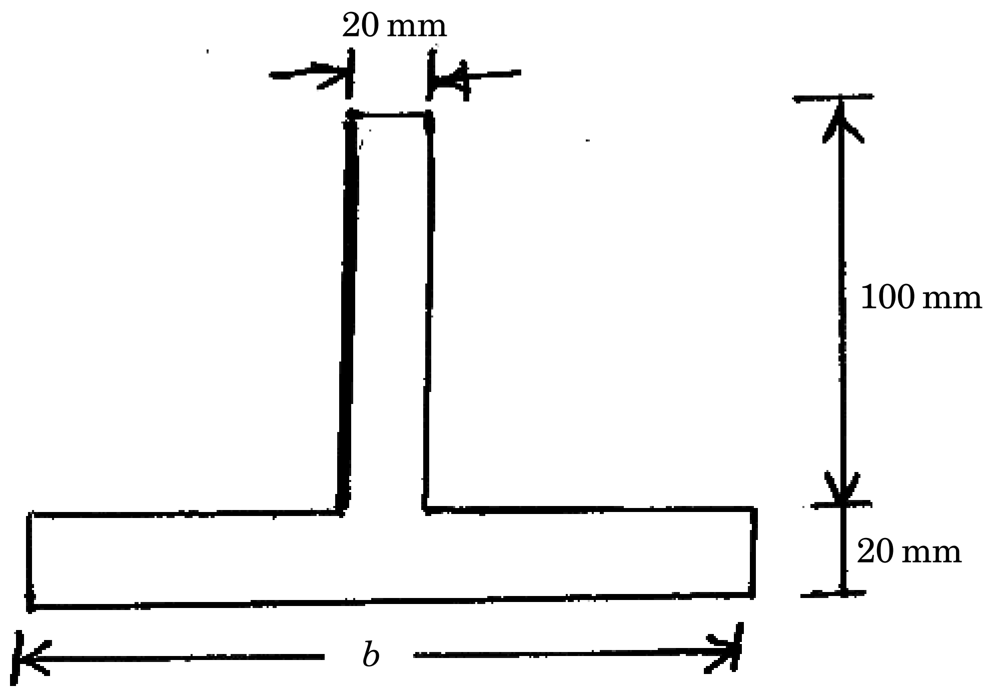


Fig. 3

9. (*a*) Derive the equation $q = \frac{SA\bar{y}}{Ib}$ for a beam section with usual notations. [10]

(*b*) A compression member of 500 mm effective length consists of a solid 24 mm diameter aluminium rod. In order to reduce the weight of the member by 25%, the solid rod is replaced by a hollow rod of outer diameter 24 mm and inner diameter 12 mm. Determine :

(*i*) percentage reduction in the critical load

(*ii*) the value of the critical load for the hollow rod. [6]

Or

10. (*a*) A cantilever beam of 1.3 m span has a rectangular cross-section 150 mm × 250 mm and carries a uniformly distributed load throughout its length. If the permissible stress in bending is 7 MPa and permissible stress in shear is 1 MPa, find the maximum value of uniformly distributed load, the beam can carry. [8]

(*b*) A hollow cylindrical cast iron column is 6 m long with both ends fixed. Determine the minimum diameter of the column if it is to carry a safe load of 300 kN with a factor of safety of 4. Take the internal diameter as 0.7 times the external diameter. Take $f_c = 550$ N/mm^2 and $a = \dfrac{1}{1600}$ in Rankine's formula. [8]

11. (*a*) A beam ABC of length 12 m has one support at the left end and the other support at 8 m from the left end. The beam carries a point load of 12 kN at the right end as in Fig. 4. Find the slopes over each support and the deflection at the right end. Take E = 2×10^5 N/mm^2, I = 5×10^8 mm^4. [9]

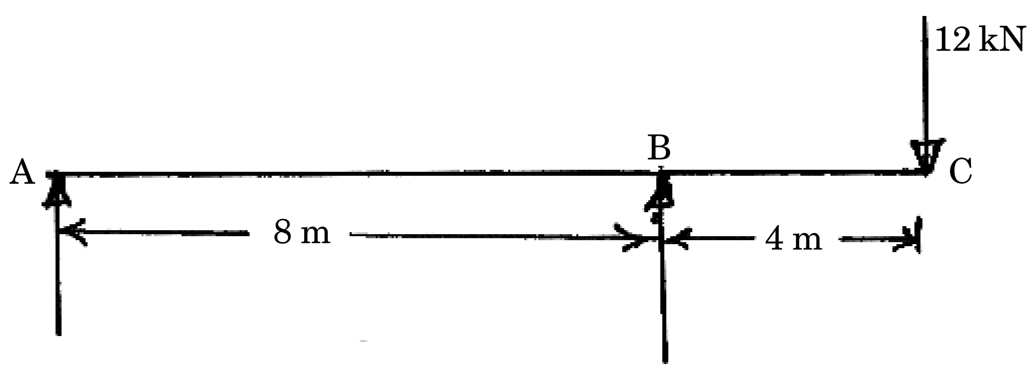


Fig. 4

(*b*) The maximum allowable shear stress in a hollow shaft (external diameter = twice internal diameter) is 80 N/mm^2. Determine the diameter of the shaft if it is subjected to a torque of 4 kNm and a bending moment of 3 kNm. Hence find the major and minor principal stress developed in the shaft. [9]

Or

12. (*a*) A beam of length 20 m is simply supported at its ends and carries two point loads of 4 kN and 10 kN at a distance of 8 m and 12 m from left end respectively. Calculate :

(*i*) deflection under each load;

(*ii*) maximum deflection

$E = 2 \times 10^5$ N/mm^2, $I = 1 \times 10^9$ mm^4. [9]

(*b*) For the column bracket riveted eccentric connection shown in Fig. 5, find the maximum shear stress developed in the rivets; if the diameter of each rivet = 24 mm. [9]

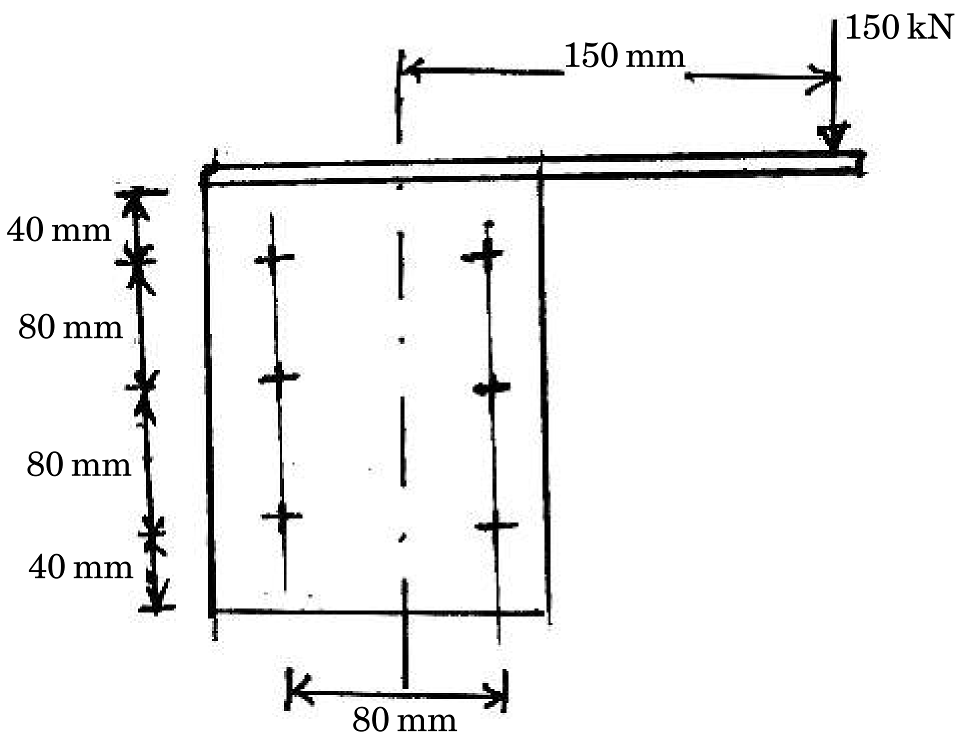


Fig. 5

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-196

S.E. (Petroleum/Petrochem./Polymer)

(II Sem.) EXAMINATION, 2012

ENGINEERING CHEMISTRY—II

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

SECTION I

1. (*a*) Give classification of carbohydrates. [6]

(*b*) Draw Haworth's projection formula for : [6]

(*i*) Maltose

(*ii*) Amylopectin

(*iii*) Cellulose.

(*c*) Discuss reaction of glucose with mild and strong oxidising agent. [4]

Or

2. (*a*) Give classification of amino acids. [6]

(*b*) Explain α-helical and β-pleated structure of proteins. [6]

(*c*) Explain *four* factors affecting enzyme activity. [4]

3. (*a*) Explain the following conversion :

Carboxylic acid $\rightarrow$ acid chloride $\rightarrow$ amide. [6]

(*b*) Explain preparation of an aldehyde by : [6]

(*i*) Oxidation of primary alcohol

(*ii*) Reduction of an acid chloride.

(*c*) Explain Gabriel synthesis for primary amines. [4]

Or

4. (*a*) Discuss synthesis of alkanes starting from : [6]

(*i*) alkyl halide

(*ii*) ketone

(*iii*) primary alcohol.

(*b*) Explain : [6]

(*i*) Koch reaction

(*ii*) Rosenmund reduction.

(*c*) Give *two* oxydative methods for synthesis of Ketones. [4]

5. (*a*) Using spectroscopic methods how will you distinguish between : [6]

(*i*) Acetone and acetaldehyde

(*ii*) Cyclohexanol and phenol.

(*b*) State and explain Beer-Lambert's law. [6]

(*c*) Define : [6]

(*i*) Chromophore

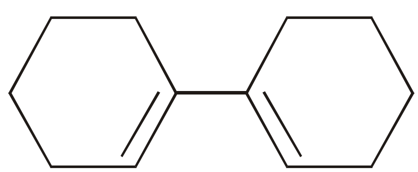
(*ii*) Bathochromic shift

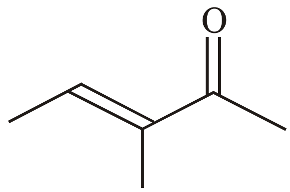
(*iii*) Chemical shift

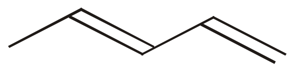
(*iv*) Hypsochromic shift.

Or

6. (*a*) Find λ_{max} for the following compounds : [6]

(*i*) 

(*ii*) 

(*iii*) 

(*b*) By I.R. spectroscopy, how will you determine presence of : [6]

(*i*) —C ≡ C—

(*ii*) $>C=C<$

(*iii*) $-\overset{\overset{\large O}{\|}}{C}-OH$.

(*c*) Discuss applications of NMR spectroscopy with suitable examples. [6]

SECTION II

7. (*a*) Give postulates of VBT. Explain structure of water molecule on the basis of VBT. [6]

(*b*) Draw molecular orbital diagram for nitrogen molecule. Explain triple bonding in the molecule. [6]

(*c*) Find atomic number of an element, if the quantum numbers for last electron are $n = 3$, $l = 2$, $m = -1$ and $s = -$. [4]

Or

8. (*a*) What is meant by hybridisation ? Explain structure of $BeCl_2$ molecule on the basis of hybridisation. [6]

(*b*) Draw molecular orbital diagram for oxygen molecule. Explain magnetic behaviour of the molecule using the diagram. [6]

(*c*) Write electron-configuration of iron atom. Write quantum numbers for last electron of iron. [4]

9. (*a*) What is meant by transition elements ? Give electronic configuration of elements of 1st transition series. [6]

(*b*) Find EAN, O-S and C.N. of metal ion in the following (any *two*) : [6]

(*i*) $\left[Fe(CO)_5\right]$

(*ii*) $K_4\left[Fe(CN)_6\right]$

(*iii*) $\left[Cu\left(NH_3\right)_4\right]SO_4$.

(*c*) With the help of proper example explain : [5]

(*i*) Co-ordination number

(*ii*) Ligand

(*iii*) Complex ion.

Or

10. (*a*) On the basis of VBT, explain tetrahedral structure of $[NiCl_4]^{2-}$. [6]

(*b*) On the basis of CFT, explain magnetic properties of octahedral cobalt complexes considering ammonia and water molecule as ligands. [6]

(*c*) Calculate CFSE for the following complex ions : [5]

(*i*) $\left[Fe(H_2O)_6\right]^{3+}$

(*ii*) $\left[Fe(CN)_6\right]^{3-}$.

11. (*a*) Explain experimental setup for thermogravimetric analysis. [6]

(*b*) Give principles of atomic absorption spectroscopy. [6]

(*c*) What is meant by ionisation energy ? 2nd I.E. > 1st I.E. for any divalent metal. Explain. [4]

Or

12. (*a*) What is meant by chromatography ? Give classification of chromatographic techniques of analysis. [6]

(*b*) Give experimental setup for TLC. Give *two* applications. [6]

(*c*) Define : [4]

(*i*) Atomic radius

(*ii*) Ionic radius.

Which will be greater and why ?

Given :

Cr = 24, Mn = 25, Fe = 26, Co = 27, Ni = 28.

Total No. of Questions—**12**]

[Total No. of Printed Pages—**7**

Seat No.	

[4262]-197

S.E. (Petroleum/Petrochemical/Polymer Engineering)

(II Sem.) EXAMINATION, 2012

HEAT TRANSFER

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Draw neat diagrams wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, electronic pocket calculators is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Derive the necessary equation for Critical Thickness of Insulation for Cylinder and discuss the dependency of heat loss on insulation thickness. [8]

(*b*) Pin fins with insulated ends are provided to increase the heat transfer rate from a hot surface. Which of the following arrangement will give higher heat transfer rate ?

Case (*i*) 4-fins of 10 cm length.

Case (*ii*) 8-fins of 5 cm length.

Thermal Conductivity $k_{(\text{fin material})}$ = 200 W/m°C, h = 20 W/m^2°C, Cross-section Area of fin = 2 cm^2, Perimeter of fin = 4 cm, Fin Base temperature = 230°C and Surrounding temperature = 30°C. [6]

(*c*) Explain in detail any *one* mode of heat transfer with *one* example each. [4]

Or

2. (*a*) Derive the necessary expression for the heat conduction through a composite wall made up of three layers of different materials. Explain the term Thermal Contact Resistance. [8]

(*b*) Find the critical radius of insulation for asbestos (k = 0.18 W/m°K) surrounding a pipe and exposed to room air at 300°K with heat transfer coefficient h = 3.8 W/m^2°K. Calculate the heat loss from a 475°K, 60 mm diameter pipe when covered with critical radius of insulation and without insulation. [6]

(*c*) Discuss the term Logarithmic Mean Area for the Hollow Cylinder. [4]

3. Explain the following terms : [16]

(*i*) Radiosity

(*ii*) Irradiation

(*iii*) Absorptivity

(*iv*) Reflectivity

(*v*) Transmissivity

(*vi*) Opaque Body

(*vii*) Planck's Law

(*viii*) Stefan-Boltzmann Law.

Or

4. (*a*) Derive the necessary expression for the Radiation exchange of heat energy between two Non-Black Infinite Parallel Plane surfaces. [12]

(*b*) Write a note on Radiation Shield. [4]

5. (*a*) Discuss in detail applicable Dimensionless Numbers used in Forced and Natural Convective heat transfer studies. [8]

(*b*) Discuss in detail : [8]

(*i*) Thermal Boundary Layer

(*ii*) Reynolds Analogy.

Or

6. (*a*) A fluid flows through the tube at the rate of 275 kg/hr at 30°C. The tube 5 m long and the diameter of the tube is 2 cm which is maintained at 100°C by steam jacketing. Find out the average heat transfer coefficient.

Properties of fluid are as below :

ρ = 850 kg/m^3, C_p = 2000 J/kg°C, k = 0.12 W/m°C,

kinematic viscosity $\nu = 5.1 \times 10^{-6}$ m^2/sec. [8]

(*b*) 0.5 kg of water per minute is passed through a tube of 20 mm diameter. Determine the length of the tube required for fully developed flow so that water to be heated from 20°C to 50°C. The heating is accomplished by condensing steam on the surface of tube and subsequently the surface temperature of the tube is maintained at 85°C.

Properties of water at 60°C are as below :

ρ = 983.2 kg/m^3, C_p = 4.178 kJ/kg°K, k = 0.659 W/m°C, Kinematic viscosity $\nu = 0.478 \times 10^{-6}$ m^2/sec.

Average Nusselt Number is given by :

$(N_{Nu})_{Avg} = 3.65.$ [8]

SECTION II

7. (*a*) Derive the expression for Logarithmic Mean Temperature Difference for Parallel type of Heat Exchanger. [10]

(*b*) Differentiate with neat diagram co-current and countercurrent flow type of Heat exchanger. [8]

Or

8. (*a*) A countercurrent flow heat exchanger has a hot and cold water streams flowing through it. The flow rates are 600 kg/hr and 1500 kg/hr and inlet temperatures are 343°K and 298°K on the hot and cold side respectively. The exit temperature on hot side is required to be 323°K. Calculate the area of heat exchanger if individual heat transfer coefficient on both sides are 1600 W/m^2°K by LMTD approach and effectiveness –NTU approach. Also find outlet temperature of cold water. [12]

(*b*) Discuss in detail the term Fouling or Scaling in a heat exchanger. [6]

9. (*a*) Discuss with neat diagram the following terms :

Nucleate Boiling, Film Boiling, Critical heat flux point. [8]

(*b*) Steam saturated at 50°C is condensing on the outside of a bank of 16 horizontal tube of 1.2 cm diameter at surface temperature of 40°C. Find the rate of condensation per meter length of tube.

The properties of water film at mean temperature are :

$\rho = 1174$ kg/m^3, $k = 0.69$ W/m°C,

Dynamic viscosity $\mu = 250 \times 10^{-6}$ kg/m.sec.

Latent heat of condensation = 132 kJ/kg. Assume vapor density is small compared to that of the condensate. [8]

Or

10. (*a*) Discuss the following :

Pool Boiling, Forced Convection Boiling, Sub-cooled Boiling, and Saturated Boiling. [8]

(*b*) Explain different factors affecting Nucleate Boiling. [8]

11. State the classification of evaporators and explain any *one* evaporator in detail. [16]

Or

12. (*a*) An evaporator is operating at atmospheric pressure. It is desired to concentrate the feed from 5% solute to 20% solute (by wt.) at a rate of 5000 kg/hr. Dry saturated steam at a pressure corresponding to saturation temperature of 399°K is used. The feed is at 298°K and boiling point rise is 5°K. Overall heat transfer coefficient is 2350 W/m^2°K. Calculate economy of evaporator and area of heat transfer.

Latent Heat of condensation of steam = 2185 kJ/kg.

Latent Heat of vaporization of water = 2257 kJ/kg.

Specific heat of feed = 4.187 kJ/kg°K. [8]

(*b*) Define the term Evaporator Economy and discuss the methods of increasing the Economy of Evaporator. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4262]-198

S.E. (Polymer/Petroleum/Petrochemical) (II Sem.)

EXAMINATION, 2012

PARTICULATE TECHNOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Discuss in detail on the conveyers used in transportation of solids. [8]

(*b*) What are the various techniques to measure particle size ? Explain any *one* method in detail. [8]

Or

2. (*a*) Explain Particle Size Distribution in detail. [8]

(*b*) Describe with neat sketch various screen analysis methods. [8]

3. (*a*) Derive the relationship between critical speed of ball mill with radius of ball mill and radius of ball. [8]

(*b*) State and explain various size reduction laws along with formulae. [8]

Or

4. (*a*) Explain with neat sketch the principle and working of Gyratory Crusher. [8]

(*b*) A crusher accepts a feed material of volume-surface mean diameter of 19 mm and gives a product of volume-surface mean diameter of 5 mm. The power required to crush 21 ton/h is 11 HP. Calculate the power required for the capacity of 25 ton/h. [8]

5. (*a*) What are the types of Thickeners ? Explain any *one* in detail. [8]

(*b*) What is froth floatation ? Describe in brief the process of floatation. [10]

Or

6. (*a*) With neat sketches, explain various steps in batch sedimentation process. [8]

(*b*) A slurry containing 5 kg of water/kg of solids is to be thickened to a sludge containing 1.5 kg of water/kg of solids in a continuous operation. The following test data is available :

Concentration (kg water/kg solids)	**Rate** (mm/s)
5.0	0.2
4.2	0.12
3.7	0.094
3.1	0.070
2.5	0.050

Calculate the minimum ore of the thickener required to effect the separation of flow of 1.21 kg/s of solids. [10]

SECTION II

7. (*a*) Explain with proper sketch, the variations of bed pressure drop with superficial velocity. [10]

(*b*) Estimate bed pressure drop expressed in cm of water manometer for particles having density of 2000 kg/m^3, diameter of 0.05 cm, 60 cm bed depth and bed porosity of 0.5. [6]

Or

8. (*a*) Explain the following terms in detail : [6]

(*i*) Minimum Fluidization Velocity

(*ii*) Froude Number.

(*b*) Discuss principle and working of Spouted bed with neat diagram. [10]

9. (*a*) Derive a relationship between thicknees of cake and volume of filtrate. [8]

(*b*) A sample of slurry was filtered at a constant rate of 0.00015 m^3/s through a leaf filter covered with a single filter cloth. After 625 seconds the pressure across the filter was 360 m of liquid. After a further 480 seconds the pressure was 600 m of liquid.

The relation between pressure drop (ΔP) and volumetric flow rate (Q) is given as :

$$(-\Delta P) = 7460 - (7460/0.0015)Q$$

Find out how long it will take to produce 1 m^3 of filtrate. [10]

Or

10. (*a*) With neat sketch, explain Rotary Drum Filter and state its applications. [8]

(*b*) Discuss the working of Vacuum Leaf Filter with labelled diagrams. [10]

11. (*a*) Write a note on liquid washing. [8]

(*b*) Explain the principle, working and design of electrostatic precipitators. [8]

Or

12. (*a*) Explain the contruction and working of bowl classifiers. [8]

(*b*) Draw neat diagram and discuss on working of Hydro-cyclone. [8]

Total No. of Questions—**6**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-199

S.E. (Petroleum/Petrochemical/Polymer)

(Second Semester) EXAMINATION, 2012

ELEMENTS OF SOCIAL SCIENCES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

SECTION I

1. (*a*) Explain the importance of Engineering Economics. [8]

(*b*) Explain the problems of Economic Organisation. [8]

Or

(*a*) State and explain different types of Markets. [8]

(*b*) Explain the merits and demerits of Mixed Economies. [8]

2. (*a*) Explain Perfect and Imperfect Competition [8]

(*b*) Explain the role of Government in Macro Economic Development. [8]

Or

(*a*) Explain the various factors of production. [8]

(*b*) Explain the concept of Capital and Private Property. [8]

3. Write short notes on the following : [18]

(*a*) LPG Model of Economic Development

(*b*) Vision of India 2020

(*c*) Law of Demand.

Or

Describe the Economic policies adopted by Govt. of India for the Economic Growth in Post-Independence Period. [18]

SECTION II

4. (*a*) Describe the concept of Civilization. [8]

(*b*) Discuss the importance of Census of India. [8]

Or

(*a*) What is the impact of Globalization on third world countries in the recent times ? Explain. [8]

(*b*) Discuss the problems of Casteism in India. [8]

5. (*a*) Explain the need for sustainable development and consumption. [8]

(*b*) Technology is a tool for social change. Comment. [8]

Or

(*a*) Explain the need preserving Ecology in the modern times. [8]

(*b*) IT Revolution has changed the face of Economy in India. Comment. [8]

6. Write short notes on the following : [18]

(*a*) Social Reforms and Reformers

(*b*) Secular Policy of India

(*c*) Union of Science and Religion.

Or

Harmonious co-existence of different religious faiths is necessary for World Peace and Economic Development of the world. Discuss. [18]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+3**

Seat No.	

[4262]-201

S.E. (First Semester) EXAMINATION, 2012

(Common for Computer & IT)

DISCRETE STRUCTURE

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer Q. Nos. **1** *or* **2**, **3** *or* **4**, **5** *or* **6** from Section I and Q. Nos. **7** *or* **8**, **9** *or* **10** and **11** *or* **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) By using mathematical induction prove that :

$$1^3 + 2^3 + \ldots\ldots + n^3 = \frac{n^2(n+1)^2}{4}.$$ [6]

P.T.O.

(*b*) Prove by constructing the truth table :

(*i*) $P \to (Q \vee R) \equiv (P \to Q) \vee (P \to R)$

(*ii*) $(P \to Q) \leftrightarrow (\neg P \vee Q)$ is a tautology. [6]

(*c*) (*i*) Obtain the dnf. for : $\sim (p \vee q) \equiv (p \wedge q)$

(*ii*) Obtain the cnf : $(\sim p \wedge q \wedge r) \vee (p \wedge q)$. [6]

Or

2. (*a*) Among the integer 1 to 1000 :

(*i*) How many of them are not divisible by 3, nor by 5, nor by 7 ?

(*ii*) How many are not divisible by 5 and 7 but divisible by 3. [6]

(*b*) Prove the expression by using the Venn diagram (any *two*) :

(*i*) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

(*ii*) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

(*iii*) $A \cap (B \oplus C) = (A \cap B) \oplus (A \cap C)$. [6]

(*c*) Among 130 students, 60 study mathematics, 51 study physics and 30 study mathematics and physics. Out of 54 students studying chemistry, 26 study mathematics, 21 study physics and 12 study both mathematics and physics. All the students studying neither mathematics nor physics are studying biology.

Find :

(*i*) How many are studying biology ?

(*ii*) How many are studying chemistry and studying mathematics but not physics ?

(*iii*) How many students are studying neither mathematics nor physics nor chemistry ? [6]

3. (*a*) Define the following terms with suitable example : [6]

(*i*) Group

(*ii*) Subgroup

(*iii*) Ring

(*iv*) Integral domain.

(*b*) Let (A, *) be a group. Show that (A, *) is an abelian group if and only if $a^2 * b^2 = (a * b)^2$. [6]

(*c*) Show that set of all idempotents in a commutative monoid S is a submonoid of S. [4]

Or

4. (*a*) Define the following terms with suitable example : [6]

(*i*) Field

(*ii*) Monoid

(*iii*) Homomorphism

(*iv*) Automorphism.

(*b*) If R is a ring such that $a^2 = a, \forall a \in R$, prove that : [6]

(*i*) $a + a = 0, \forall a \in R$

(*ii*) R is a commutative ring.

(*c*) Find number of code generated by the given parity check matrix H. Also find all code words generated.

$$H = \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 \end{bmatrix}.$$ [4]

5. (*a*) If $X = \{1, 2, 3, ..., 7\}$ and $R = \{(x, y) | x - y$ is divisible by $3\}$. Show that R is on equivalence relation. Draw the digraph of R. [4]

(*b*) If $S = \{1, 2, 3, ... 8, 9\}$. Determine whether or not each of the following is a partition of S :

(*i*) $\{\{1, 3, 5\}, \{2, 6\}, \{4, 8, 9\}\}$

(*ii*) $\{\{1, 3, 5\}, \{2, 4, 6, 8\}, \{7, 9\}\}$

(*iii*) $\{\{1, 3, 5\}, \{2, 4, 6, 8\}, \{5, 7, 9\}\}$

(*iv*) $\{\{S\}\}$ [4]

(c) Find the transitive closure of R by Warshall's algorithm; where

$$A = \{1, 2, 3, 4, 5, 6\} \text{ and } R = \{(x, y) \mid |x - y| = 2\}. \quad [4]$$

(d) Define the following terms :

(i) Poset

(ii) Equivalence class

(iii) Chain

(iv) Antichain. [4]

Or

6. (a) If $f(x) = x + 2$, $g(x) = x - 2$ and $h(x) = 3x$ for $x \in R$, where R = Set of real numbers.

Find :

gof, fog, fof, gog, foh, $fohog$. [6]

(b) Find the homogeneous solution for the recurrence relation

$$a_n = 6a_{n-1} + 11a_{n-1} + 11a_{n-2} - 6a_{n-3}$$

if $a_0 = 2$, $a_1 = 5$, $a_2 = 15$. [6]

(c) State and explain Pigeonhole principle. Show that if 7 colors are used to paint 50 bicycle, at least 8 bicycle will be of the same color. [4]

SECTION II

7. (*a*) With reference to the Graph theory define the following terms : [6]

(*i*) Regular graph

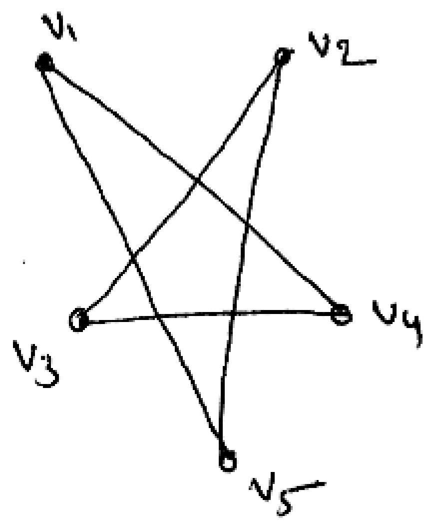
(*ii*) Acyclic graph

(*iii*) Bipartite graph

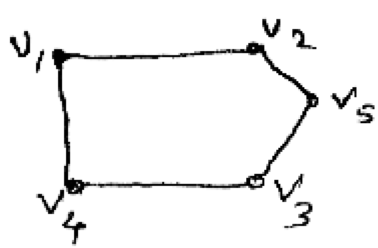
(*iv*) Multigraph.

(*b*) Find the complement of the following graphs : [4]

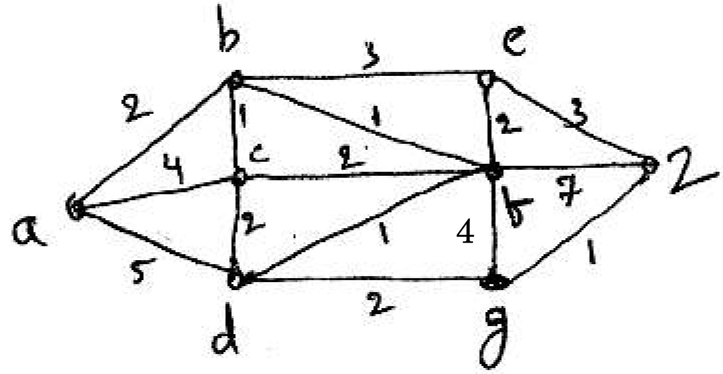
(*i*)



(*ii*)



(*c*) Find the shortest path from a to z, using Dijkstra's Algorithm. [8]



Or

8. (*a*) With reference to the Graph theory define the following terms : [6]

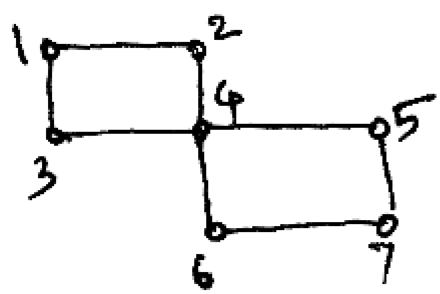
(*i*) Hamilton paths and circuit

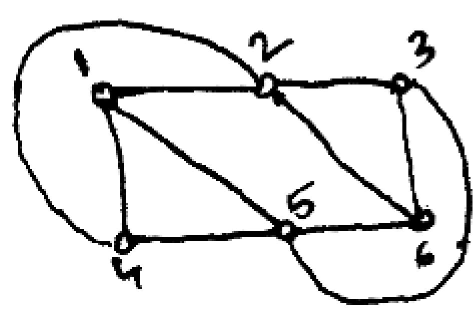
(*ii*) Eulerian paths and circuit

(*iii*) Planar graph

(*iv*) Isomorphic graph.

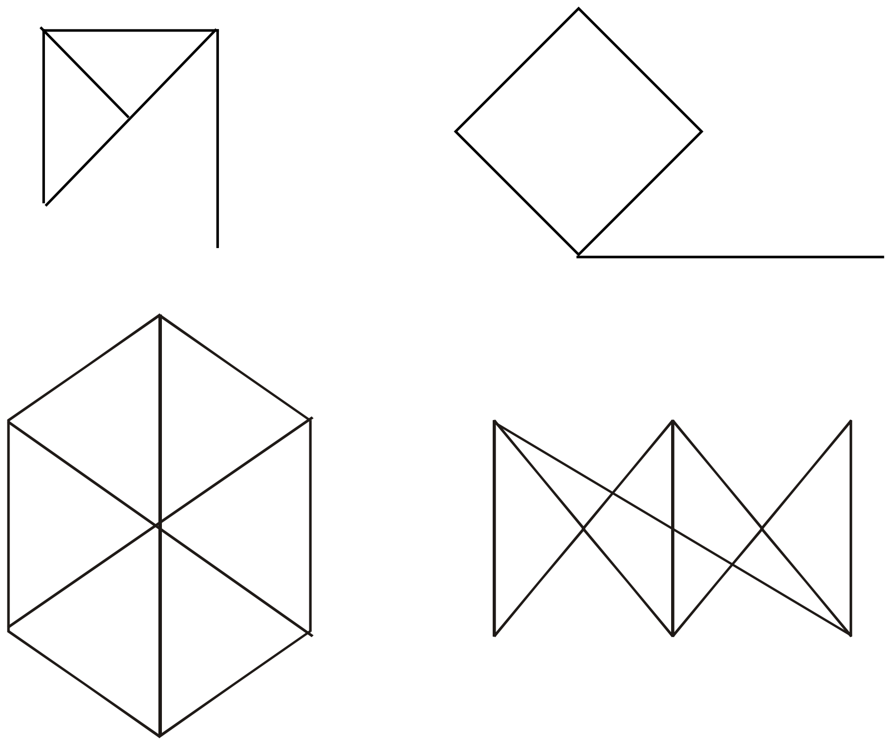
(*b*) (*i*) Determine, if the following graphs are having the Hamilton circuit or Hamilton path. Justify your answer. [4]



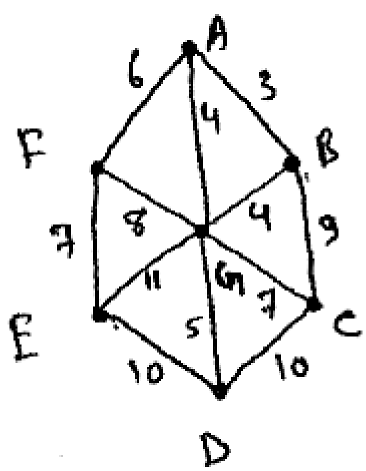


(*ii*) Show that in a connected graph with 6 vertices and 12 edges each of the region is bounded by 3 edges. [4]

(c) Identify whether the given graphs are isomorphic or not. [4]



9. (a) What do you mean by spanning tree ? State the Prim's algorithm to find the minimum spanning tree. Find the minimum spanning tree of the given graph G. [8]



(*b*) What is optimal binary tree ? State and explain the Huffman algorithm to find the optimal binary tree. Construct an optimal tree for the weights : 8, 9, 10, 11, 13, 15, 22. Also generate the optimal prefix code. [8]

Or

10. (*a*) Find the fundamental system of cutset for graph G shown in the Fig. G, with respect to spanning tree Fig T. [8]

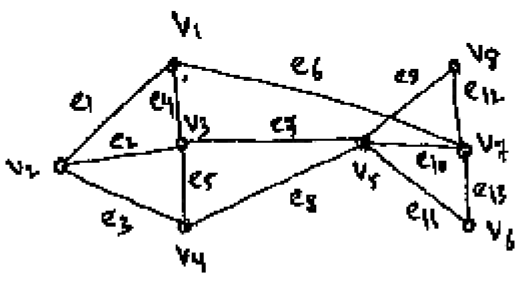


Fig. G

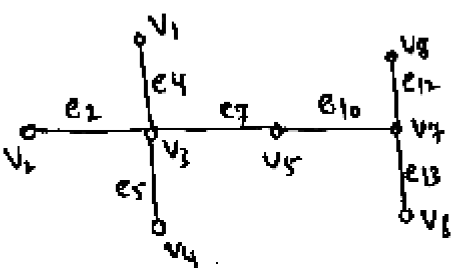
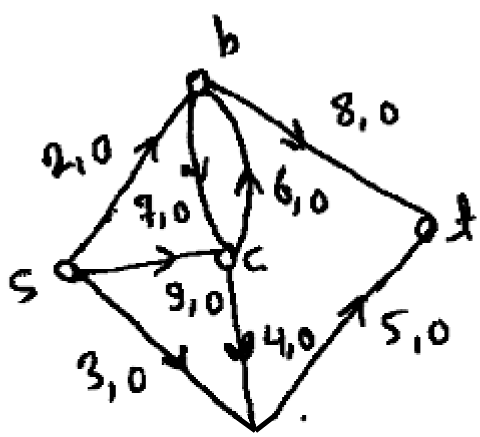


Fig. T

(*b*) Determine the maximal flow in the following transport outwork. [8]



11. (*a*) A woman has 11 friends :

(*i*) In how many ways can she invite five of them for dinner ?

(*ii*) In how many ways if two of them are married and will not attend separately ? [4]

(*b*) (*i*) How many vehicle number plates can be made if each plate contains two different letters followed by three different digits ?

(*ii*) Find if first digit cannot be zero. [6]

(*c*) An 8 member team is to be formed from a group of 10 men and 15 women. In how many ways can the team be chosen if :

(*i*) The team must contain 4 men and 4 women

(*ii*) There must be more men than women

(*iii*) There must be at least two men ? [6]

Or

12. (*a*) 4 persons are chosen at random from a group of 3 men, 2 women and 4 children. Find the probability that exactly two of them will be children. [6]

(*b*) A committee of 12 students consists of 3 representatives from 1st year, 4 from 2nd year and 5 from 3rd year. Out of these 12 students, 3 are to be executed from committee by drawing lots. What is the probability that :

(*i*) 3 students belong to 3 different classes

(*ii*) 2 belong to one class and 1 belongs to another class

(*iii*) 3 belong to same class ? [6]

(*c*) In a University 60% of professors are males and 40% are females. Also 50% of male professors and 60% female professors know computers. Find the probability that a professor knowing computer is a female. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-202

S.E. (Computer Engineering) (I Sem.) EXAMINATION, 2012

PROGRAMMING AND PROBLEM SOLVING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) In Section I, attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**.

(*ii*) In Section II, attempt Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*iii*) Answers to the two Sections should be written in separate answer-books.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Figures to the right indicate full marks.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What do you mean by Algorithmic solutions and Heuristic solutions ? Describe the different steps in problem solving. [8]

(*b*) Is the = sign an assignment instruction or a relational operator in the following equations ? Justify your answer :

(*i*) A = B + 2 + C

(*ii*) A – B = 2 + C. [4]

(*c*) Define a function. Explain each category with a suitable example. [4]

Or

2. (*a*) Write short notes on the following with suitable examples : [12]

(*i*) Interactivity Chart

(*ii*) IPO Chart

(*iii*) Internal Documentation and External Documentation.

(*b*) State and explain any *four* difficulties with problem solving. [4]

3. (*a*) Using first +ve and then –ve logic, write the algorithm and draw the flowcharts for the following set of conditions : [12]

Gross Salary	**Tax Rate**
Gross < = 2000	1%
2000 – 4000	3%
4000 – 5000	5%
Gross > 5000	8%

(*b*) What are the different ways to send data from one module to another through the use of parameters with suitable example ? [6]

Or

4. (*a*) Explain in brief about decision table using suitable example. [6]

(*b*) Describe and explain complete steps of solution development of an instructor calculates grades by dropping the lowest homework score and the lowest test score and adding the remaining scores together. He then calculates the final points as a percentage of the total points possible. The instructor needs to know the final points for a given student. (use the minimum function that returns the minimum value in a list of values.) [12]

5. (*a*) Design an algorithm to calculate result of 'N' students of a class and find number of students passed in grades FCD, FC, HSC, SC, Pass class. Also find count value of failed students. [8]

(*b*) Write pseudo algorithm to evaluate the function cos (X) as defined by the infinite series expansion : [8]

$$\cos(X) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \ldots.$$

Or

6. (*a*) Design an algorithm to iteratively compute the reciprocal of a number. [8]

(*b*) Given integer X compute X^n, where n is positive integer greater than 1. [8]

SECTION II

7. (*a*) Design an algorithm to input n temperatures and produce the appropriate distribution of daily temperatures. (The temperatures are integer values in the range –35°C to + 7°C). [8]

(*b*) What is frequency distribution ? Explain with example. [4]

(*c*) Write pseudo algorithm to find the sum of rows, sum of columns and sum of major diagonal of a square matrix (N×N). [6]

Or

8. (*a*) Write pseudo algorithm to partition the array into two subsets such that elements < = x are in one set and > x elements in other set. [8]

(*b*) Write pseudo algorithm that places the kth element of an array in position 1, the (k = 1)th element in position 2 etc. The original 1st element is placed at (n – k + 1) and so on. [6]

(*c*) Differentiate Table Lookup Technique and Pointer Technique. [4]

9. (*a*) Explain algorithm for left-right justification of given text. [8]

(*b*) Take two ordered sets A and B. Design an algorithm to determine whether or not set A is contained within set B. [4]

(*c*) Write pseudo algorithm to count number of characters in each line. [4]

Or

10. (*a*) Write the following pseudo algorithm : [8]

(*i*) To setup partial match table in linear pattern search

(*ii*) To insert given new pattern at the given position in the text.

(*b*) Design and implement a word searching algorithm that on finding a mismatch with the current word simply reads characters to the start of the text word before attempting a match again. [8]

11. (*a*) Explain the concept of Objects and Classes in detail. [6]

(*b*) Define Friend Function ? Explain in detail with suitable example. [8]

(*c*) What is methods ? [2]

Or

12. (*a*) What is Polymorphism ? Explain with suitable example. [6]

(*b*) Explain static member function with suitable example. [6]

(*c*) Explain the term 'Visibility Modes'. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-203

S.E. (Computer and IT) (I Sem.) EXAMINATION, 2012

DIGITAL ELECTRONICS AND LOGIC DESIGN

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) In Section I attempt : Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**.
In Section II attempt : Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Convert the following numbers to hexadecimal form. Show the steps of conversion : [8]

(*i*) $(675.625)_{10}$

(*ii*) $(451)_8$

(*iii*) $(95.5)_{10}$

(*iv*) $(11001011101)_2$.

(*b*) Convert the following numbers into equivalent decimal numbers : [8]

(*i*) $(327.4051)_8$

(*ii*) $(5A.FF)_{16}$

(*iii*) $(101110111)_2$

(*iv*) $(3FFF)_{16}$.

(*c*) Represent +40 and –40 decimal numbers using 2's complement method. [2]

Or

2. (*a*) Convert the following numbers to octal form. Show the steps of conversion : [8]

(*i*) $(111110001.10011001101)_2$

(*ii*) $(3287.51)_{10}$

(*iii*) $(0.BF85)_{16}$

(*iv*) $(1234)_{16}$.

(*b*) Minimize the following four variable functions using K-map. '*d*' represents don't care conditions : [10]

(*i*) $f(A, B, C, D) = \Sigma m(1, 3, 7, 11, 15) + d(0, 2, 5)$

(*ii*) $f(A, B, C, D) = \Pi M(4, 5, 6, 7, 8, 12) \cdot d(1, 2, 3)$.

3. (*a*) Compare TTL and CMOS logic families. [8]

(*b*) Draw and explain 2-input NAND TTL logic gate with totem output driver. [8]

Or

4. (*a*) Explain the standard TTL characteristics in detail. [8]

(*b*) Draw and explain the working of a 2-input CMOS NAND gate. [8]

5. (*a*) Implement the following expression using 8 : 1 multiplexer :

$$f(A, B, C, D) = \Sigma m(2, 4, 6, 7, 9, 10, 11, 12, 15).$$ [8]

(*b*) Design 2-bit magnitude comparator using logic gates. Assume that A and B are 2-bit inputs. The outputs of comparator should be A > B, A = B, A < B. [8]

Or

6. (*a*) Design 4-bit BCD to excess-3 code converter. Use logic gates as per your design and requirement. [8]

(*b*) Draw and explain 4-bit BCD adder using IC7483. Also explain with example addition of numbers with carry. [8]

SECTION II

7. (*a*) Draw and explain 3-bit asychronous UP counter. Also draw the necessary timing diagram. Compare between synchronous counter and asynchronous counter. [10]

(*b*) Design the following using IC7490 : [8]

(*i*) MOD 97 counter

(*ii*) MOD 45 counter.

Or

8. (*a*) Design sequence detector using J-K flip-flop to detect the following sequence ....1101............. [10]

(*b*) Explain serial to parallel shift register with neat circuit diagram and timing diagram. [8]

9. (*a*) What is ASM chart ? Explain MUX controller method using suitable example. [8]

(*b*) What are the important features of VHDL ? Write VHDL code for 4 : 1 multiplexer in Behavioural and Data flow modeling. [8]

Or

10. (*a*) What is VHDL ? Write VHDL code for 3 : 8 decoder using CASE statement. [8]

(*b*) Design ASM chart for 2-bit up-down counter having mode control inputs. [8]

11. (*a*) Differentiate between CPLD and FPGA. [8]

(*b*) Draw and explain basic microprocessor architecture. [8]

Or

12. (*a*) Implement 4 : 1 multiplexer using PAL. [8]

(*b*) Explain basic characteristics of FPGA. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-204

S.E. (COMPUTER) (I Sem.) EXAMINATION, 2012

DATA STRUCTURE AND ALGORITHM

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What are different modes available to open file in 'C' ? [6]

(*b*) What is recursion ? Explain with example. [4]

(*c*) Explain multidimensional array in C. [6]

P.T.O.

Or

2. (*a*) Explain call by reference and call by value with example. [8]

(*b*) Write recursive function for the following, show step by step function call (1, 3) :

$$A(m, n) = n + 1 \qquad \text{if } m = 0$$

$$= A(m - 1, 1) \qquad \text{if } n = 0$$

$$= A(m - 1), A(m, n - 1) \text{ else.}$$ [8]

3. (*a*) What are the different asymptotic notations ? Explain each with example. [7]

(*b*) What is frequency count for the following :

```
int i,j,k;
for (i=1; i<=n; i++)
for (j=1; j<n; j++)
{
    c[i][j]=0;
    for (k=1; k<=n; k++)
        c[i][j] + = a[i][k]*b[k][j];
}
```

Find out its time and space complexity. [9]

Or

4. (*a*) State whether it is correct or incorrect. Justify your answer : [10]

(*i*) $10n^2 + 9 = O(n)$

(*ii*) $33n^3 + 4n^2 = \Omega(n^2)$

(*iii*) $n! = O(n^n)$

(*iv*) $n^3 2^n + 6n^2 3^n = O\,(n^3 2^n)$

(*v*) $3n + 6 = O(n)$.

(*b*) Define space complexity and time complexity. Explain with example. [6]

5. (*a*) Write a pseudocode for sparse matrix addition. Write its time and space complexity. [8]

(*b*) What is an Abstract Data Type ? Write ADT for queue. [6]

(*c*) Derive the address calculation formula for two-dimensional array in column major representation and row major representation. [4]

Or

6. (*a*) Write pseudocode for polynomial multiplication using sequential organization. [8]

(*b*) Write an ADT for sparse matrix. [6]

(*c*) Write pseudocode to find simple transpose of sparse matrix. [4]

SECTION II

7. (*a*) Write a quicksort algorithm and analyze the same to find best case, worst case time complexity. [8]

(*b*) Write the output of each pass of the shell sort for the following list :

26, 5, 77, 66, 29, 19, 6, 12, 41, 32

What is time complexity of shell sort ? [8]

Or

8. (*a*) Write pseudocode for bubble sort and analyze the best case, worst case and average case complexity of the same. [6]

(*b*) Explain stability in sorting. Name at least *two* stable and unstable sorting algorithms. [4]

(*c*) Write all passes for Fibonacci Search algorithm to search 30, 5, 90 from the given sequence : [6]

5, 10, 15, 20, 28, 30, 50, 80, 85, 90

9. (*a*) Explain primitive operations of circular queue using linked organization. [6]

(*b*) Write and explain node structure to represent GLL in C. Show graphical representation of the following using GLL : [8]

(1, 2, 3, C) (4, 5, (6)), 7, (8, C)))

(*c*) Write and explain node structure to represent polynomial using GLL in C. [2]

Or

10. (*a*) Write a pseudocode to merge two sorted singly linked list. What is the time complexity of it ? [8]

(*b*) Write a pseudocode to perform multiplication of two polynomials using circular linked list. [8]

11. (*a*) Convert the given infix expression in postfix expression. Show step by step conversion. Evaluate postfix expression with values :

$x = 7, \quad y = 4, \quad z = 65, \quad a = 9, \quad b = 2$

$x * (y + (z / ((y \wedge b) - (x + y)))) - a$ [10]

(*b*) Write short notes on : [8]

(*i*) Josephus problem

(*ii*) Multiple stack.

Or

12. (*a*) Write a pseudocode to convert given prefix expression to postfix expression. [8]

(*b*) State any *three* applications of queue. Explain any *one*. [5]

(*c*) Explain circular DQ using head node and graphically show insertion of new node at start, at end. [5]

Total No. of Questions—**6**] [Total No. of Printed Pages—**3**

Seat No.	

[4262]-205

S.E. (Comp./IT Engg.) (I Sem.) EXAMINATION, 2012

HUMANITIES AND SOCIAL SCIENCES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

SECTION I

1. (*a*) Explain in brief : [10]

(*i*) Structure of Indian Society.

(*ii*) Panchayat Raj for rural development.

(*b*) Explain in brief importance of Sociology. [6]

Or

(*a*) Explain the institutions of marriage and types of families with their salient features. [10]

(*b*) India is a land of diversified culture. Discuss. [6]

2. (*a*) Explain the social impact of Industrial development in brief. [8]

(*b*) Differentiate between social change and social progress. [8]

Or

(*a*) Explain the salient features of Policy on National Education in brief. [8]

(*b*) India needs to improve upon Health Sector. Comment. [8]

3. (*a*) Technology can change the Indian Agriculture sector to increase production. Explain. [9]

(*b*) India is a land of greater opportunities for investments in Infrastructure sector. Explain. [9]

Or

Write short notes on the following : [18]

(*i*) Green Revolutions in India

(*ii*) Private Sector in India for Economic Development

(*iii*) Consumer Awareness.

SECTION II

4. Explain in brief :

(*i*) Air Pollution [5]

(*ii*) Components of Ecosystems [5]

(*iii*) Global Warming. [6]

Or

(*i*) Energy Resources in India [5]

(*ii*) Global Population Growth [5]

(*iii*) Loss of Bio-diversity. [6]

5. (*a*) Explain the Law of Demand and Supply. [8]

(*b*) Explain the need for Planned Economic Development of India. [8]

Or

(*a*) Discuss the challenges faced by Indian Economy. [8]

(*b*) Discuss the priorities and problems in the Five Year Plans. [8]

6. Write short notes on the following : [18]

(*i*) Ration Analysis

(*ii*) Budget Analysis

(*iii*) Cost Analysis.

Or

(*i*) Reserve Bank of India

(*ii*) Financial Institutions of India

(*iii*) International Economy.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-206

S.E. (Comp. Engg.) (II Sem.) EXAMINATION, 2012

MICROPROCESSOR AND INTERFACING TECHNIQUES

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw and explain programmers' model of 8086 micro-processor. [8]

(*b*) How does 8086 convert a logical address into a physical address ? [8]

Or

2. (*a*) Draw and explain the memory read timing cycle of 8086 microprocessor for Maximum mode. [8]

(*b*) List out the signals of the 8086 which have different meanings in minimum and maximum mode. [8]

3. (*a*) Explain the various addressing modes of 8086 along with *one* example. [8]

(*b*) Write an 8086 ALP to separate even and odd numbers in the array. [8]

Or

4. (*a*) Explain the following instruction for 8086 microprocessor : [8]

(*i*) PUSH

(*ii*) IMUL

(*iii*) STOSB

(*iv*) CALL.

(*b*) Explain the following Assembler directives : [8]

(*i*) ENDP & ENDM

(*ii*) MODEL

(*iii*) LABEL

(*iv*) PUBLIC.

5. (*a*) Draw and explain structure of PSP. [8]

(*b*) Explain what is TSR. Explain the structure of TSR in detail. [10]

Or

6. (*a*) What is the difference between DOS and BIOS calls ? [8]

(*b*) Draw and explain the functional block diagram of 8259 PIC. [10]

SECTION II

7. (*a*) Explain BSR & I/O mode of 8255 with appropriate control word formats. [8]

(*b*) Interface a typical 8-bit DAC with 8255 and write a program to generate square waveform of period 100 ms. The 8086 runs at 10 MHz frequency. [10]

Or

8. (*a*) Draw and explain the functional block diagram of 8251. [8]

(*b*) What are different methods of ADC ? Explain dual slope ADC with block diagram. [10]

9. (*a*) Draw and explain the functional block diagram of 8279. [8]

(*b*) Explain with the help of block diagram functioning of 8253 in different programmable modes. [8]

Or

10. (*a*) Explain in brief how 8279 is used for keyboard/display interface with a suitable example. [8]

(*b*) Explain the various modes of 8237 in detail. [8]

11. (*a*) Draw and explain the architecture of 8087 NDP. [8]

(*b*) Draw and explain minimum mode configuration of 8086 processor. [8]

Or

12. (*a*) Explain stack of 8087 with example. [8]

(*b*) Explain the use of 8284 and 8286 in interfacing memory with 8086. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4262]-207

S.E. (Computer) (II Sem.) EXAMINATION, 2012

DATA STRUCTURE

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain the following : [9]

(*i*) Full and complete binary trees.

(*ii*) List and explain in brief applications of binary tree.

(*iii*) Explain class & object in OOP concept.

(*b*) Write non-recursive algorithm for traversal of binary tree : [9]

(*i*) Inorder

(*ii*) Preorder.

Or

2. (*a*) Draw binary search tree for data 12, 18, 20, 30, 35, 40, 42, 48, 52. If root is 40 and leafs are 12, 52, write Binary Search Tree (BST) search algorithm. [10]

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

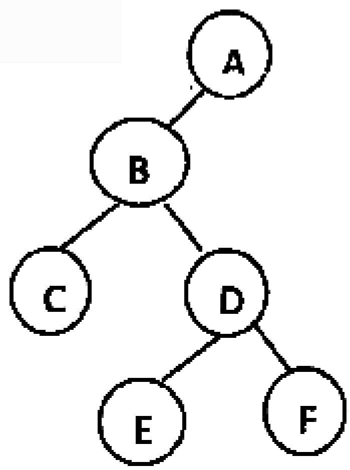


Fig. A binary tree

(*i*) What is array representation of given binary tree ?

(*ii*) What is linked representation of given binary tree ? What are important observations of linked representation ?

3. (*a*) Write algorithm for Breadth First Traversal of the graph. Also write its complexity. [8]

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

(*i*) State the difference between Kruskal's and Prims algorithm for minimum spanning tree (MST).

(*ii*) Graph as an ADT.

Or

4. (*a*) Write Kruskal's Algorithm for MST and explain it with example. [8]

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

(*i*) What are graph storage structures ?

(*ii*) Topological sort.

5. (*a*) Write and explain algorithm to delete node from AVL tree. [8]

(*b*) What is hash function ? Explain the different types of hash functions. [8]

Or

6. (*a*) Explain different types of rotation for AVL tree with suitable example. [8]

(*b*) What are hashing methods ? Explain in brief. [8]

SECTION II

7. (*a*) Define heap. Explain types of heap. Write an algorithm to insert an element into heap. [8]

(*b*) Construct a B tree of order 5 for the following data :

50, 85, 42, 10, 16, 60, 70, 80, 87, 100, 120, 65, 150, 62, 30, 17, 18, 28, 75, 78.

What is the best and worst case complexity of insert and delete operation on B tree ? [10]

Or

8. (*a*) What is B tree ? Explain the process for deleting a particular value from B tree. [8]

(*b*) State algorithm to sort elements of a given array in ascending order using heapsort. Sort the following numbers using heapsort in ascending order :

38, –10, –11, 72, 98, 62, 44. [10]

9. (*a*) Write an algorithm to perform create, insert, display and search operations for sequential file organization. [8]

(*b*) What is index sequential file organization ? State its advantages and disadvantages. [8]

Or

10. (*a*) What is file ? List different file opening modes. Explain Index sequential file organization in brief. [8]

(*b*) Explain in brief : [8]

(*i*) Linked file organization

(*ii*) Direct file organisation.

11. (*a*) Explain the following terms : [8]

(*i*) ADT

(*ii*) Inheritance in C++

(*iii*) Algorithms and its characteristics

(*iv*) Generic programming.

(*b*) What is iterator and Container ? List different types of iterators and explain each in brief. [8]

Or

12. (*a*) Give the implementation of a queue using list in a STL with respect to : [8]

(*i*) Insertion of an element

(*ii*) Deletion of an element.

(*b*) Write a program in C++ to implement stack using STL. [8]

Total No. of Questions—**6**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-208

S.E. (Computer) (II Sem.) EXAMINATION, 2012

COMPUTER GRAPHICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) *All* questions are compulsory.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain Bresenham's line drawing algorithm. (Do not give Pseudo-code) [6]

(*b*) What is frame buffer ? Explain the importance of it. [4]

(*c*) What is vector generation ? Explain the problem of vector generation. [6]

Or

(*a*) Find the amount of memory required by an 8 plane frame buffer each of red, green, blue having resolution of 1024×768. [4]

(*b*) Write a short note on Display File Interpreter. [4]

(*c*) Explain Bresenham's Circle Drawing Algorithm. (Do not give Pseudo-code) [8]

2. (*a*) Compare different polygon filling algorithm. [4]

(*b*) Explain generalized clipping. [4]

(*c*) What is windowing and clipping ? What is interior and exterior clipping ? [8]

Or

(*a*) Explain how a polygon is filled with pattern. [4]

(*b*) Explain even-odd method to determine polygon interior points. [4]

(*c*) Use Cohen-Sutherland outcode algorithm to clip two lines $P_1(40, 15) - P_2(75, 45)$ and $P_3(75, 45) - P_4(100, 10)$ against a window A(50, 10), B(80, 10), C(80, 40), D(50, 40). [8]

3. (*a*) What is the need of homogeneous coordinate system ? Give homogeneous representation of scaling, rotation and translation matrices. [6]

(*b*) Translate the square ABCD with coordinates A(0, 0), B(3, 0), C(3, 3), D(0, 3) by 2 units in both directions and then scale it by 2 units in X-direction and 0.5 units in Y-direction. [6]

(*c*) Derive the transformation matrix for rotation about an arbitrary point. [6]

Or

(*a*) Find transformation matrix that transforms a square ABCD whose center is at (2, 2), is reduced to half of its size with center still remaining at (2, 2). The coordinates of square ABCD are A(0, 0), B(0, 4), C(4, 4), D(4, 0). Find the coordinates of transformed square. [8]

(*b*) What is shear transformation ? Explain X-shear and Y-shear. [5]

(*c*) Why is projection necessary ? Derive the transformation matrix for parallel projection. [5]

SECTION II

4. (*a*) Suggest a scheme to create an illusion of a spaceship moving away from the observer. [8]

(*b*) What is the difference between conventional and computer based animations ? [8]

Or

(*a*) Suggest a scheme to create an illusion of a sky full of twinkling stars. [8]

(*b*) Write a short note on Animation Languages. [4]

(*c*) What is Morphing ? Give applications of Morphing. [4]

5. (*a*) Explain Back-Face removal algorithm. [8]

(*b*) Explain RGB colour model. [8]

Or

(*a*) Explain Z-Buffer Algorithm. [8]

(*b*) Explain Gouraud Shading. [8]

6. Write short notes on : [18]

(*a*) B-splines

(*b*) Interpolation

(*c*) Fractals.

Or

Write short notes on : [18]

(*a*) Blending functions

(*b*) Bezier curves

(*c*) Fractal lines and surfaces.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-209

S.E. (Comp. Engg.) (II Sem.) EXAMINATION, 2012

COMPUTER ORGANISATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Show the general structure of an IAS computer (stored program computer) and explain. [8]

(*b*) Explain instruction cycle with the help of state diagram. [10]

Or

2. (*a*) Explain Booth's algorithm to multiply the following pair of numbers : [10]

A = 13 multiplicand

B = –11 multiplier

(*b*) Give the steps involved in non-restoring division with an example. [8]

3. (*a*) With the help of diagram explain internal structure of CPU. [8]

(*b*) Describe the following addressing modes along with suitable examples : [8]

(*i*) Indirect

(*ii*) Register indirect

(*iii*) Base with Index

(*iv*) Direct.

Or

4. (*a*) What are the advantages of pipelining ? [8]

(*b*) What is the difference between data hazard and instruction hazard ? Given an example of each. [8]

5. (*a*) What are the differences between the single and multiple bus organization of the control unit ? [8]

(*b*) How are the control signals generated in hardwired control unit ? [8]

Or

6. (*a*) Give an example of micro-programmed control instruction. [8]

(*b*) Enlist the differences between sequential and combinatorial ALU. [8]

SECTION II

7. (*a*) With the help of diagram explain the uses of Synchronous DRAM (SDRAM). [8]

(*b*) Define the terms memory latency, memory cycle time and memory access time. [8]

Or

8. (*a*) Explain the various Cache memory mapping functions. [12]

(*b*) Define page fault and how OS manages the page fault ? [4]

9. (*a*) What are the two addressing methods of I/O devices ? Describe them. [8]

(*b*) How does the OS enable and disable the interrupts ? [8]

Or

10. (*a*) What is the use of DMA ? What is cycle stealing in DMA ? [8]

(*b*) Which signals are used to connect the printer to the processor ? [8]

11. (*a*) Explain the SISD, SIMD and MIMD systems. [10]

(*b*) What are the solutions to cache coherence problem ? [8]

Or

12. (*a*) What is the use of message passing protocol ? [6]

(*b*) Write short notes on any *three* of the following : [12]

(*i*) SMP

(*ii*) USB bus

(*iii*) Clusters

(*iv*) ROM.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+3**

Seat No.	

[4262]-210

S.E. (Electrical/Instru./Comp./I.T.) (Second Semester)

EXAMINATION, 2012

ENGINEERING MATHEMATICS-III

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) In Section I : attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**. In Section II : attempt Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Solve any *three* of the following : [12]

(*i*) $(D^2 - 4D + 4)\ y = e^{2x} + 3^x + 5.$

(*ii*) $(D^2 - 1)\ y = e^x (1 + x^2 + \sin x)$

(*iii*) $(D^2 + 4)\ y = \text{cosec } 2x$ (by method of variation of parameters)

(*iv*) $x^3y'' + 3x^2y' + xy = \sin (\log x)$

(*b*) Solve : [5]

$$\frac{dx}{dt} - wy = a \cos pt$$
$$\frac{dy}{dt} + wx = a \sin pt$$

Or

2. (*a*) Solve any *three* of the following : [12]

(*i*) $y'' - y' - 2y = 2 \log x + 1/x + 1/x^2$

(*ii*) $(D^3 + 8) y = x^4 + 2x + 1$

(*iii*) $(3x + 2)^2 y'' + 3 (3x + 2) y' - 36y = 9x^2 + 12x + 4$

(*iv*) $\dfrac{x^2 dx}{y^3} = \dfrac{y^2 dy}{x^3} = \dfrac{dz}{z}$

(*b*) An uncharged condenser of capacity 'C' is charged by applying an e.m.f. of value : [5]

$$E \sin \left(\frac{t}{\sqrt{LC}}\right)$$

through leads of inductance 'L' and negligible resistance 'R'. The charge Q on the plate of condenser satisfies the differential equation

$$\frac{d^2Q}{dt^2} + \frac{Q}{LC} = \frac{E}{L} \sin \frac{t}{\sqrt{LC}}.$$

Show that charge at any time 't' is :

$$Q = \frac{EC}{2} \left\{ \frac{\sin t}{\sqrt{LC}} - \frac{t}{\sqrt{LC}} \frac{\cos t}{\sqrt{LC}} \right\}$$

3. (*a*) If

$$v = 3x^2 y - y^3,$$

find its harmonic conjugate 'u'. Hence find $f(z)$. [6]

(*b*) Evaluate :

$$\oint_c \frac{e^z \, dz}{(z+1)^2 (z-2)}$$

where 'c' is the circle $|z - 1/2| = 3$. [5]

(*c*) Find the transformation, which sends the points -1, 0, 1 from Z-plane into the points 0, i, $3i$ of W-plane. [5]

Or

4. (*a*) Show that an analytic function with constant modulus is constant. [5]

(*b*) Evaluate :

$$\int_c \frac{\sin(\pi z^2) + 2z}{(z-1)^2 (z-2)}$$

where '*c*' is the circle $|z| = 4$, using Cauchy's residue theorem. [5]

(*c*) Find the map of the straight line $y = x$, under the transformation [6]

$$w = \frac{z-1}{z+1}.$$

5. (*a*) Using Fourier integral representation of the function, establish the following relation : [5]

$$\int_0^\infty \frac{\cos \lambda x + \lambda \sin \lambda x}{1 + \lambda^2} \, d\lambda = \begin{cases} 0 & x < 0 \\ \pi/2 & x = 0 \\ \pi e^{-x} & x > 0 \end{cases}$$

(*b*) Find Fourier transform of the following function : [4]

$$f(x) = \begin{cases} \pi/2 \cos x & , |x| \le \pi \\ 0 & |x| > \pi. \end{cases}$$

(*c*) Find *z*-transform of the following (any *two*) : [8]

(*i*) $f_k = 2^k + (1/2)^k \ , \ k \ge 0$

(*ii*) $f_k = 3^k \cos(7k + 2), \quad k \geq 0$

(*iii*) $f_k = (k + 1)(k + 2)\, 2^k, \quad k \geq 0.$

Or

6. (*a*) Find inverse z-transform of the following (*any two*) : [8]

(*i*) $F(z) = \dfrac{z^3}{(z - 1)(z - 1/2)^2}, \quad |z| > 1$

(*ii*) $F(z) = \dfrac{3z^2 + 2z}{z^2 - 3z + 2}, \quad 1 < |z| < 2$

$$\int_0^\infty f(x) \sin \lambda x \, dx = \frac{e^{-a\lambda}}{\lambda}.$$

(*iii*) $F(z) = \dfrac{z^2}{(z^2 + 1)}$ (inversion integral method)

(*b*) Obtain $f(k)$, given that : [5]

$12f(k+2) - 7f(k+1) + f(k) = 0, \ k \geq 0, \ f(0) = 0, \ f(1) = 3.$

(*c*) Solve the integral equation : [4]

SECTION II

7. (*a*) Fluctuations in the aggregate of marks obtained by two groups of students are given below. Find out which of the two shows greater variability : [6]

Group A	Group B
518	825
519	830
530	830
530	819
544	814
542	814
518	844
550	842
527	842
527	826
531	832
550	835
550	835
529	840
528	840

(*b*) From a group of 10 students, marks obtained by each in papers of Mathematics and Applied Mechanics are given below : [6]

X (Marks in Maths)	**Y** (Marks in App. Mech.)
23	25
28	22
42	38
17	21
26	27
35	39
29	24
37	32
16	18
46	44

Calculate coefficient of correlation.

(*c*) The mean and variance of binomial distribution are 6 and 2 respectively. Find $p(r \geq 1)$. [5]

Or

8. (*a*) Two variates x and y take the values : [7]

x	y
6	9
2	11
10	5
4	8
8	7

Find the regression line of y on x and estimate y for $x = 4.5$.

(*b*) In a certain examination test, 2000 students appeared in a subject of statistics. Average marks obtained were 50% with standard deviation 5%. How many students do you expect to obtain more than 60% of marks, supposing that marks are distributed normally ? [5]

[Z = 2, A = 0.4772]

(*c*) The table below gives number of books issued from a certain library on the various days of week :

Days	**No. of Books Issued**
Monday	120
Tuesday	130
Wednesday	110
Thursday	115
Friday	135
Saturday	110

Test at 5% l.o.s. whether issuing of books is uniformly distributed. [5]

9. (*a*) Show that tangent at any point of the curve :

$$x = e^t \cos t,\ y = e^t \sin t,\ z = e^t$$

makes a constant angle with z-axis. [4]

(*b*) Find the directional derivative of

$$\phi = xy^2 + yz^3 \text{ at } (1, -1, 1)$$

along the direction normal to the sphere :

$$x^2 + y^2 + z^2 = 6$$

at the point (1, 1, 2). [6]

(*c*) Show that :

$$\overline{F} = (6xy + z^3)\,\overline{i} + (3x^2 - z)\,\overline{j} + (3xz^2 - y)\,\overline{k} \text{ is}$$

irrotational and find the corresponding scalar potential ϕ. [6]

Or

10. (*a*) Show that :

(*i*) $\nabla^2 f(r) = \dfrac{d^2 f}{dr^2} + \dfrac{2}{r}\dfrac{df}{dr}$

$$\overline{F} = \frac{1}{r}[r^2\,\overline{a} + (\overline{a} \cdot \overline{r})\,\overline{r}]$$

(*ii*) If $\rho\overline{E} = \nabla\phi$. then $\overline{E}$. curl $\overline{E} = 0$. [6]

(*b*) If the directional derivative of :

$$\phi = axy + byz + czx \text{ at } (1, 1, 1)$$

has maximum magnitude 6 in a direction parallel to *z*-axis, find the value of *a*, *b*, *c*. [5]

(*c*) Show that :

is irrotational. Hence find corresponding scalar potential ϕ. [5]

11. (*a*) Find the work done in moving a particle once round the ellipse :

$$\frac{x^2}{25} + \frac{y^2}{16} = 1, \; z = 0$$

under the field of force given by : [6]

$$\overline{\mathrm{F}} = (2x - y + z^2)\,\overline{i} + (x + y - z)\,\overline{j} + (3x - 4y + 2z)\overline{k}.$$

(*b*) Evaluate :

$$\iint_{\mathrm{S}} (x^3\,\overline{i} + y^3\,\overline{j} + z^3\,\overline{k}) \,.\, d\overline{\mathrm{S}}$$

where S is the surface of the sphere : [5]

$$x^2 + y^2 + z^2 = a^2.$$

(*c*) Verify Stokes' theorem for : [6]

$$\overline{\mathrm{F}} = xy^2\,\overline{i} + y\overline{j} + z^2\,x\,\overline{k}$$

for the surface of a rectangular lamina bounded by :

$$x = 0,\; y = 0,\; x = 1,\; y = 2,\; z = 0.$$

Or

12. (*a*) Two of Maxwell's electromagnetic equations are :

Given $\overline{\mathrm{B}}$ = curl $\overline{\mathrm{A}}$ then deduce that :

$$\overline{\mathrm{E}} + \frac{\partial \overline{\mathrm{A}}}{\partial t} = -\,\mathrm{grad}\ \mathrm{V}$$

where V is a scalar point function. [5]

(*b*) Use Stokes' theorem to evaluate :

$$\int_C (4y\bar{i} + 2z\bar{j} + 6y\bar{k}) \,.\, d\bar{r}$$

where 'C' is curve of intersection of :

$$x^2 + y^2 + z^2 = 2z \text{ and } x = z - 1.$$ [6]

(*c*) Evaluate :

$$\iint_S xz^2 \, dydz + (x^2y - z^2)\, dzdx + (2xy + y^2z)\, dxdy$$

where S is the surface enclosing a region bounded by hemisphere :

$$x^2 + y^2 + z^2 = a^2$$

above the xy-plane. [6]

Total No. of Questions—**6**]　　　　　　[Total No. of Printed Pages—**3**

Seat No.	

[4262]-210A

S.E. (Computer Engg.) EXAMINATION, 2012

FINANCIAL AND INDUSTRIAL MANAGEMENT

(2003 PATTERN)

Time : Three Hours　　　　　　**Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

SECTION I

1. (*a*) Explain the functions of Management. [8]

(*b*) Discuss the levels of Management. [8]

Or

(*a*) Explain the concept of Scientific Management by F.W. Taylor. [6]

(*b*) Explain the principles of management by Henry Fayol in brief. [10]

2. (*a*) Discuss the importance and scope of Engineering Economics. [6]

(*b*) Explain the conditions of Valid Contract. [5]

(*c*) Explain 'e-Commerce'. [5]

Or

Explain the following :

(*a*) Patents and Copyrights. [6]

(*b*) Functions of SEBI. [5]

(*c*) Functions of Chamber of Commerce. [5]

3. Describe the formation and salient features of Joint Stock Companies along with their advantages and disadvantages. [18]

Or

Write short notes on the following : [18]

(*a*) Functional Structure

(*b*) Public Sector Undertaking

(*c*) Partnership

SECTION II

4. (*a*) Explain the process of Manpower Planning. [8]

(*b*) Expain the process of Communication. [8]

Or

(*a*) State and explain different types of recruitments. [8]

(*b*) Explain the importance of training and different methods of training. [8]

5. (*a*) Explain the elements and types of cost. [8]

(*b*) Expain the importance of Budget and Budgetary Control. [8]

Or

(*a*) Explain different types of Capitals. [8]

(*b*) Explain the contents and importance of Balance Sheet. [8]

6. Write short notes on the following : [18]

(*a*) Payback Method

(*b*) Accounting Rate of Returns

(*c*) Profit and Loss Account.

Or

(*a*) Define depreciation and explain any *two* methods of calculating depreciation. [9]

(*b*) Explain the following Ratios : [9]

(*i*) Activity Ratio

(*ii*) Liquidity Ratio

(*iii*) Debt-Equity Ratio.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-210-B

S.E. (Computer) EXAMINATION, 2012

ELECTRONIC DEVICES AND CIRCUITS

(2003 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Solve Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**. Q. No. **5**, *or* Q. No. **6** from Section I and Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answer any *three* questions from each Section.

(*iii*) Answer *three* questions from Section I and *three* questions from Section II.

(*iv*) Answers to the two Sections should be written in separate answer-books.

(*v*) Neat diagrams must be drawn wherever necessary.

(*vi*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vii*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Enlist *three* types of Biasing circuits in BJT and explain *one* with neat diagram. [8]

(*b*) Define :

(1) Stability factor (S, S', S")

(2) Q point on d.c. load line and its significance. [8]

P.T.O.

Or

2. (*a*) Explain importance of thermal runaway with reference to BJT and FET. [8]

(*b*) Define Bias compensation and explain different bias compensation techniques used in transistor circuits. [8]

3. (*a*) State and explain Miller's theorem. Derive equation for input and output resistance. [8]

(*b*) Draw approximate *h*-parameter model for common emitter transistor circuit. Also derive expression for R_i, R_o, A_v and A_i. [8]

Or

4. (*a*) Write a short note on Bootstrapped Emitter follower circuit. [8]

(*b*) Explain what are the needs of Multistage amplifier and its effect on Gain and Bandwidth. [8]

5. (*a*) Write a short note on high input impedance circuit. [8]

(*b*) Draw a two stage CE amplifier with its equivalent circuit diagram. Explain the effect of loading in multistage amplifier. [10]

Or

6. (*a*) Draw the '*h*'-parameter equivalent circuit of common collector amplifier and find R_i, R_o, A_v and A_i. [8]

(*b*) Why is power amplifier known as large signal amplifier ? How does power amplifier differ from voltage amplifier ? [10]

SECTION II

7. (*a*) The p-channel FET has an $I_{DSS} = -20$ mA, $V_p = 10$ V, $V_{GS} = 8.32$ V. Calculate drain current, transconductance. [8]

(*b*) Explain analysis of common source amplifier with and without source resistance. [8]

Or

8. (*a*) Explain with neat diagram the working of biasing circuits used for EMOSFET. [8]

(*b*) Explain the working of n-channel EMOSFET. Sketch its transfer characteristics. [8]

9. (*a*) Draw and explain with neat diagram Schmitt Trigger. [8]

(*b*) Draw and explain with neat diagram the Basic block diagram of op-amp. [8]

Or

10. (*a*) Draw and explain with neat circuit diagram a voltage to current converter. [8]

(*b*) Draw and explain with neat circuit diagram a square wave generator. [8]

11. (*a*) Draw a block diagram of SMPS. State its various types, specifications and applications. [8]

(*b*) Explain the construction, operation of Triac and V-I characteristics of Triac with the help of equivalent circuit of it. [10]

Or

12. (*a*) Compare ON LINE UPS and OFF LINE UPS. [8]

(*b*) Sketch the V-I characteristics of SCR. Explain latching current. holding current and forward break over voltage. [10]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4262]-211

S.E. (I.T.) (First Semester) EXAMINATION, 2012

COMPUTER ORGANIZATION

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer question **1** *or* **2**, **3** *or* **4** and **5** *or* **6** from Section I and question **7** *or* **8**, **9** *or* **10** and **11** *or* **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw flow chart for Non-Restoring Division Algorithm and perform division operation on the following numbers using the same method :

Dividend = 1101 Divisor = 0100 [10]

P.T.O.

(*b*) Draw IEEE standards for Single Precision and Double Precision floating point numbers and state various fields in it with their size and significance. [8]

Or

2. (*a*) Draw the Hardware Implementation of Booth's multiplication algorithm and perform the multiplication operation of the following pair of signed numbers using Bit Pair Recoding method :

Multiplicand = 110011

Multiplier = 101100. [10]

(*b*) Draw Von Neumann Architecture and explain function of registers in it. [8]

3. (*a*) Draw and explain instruction format for 8086 processor. [8]

(*b*) Explain the following addressing modes of 8086 with *one* example of each :

(*i*) Register Addressing

(*ii*) Based Addressing

(*iii*) Immediate Addressing

(*iv*) Based Index with Displacement Addressing. [8]

Or

4. (*a*) Draw and explain architecture of 8086. [8]

(*b*) Draw Timing Diagram for Memory Write Cycle of 8086 in Minimum Mode and list operations in each T state. [8]

5. (*a*) Compare :

(*i*) Hardwired Control and Micro-programmed Control.

(*ii*) Horizontal and Vertical Microinstruction Format. [8]

(*b*) Write the control sequence for the following instruction for the single bus organization : SUB (R_3), R_4

Where R_3 is source register and R_4 is destination register. [8]

Or

6. (*a*) What is Microinstruction Sequencing ? Explain with the help of suitable diagram the technique used to solve the problem due to several branch instructions in micro-program sequencing. [8]

(*b*) Draw the diagram of Micro-programmed control unit and give its advantages and disadvantages. [8]

SECTION II

7. (*a*) Compare SRAM *Vs.* DRAM. [8]

(*b*) A cache consisting of 256 blocks of 16 word each for a total of 4096 (4K) words and assume that the main memory is addressable by a 16 bit address and it consists of 4K blocks. How many bits are there in each of the TAG, BLOCK/SET and WORD fields for direct mapping cache ? [8]

Or

8. (*a*) What is MESI Protocol ? Explain the meaning of each of the four states of the MESI Protocol. [8]

(*b*) Write short notes on (any *two*) : [8]

(*i*) Magnetic Disk

(*ii*) EPROM

(*iii*) CDROM

(*iv*) RAID.

9. (*a*) List the features of IC 8255 and IC 8251. [8]

(*b*) Explain Programmed Control I/O with a neat diagram. [8]

Or

10. (*a*) Compare : [8]

(*i*) Memory Mapped I/O and I/O Mapped I/O.

(*ii*) Synchronous and Asynchronous Serial Communication.

(*b*) Explain the working principle of the following :

(*i*) Video Displays

(*ii*) Scanner. [8]

11. (*a*) Compare Closely coupled and Loosely coupled multiprocessor configurations. Explain loosely coupled multiprocessor configuration. [12]

(*b*) Explain instruction pipelining in brief. [6]

Or

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

(*i*) Superscalar Architecture

(*ii*) RISC

(*iii*) Cluster

(*iv*) UMA

(*v*) NUMA.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

Seat No.	

[4262]-212

S.E. (I.T.) (First Semester) EXAMINATION, 2012

FUNDAMENTAL OF DATA STRUCTURE

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Differentiate between structure and union. [4]

(*b*) Explain while and for loop in C language with example. [6]

(*c*) Explain different bitwise operators in C. [6]

Or

2. (*a*) Write a C function to concatenate two strings without using library function. [5]

(*b*) State different logical operators in C. Explain short circuit evaluation. [6]

(*c*) Describe the following declarations : [5]

(*i*) int *a[10];

(*ii*) int (*p)[2];

(*iii*) char s[100][65][80];

(*iv*) float **y;

(*v*) enum x {A, B, C};

3. (*a*) Explain any *four* functions used for file handling. [6]

(*b*) What are different methods for passing parameters to function ? Write how array can be efficiently passed to a function with example code. [6]

(*c*) Write output of the following code : [4]

```
void main(void)
{
    int A[4][3] = {{1, 0, 3},
                   {6, 8, 5},
                   {3, 5, 9}};
    printf("%d %d %d %d", **A, A[2][2], A[1][2],A[3][10]);
}
```

Or

4. (*a*) Write a C function to compare two strings without using library functions. [4]

(*b*) Write a program to represent a list of student's records and find topper among them. [6]

(*c*) What is recursion ? Write and explain recursive function to find factorial of a number. [6]

5. (*a*) What do mean by asymptotic notations ? Explain with examples. [6]

(*b*) Classify data structures and give example of each type. [6]

(*c*) What is frequency count of a statement ? Explain its use in algorithm analysis. [6]

Or

6. (*a*) Analyze time complexity of the following code : [6]

(*i*)
```
for (i=0; i<m; i++)
for(j=0; j<n; j++)
sum=sum+A[i][j];
```

(*ii*)
```
int display (int n)
{   int i=1;
    while(i<=n)
    printf("%d", i);
}
```

(*b*) Write a short note on space complexity of a program. [6]

(*c*) Define the following terms : [6]

(*i*) Data object

(*ii*) Data type

(*iii*) Abstract data structure.

SECTION II

7. (*a*) Write pseudo C code for bubble sort. Show output of each pass to arrange the following numbers in ascending order : [10]

11, 7, 14, 8, 6, 70, 28, 21, 2, 9, –5

(*b*) Write non-recursive pseudo C code for binary search and explain search operation with example. [8]

Or

8. (*a*) Write pseudo C code to merge two sorted lists of integers stored in arrays to form a third sorted list. Analyze time complexity of this code. [10]

(*b*) Write and explain worst case input for quick sort to sort list of numbers in ascending order. State worst case time complexity. [8]

9. (*a*) Represent a sparse matrix using suitable data structure and write pseudo C code to add two sparse matrices. Analyze its time complexity. [10]

(*b*) Explain sequential memory organization using suitable data structure. [6]

Or

10. (*a*) Write data structure to represent polynomial in two variables. Represent the following polynomials using the declared data structure in graphical form : [6]

(*i*) $3 + 2x + 9xy^3$

(*ii*) $x^3 + y^4 + 2x^3y^4$.

(*b*) Derive formula to calculate address of any location in two-dimensional arrays. [4]

(*c*) Compare sequential and linked memory organization. [6]

11. (*a*) Write data structure to represent a node of a generalized linked list. Represent the following lists : [6]

(*i*) $(a, b, c (d, e, f), g, h)$

(*ii*) $(p (q, r) s (t, u), v)$.

(*b*) Write node structure to represent Circular SLL of integers. Write a program with the following options : [10]

(*i*) Create list

(*ii*) Display list

(*iii*) Delete a specified value

(*iv*) Insert a value after a given item.

Or

12. (*a*) Give node structure to represent a list names using DLL and write C functions for the following : [8]

(*i*) Display list forward

(*ii*) Display list reverse

(*iii*) Display names starting with letter **S** or **s**.

(*b*) Compare SLL and DLL. [4]

(*c*) Explain importance of header node in a linked list. [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4262]-213

S.E. (Information Technology) (Second Semester)

EXAMINATION, 2012

COMPUTER GRAPHICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer question **1** or **2**, **3** or **4** and **5** or **6** from Section I and question **7** or **8**, **9** or **10** and **11** or **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain Bresenham's line drawing algorithm in detail. Rasterise the following line using Bresenham's line generating algorithm P1 (5, 8) – P2 (9, 5). [8]

(*b*) Define : [6]

(*i*) Aspect Ratio

(*ii*) Pixel

(*iii*) Resolution.

(*c*) Explain Display File structure. [4]

Or

2. (*a*) What are Scanners ? Explain in detail the working principle of scanners. List different type of scanners. [8]

(*b*) What are the different methods for character generation ? Explain star bust method in detail. [4]

(*c*) Explain DDA line generation algorithm in detail with an example. [6]

3. (*a*) Explain the different types of polygons. Also explain the various methods for testing a pixel inside a polygon. [6]

(*b*) Find the final co-ordinate of triangle

A(2, 4), B(4, 6), C(2, 6)

after the reflection about the line $x - 2y = -4$. [10]

Or

4. (*a*) Magnify the triangle P(0, 0), Q(2, 2) and R(10, 4) to four times its size while keeping R(10, 4) fixed. [8]

(*b*) Explain the scan line polygon filling algorithm. [5]

(*c*) Explain homogeneous co-ordinate system. Give the homogeneous coordinate matrices for rotation and scaling. [3]

5. (*a*) Compare Bezier and B-Spline techniques for curve generation and discuss their properties. [8]

(*b*) Explain parallel and Perspective Projections also state their types. [8]

Or

6. (*a*) Write short notes on : [8]

(*i*) Polygon Meshes

(*ii*) Quadratic Surfaces.

(*b*) Obtain 3D matrices for : [8]

(*i*) Reflection relative to coordinate axes

(*ii*) Reflection relative to plane.

SECTION II

7. (*a*) Explain different steps used in design of animation sequence. [8]

(*b*) Explain different methods to specify motions of objects in an animation sequence. [8]

Or

8. (*a*) Explain the following color model : [8]

(*i*) HSV color model

(*ii*) YIQ color model.

(*b*) Explain raster animations and computer animation languages. [8]

9. (*a*) Explain specular reflection with neat diagram. [4]

(*b*) What is the basic purpose of Ray tracing algorithm. Explain ray tracing to find shadows. [6]

(*c*) Explain space-subdivision method to reduce ray surface intersection calculation. [6]

Or

10. (*a*) Compare Gaurand shading with phong shading. [8]

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

(*i*) Diffuse reflection

(*ii*) Ray tracing to find reflection.

11. (*a*) Explain bump mapping and frame mapping. [6]

(*b*) Write short notes on : [12]

(*i*) Shadows

(*ii*) GPU

(*iii*) Fractal lines and surfaces.

Or

12. (*a*) Explain construction of Bezier curve with its four control points. [6]

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

(*i*) Koch curve

(*ii*) Fractal and topological dimensions.

(*c*) Explain features of any Graphics tool that you have studied. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-214

S.E. (Information Technology) (II Sem.) EXAMINATION, 2012

PROCESSOR ARCHITECTURE AND INTERFACING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer question **1** *or* **2**, **3** *or* **4** and **5** *or* **6** from Section I and question **7** *or* **8**, **9** *or* **10** and **11** *or* **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw and explain functional block diagram of 80386 in detail. [10]

(*b*) Differentiate between Memory mapped I/O and I/O mapped I/O. [8]

Or

2. (*a*) Explain different Control Registers of 80386 Microprocessor in detail. [10]

(*b*) Explain Memory Segmentation of 80386 Microprocessor in Real mode. [8]

3. (*a*) What are the components of MS-DOS ? Explain different DOS function with suitable examples. [8]

(*b*) Draw and explain Programmable Peripheral Interface in detail. [8]

Or

4. (*a*) What do you mean by Assembler Directives ? How is it different from Instruction ? Explain with examples. [8]

(*b*) Differentiate between : [8]

(*i*) FAR and NEAR procedure

(*ii*) .EXE and .COM.

5. (*a*) Draw and explain how 80386 Microprocessor translates Logical address into Linear address. [10]

(*b*) Write a short note on Virtual Memory of 80386 Microprocessor. [6]

Or

6. (*a*) Draw and explain how 80386 Microprocessor translates Linear address into Physical address. [10]

(*b*) What is TLB ? Why is it necessary ? Explain with the help of diagram. [6]

SECTION II

7. (*a*) What is TSS ? What are the contents of it ? Discuss its use in Multitasking. [8]

(*b*) Explain I/O Permission bit Map. [6]

(*c*) Differentiate between Real Mode and Virtual 8086 Mode. [4]

Or

8. (*a*) How are Interrupts handled in Protected mode ? Explain with the help of neat diagram. [8]

(*b*) Explain CALL Gate mechanism in detail. [6]

(*c*) What do you mean by Exception ? [4]

9. (*a*) Describe Internal and External Data Memory organization of 8051 Microcontroller in detail. [8]

(*b*) What are different sources of Interrupts in 8051 Microcontroller ? Explain Interrupts handling mechanism of 8051 Microcontroller. [8]

Or

10. (*a*) Draw and explain Architecture of 8051 Microcontroller. [8]

(*b*) Explain register set of 8051 Microcontroller. [8]

11. (*a*) Describe Serial Prot of 8051 Microcontroller with the help of SCON. [10]

(*b*) Describe the features of Texas MSP 430. [6]

Or

12. (*a*) Explain Timer Structure of 8051 Microcontroller and SFRs used in Timer Programming. [12]

(*b*) Describe the features of PIC16F8XX Microcontroller. [4]

Total No. of Questions—**12**]   [Total No. of Printed Pages—**7**

Seat No.	

[4262]-215

S.E. (IT) (II Sem.) EXAMINATION, 2012

DATA STRUCTURES AND FILES

(2008 PATTERN)

Time : Three Hours   **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Compare index sequential and direct access files. [6]

(*b*) Create a Hash table and resolve collisions using linear probing with and without replacement :

9, 45, 13, 59, 12, 75, 88, 11, 105, 46

Hash table size = 11 and Hash function = key mod 10. [8]

(*c*) Write a note on re-hashing. [4]

P.T.O.

Or

2. (*a*) Write pseudo-code for implementation of primitive functions of index-sequential file. [8]

(*b*) Write a note on characteristics of good hash function. [4]

(*c*) Write a 'C' program using command line arguments to perform the following operations on a file :

(*i*) Count number of white spaces

(*ii*) Count number of special characters. [6]

3. (*a*) Convert the given postfix expressions into infix and prefix :

AB – C + DEF –+^

ABCDE –+^*EF*–

Show stack contents in each case. [8]

(*b*) Explain the concept of multistacks. [4]

(*c*) Write a note on implicit and explicit stacks. [4]

Or

4. (*a*) Implement stack as an ADT using sequential organisation. [8]

(*b*) Write a 'C' code to create an expression tree and perform non-recursive in-order traversal. [8]

5. (*a*) Specify which of the following applications would be suitable for a FIFO queue and justify your answer :

(*i*) A program to keep track of patients as they check into a clinic, assigning them to doctors on a first come, first-served basis.

(*ii*) An inventory of parts is to be processed by part number.

(*iii*) A dictionary of words used by spelling checker is to be created.

(*iv*) Customers are to take token nos. in a bank and are to be serviced when their nos. come up. [4]

(*b*) Write a pseudo-code to implement queue using sequential organization. [8]

(*c*) List down applications of queue. [4]

Or

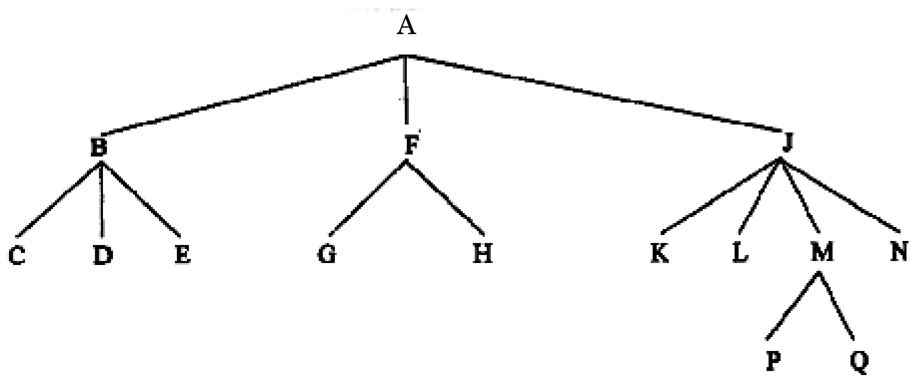
6. (*a*) Write a 'C' code for implementation of priority queue. [8]

(*b*) Compare multiqueue, double ended queue and priority queue. [8]

SECTION II

7. (*a*) What is the necessity of converting a tree into binary tree ?

Convert the following tree into a binary tree and list down the steps for the same. [6]



(*b*) Implement binary tree as an ADT. [8]

(*c*) Write a 'C' function to implement post order traversal on threaded binary tree. [4]

Or

8. (*a*) Write a recursive function to find the height of a binary tree. [6]

(*b*) Given the following traversals build a binary tree from them : [6]

(*i*) In-order : 15, 22, 25, 30, 33, 40, 44, 50, 60, 75, 80, 90

(*ii*) Pre-order : 50, 25, 22, 15, 40, 30, 33, 44, 75, 60, 90, 80.

(*c*) Write a 'C' function to delete a node from a binary search tree. [6]

9. (*a*) For the graph given draw the adjacency list and matrix : [4]

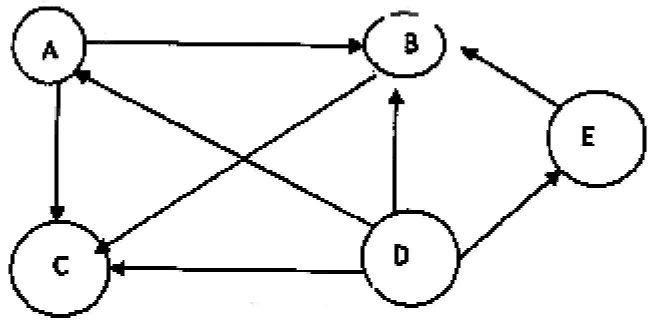


Fig. 1

(*b*) Write pseudo-code for Prim's method for finding MST of graph and explain the same for the graph whose weight matrix is given : [8]

	X	**Y**	**S**	**T**
X	0	0	3	0
Y	5	0	1	7
S	2	0	0	4
T	0	6	8	0

Fig. 2

(*c*) Define the following w.r.t. graphs with examples : [4]

(*i*) Degree of node

(*ii*) Isolated node

(*iii*) Path

(*iv*) Cycle.

Or

10. (*a*) Write pseudo-code for Kruskal's method for finding MST of graph and explain the same for the graph whose weight matrix is given in Fig 2. [8]

(*b*) Write a 'C' function to find the shortest path in a graph using Dijkstra's algorithm with an example. [8]

11. (*a*) Construct an AVL search tree by inserting the following elements in the order of their occurrence. Show the balance factor and type of rotation at each stage : [10]

64 1 44 26 10 110 98 85 13 20

(*b*) Explain the mechanism to create Huffman's tree and use it for encoding and decoding. Assume suitable data. [6]

Or

12. (*a*) Sort the following numbers in ascending order using heap sort. Show the sorting stepwise : [8]

17 20 114 44 30 2 18 33 56 10

(*b*) Create a Huffman's tree for the given data set and find the corresponding Huffman's codes : [8]

Data	**Weight**
A	10
B	3
C	4
D	15
E	2
F	4
G	2
H	3

Total No. of Questions—**12**]   [Total No. of Printed Pages—**4+1**

Seat No.	

[4262]-216

S.E. (Information Technology) (II Sem.) EXAMINATION, 2012

DATA COMMUNICATIONS

(2008 PATTERN)

Time : Three Hours   **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer questions **1** *or* **2**, **3** *or* **4**, **5** *or* **6** from Section I and questions **7** *or* **8**, **9** *or* **10, 11** *or* **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Explain the Data Communication System with its *five* components and discuss the fundamental characteristics of Data Communication System. Give the different forms in which data can be represented. [8]

(*b*) Explain four levels of addresses used in an Internet. Draw the diagram to show the relationship of Layers and Addresses in TCP/IP. [8]

Or

2. (*a*) Explain with diagram Pulse Code Modulation. Define the term Quantization Error. [8]

(*b*) Draw the diagram of OSI model. Discuss briefly the functions of each layer. [8]

3. (*a*) Explain the following : [8]

(*i*) Amplitude Modulation

(*ii*) Frequency Modulation

Draw the frequency domain representation of AM and FM wave.

(*b*) Define Spread Spectrum and its goal. Explain FHSS and DSSS. [8]

Or

4. (*a*) Define Multiplexing and De-Multiplexing. Explain Frequency—Division Multiplexing and Wavelength—Division Multiplexing. [8]

(*b*) Explain the following methods of Digital to Analog conversion : [8]

(*i*) ASK

(*ii*) FSK

(*iii*) PSK

(*iv*) QAM.

5. (*a*) Draw the diagram of an electromagnetic spectrum for Wireless Communication. Explain various modes of propagation for Unguided Signal. [9]

(*b*) Explain the cricuit switched network. What are the three phases of it ? Draw Delay diagram. [9]

Or

6. Write short notes on (**6** marks each) : [18]

(*i*) Asymmetric Digital Subscriber Line (ADSL)

(*ii*) Virtual Circuit Network

(*iii*) Signaling System Seven (SS7).

SECTION II

7. (*a*) What is hamming distance ? Explain with example. Explain simple parity check code. [8]

(*b*) Explain different ARQ techniques. Comment on the performance of each. [8]

Or

8. (*a*) Explain various station types and configurations used in HDLC. [8]

(*b*) What is CRC ? Generate the CRC code for message 1101010101. Given generator polynomial $g(x) = x^4 + x^2 + 1$. [8]

9. (*a*) Discuss CSMA/CD Random Access techniques. How is collision avoidance achieved in the same ? [8]

(*b*) Explain the following physical layer implementations in standard Ethernet :

(*i*) 10Base5

(*ii*) 10Base2

(*iii*) 10BaseT

(*iv*) 10BaseF

with respect to media, maximum length and line encoding. [8]

Or

10. (*a*) Explain FDMA, TDMA and CDMA in detail. [8]

(*b*) Discuss Gigabit Ethernet with reference to the following : [8]

(*i*) MAC Sub-layer

(*ii*) Gigabit Ethernet Frames.

11. Write short notes on :

(*i*) Working of Switch and Router. [6]

(*ii*) Virtual LAN. [6]

(*iii*) SONET Layers. [6]

Or

12. Write short notes on :

(*i*) Backbone Network. [6]

(*ii*) SONET Devices. [6]

(*iii*) Working of Router and Gateway. [6]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-217

S.E. (I.T.) EXAMINATION, 2012

MANAGEMENT AND FINANCE

(2003 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

SECTION I

1. (*a*) Explain in detail F. W. Taylor's theory of Scientific Management. Highlight the importance of this theory at present context. [10]

(*b*) Define Management. Explain various functions of management. [8]

Or

2. (*a*) Critically examine Henry Fayol's theory of Management. Explain its 14 principles. [10]

(*b*) Explain whether management is an art, science or a profession. [8]

3. (*a*) Define law of demand. Explain various determinants of demand and how demand curve is derived ? [8]

(*b*) State and explain various characteristics of human wants. [8]

Or

4. Explain the following concepts : [16]

(*i*) Salient features of Contract Act

(*ii*) Role of SEBI to control capital market.

5. (*a*) Explain the concept of ERP and its importance to business. [8]

(*b*) Differentiate between functional organisation and staff organisation with their merits and demerits. [8]

Or

6. Explain in detail various forms of Business Organisation. Explain the difference between Partnership and Joint Stock Company. [16]

SECTION II

7. Define man-power planning with its functions and techniques. [16]

Or

8. (*a*) State and explain various methods of training imparted to industrial workers. [8]

(*b*) Define capital structure. Explain various types of capital and its importance. [8]

9. Explain in brief : [16]

(*i*) Methods of capital budgeting

(*ii*) Money market and capital market.

Or

10. Define break-even analysis. What are its assumptions ? Construct CVP graph and explain its significance to industry. [16]

11. (*a*) What is overheads ? Explain various types of overheads with examples. [9]

(*b*) Define credit rating. Explain the process and techniques of credit rating. [9]

Or

12. (*a*) Define depreciation. Explain various methods of depreciation. [12]

(*b*) Explain the following ratios : [6]

(*i*) Debt-Equity Ratio

(*ii*) Leverage Ratio.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-218

S.E. (Information Technology) EXAMINATION, 2012

PROGRAMMING PARADIGM AND METHODOLOGY

(2003 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) What are the characteristics of a good programming language ? Explain each in short. [8]

(*b*) Discuss the various expression notations used by the programming languages to solve the expression. [10]

Or

2. (*a*) What are the different benefits of higher level languages over low and assembly level languages ? [8]

(*b*) Explain with suitable example about logic programming paradigm of programming language. [6]

(*c*) Differentiate between Assembler and Debugger. [4]

3. (*a*) Demonstrate early binding and late binding with an example. [6]

(*b*) Explain enumeration data type with a suitable example. [4]

(*c*) Compare the scalar data type and composite data type. [6]

Or

4. (*a*) Give an example of an operation in programming language that is implemented as an in-line code sequence. [8]

(*b*) What are the different bindings of data object ? Give the attributes of each of them. [8]

5. (*a*) What do you mean by call by value and call by reference ? Explain with suitable example. [8]

(*b*) What are the different storage classes in 'C' language ? Explain each in brief. [8]

Or

6. (*a*) Explain the following parameter passing methods with simple program fragment : [8]

(*i*) Call by value

(*ii*) Call by reference

(*iii*) Call by name

(*iv*) Call by value result.

(*b*) Define the terms function and macro. How do they differentiate from each other ? [8]

SECTION II

7. (*a*) What is meant by constructor and destructor ? What are the different types of constructors ? For what purpose constructor and destructor are used in a program ? [10]

(*b*) What is a friend function ? Explain with suitable example. [8]

Or

8. (*a*) What are the different components of PROLOG program ? [8]

(*b*) Define the following terms with respect to OOP with suitable example : [10]

(*i*) Object

(*ii*) Class

(*iii*) Subclass

(*iv*) Instance

(*v*) Method.

9. (*a*) Explain characteristics of object oriented programming languages. [8]

(*b*) Explain different types of inheritance in C++. [8]

Or

10. (*a*) What are the different storage classes in C ? Explain each in brief. [8]

(*b*) What do you mean by virtual function ? Explain polymorphism with suitable example. [8]

11. (*a*) Write different data types for : [8]

(*i*) Pascal

(*ii*) C

(*iii*) LISP

(*iv*) PROLOG.

(*b*) Write a program to reverse a string without using library functions in 'C'. [4]

(*c*) Write a short note on garbage collection. [4]

Or

12. (*a*) Explain the following with respect to C++ : [6]

(*i*) Primitive data types

(*ii*) User defined data types

(*iii*) Storage representation

(*iv*) Standard input-output function.

(*b*) Explain at least one special feature of C, C++, LISP and PROLOG and give the suitable examples of each special feature to explain them. [6]

(*c*) How the file handling is different in C++ than C ? [4]

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-219

S.E. (Information Technology) EXAMINATION, 2012

MICROPROCESSOR SYSTEMS

(2003 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer question **1** *or* **2**, **3** *or* **4** and **5** *or* **6** from Section I and question **7** *or* **8**, **9** *or* **10** and **11** *or* **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Give any *five* addressing modes of 8086. Explain with an example. [10]

(*b*) With the help of suitable diagram explain the concept of odd memory bank and even memory bank and their selection process. [8]

Or

2. (*a*) Give the features of 8086. Draw and explain functional diagram of 8086 in minimum mode. [10]

(*b*) Explain the functions of the following pins of 8086 : [8]

(*i*) ALE

(*ii*) READY

(*iii*) MN/MX'

(*iv*) HLDA.

3. (*a*) What is meant by assembly language programming ? Define assembler, linker and debugger. [8]

(*b*) What is the meaning of Assembler Directives ? Explain any *four* directives. [8]

Or

4. (*a*) Explain the difference between : [8]

(*i*) DOS and BIOS

(*ii*) .COM and .EXE.

(*b*) Explain NEAR and FAR procedure with an example. [8]

5. (*a*) What are the different operating modes of 8259 and give Control and Status word format of it. [8]

(*b*) Explain the following interrupt types of 8086 system : [8]

Type_1 and Type_2.

Where are the starting address of ISR of these interrupts stored in IVT ?

Or

6. (*a*) Draw and explain the internal block diagram of 8254. [8]

(*b*) Write a short note on IVT of 8086. [8]

SECTION II

7. (*a*) Draw block diagram of 8255 PPI and explain it in detail. [8]

(*b*) Give the difference between parallel and serial communication and Synchronous and Asynchronous Communication. [8]

Or

8. (*a*) Give format of 'Command Word Register' and 'Mode Word Register' of 8251 and explain the same. [8]

(*b*) What is RS 232 interface ? What is null modem ? Explain various signals associated with RS 232 interface. [8]

9. (*a*) Explain confirming code segment and non-confirming code segment. [8]

(*b*) How to convert Logical Address to Linear Address when 80386 is operating in protected mode ? Explain necessary registers used for the same. [10]

Or

10. (*a*) Explain how 80386 switch from Real Mode to protected mode. [8]

(*b*) What is Call Gate ? Explain its role in changing privilege level. [10]

11. (*a*) Explain the following in brief : [8]

(*i*) Task Register

(*ii*) Busy Bit

(*iii*) NT (Nested Task) Bit

(*iv*) TS (Task Switch) Bit.

(*b*) What is Exception ? Explain its types. [8]

Or

12. (*a*) Draw diagram of Pentium Processor Architecture and explain. [8]

(*b*) Write a short note on Virtual 8086 mode of 80386. [8]

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+2**

Seat No.	

[4262]-221

S.E. (Biotechnology) (First Semester) EXAMINATION, 2012

APPLIED CHEMISTRY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer only *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables or electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Define Carbene. Give its *two* methods of generations and explain its types and geometry. [6]

(*b*) What are the conditions of resonance ? Draw the resonance structures of :

(*i*) Naphthalene

(*ii*) Aniline

(*iii*) Nitrobenzene. [6]

(*c*) Justify the following (**2** marks each) :

(*i*) Guanidine is stronger base.

(*ii*) Cyclooctatetraene is non-aromatic.

(*iii*) Monochloroacetic acid is stronger than acetic acid. [6]

Or

2. (*a*) Explain in brief about Hyperconjugation and Steric effect with suitable example. [6]

(*b*) Define Hückel's rule and explain criteria of aromaticity with example. [6]

(*c*) Classify the following compounds as Aromatic, Non-aromatic and Antiaromatic :

(*i*) Pyrrole

(*ii*) Cyclopropenyl cation

(*iii*) Cyclobutadiene

(*iv*) Naphthalene

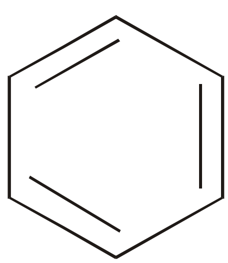
(*v*) Tropylium ion

(*vi*) Annulene[18]. [6]

3. (*a*) Compare S_N1 and S_N2 reactions on the basis of mechanism, stereochemistry and energy profile diagram. [6]

(*b*) Predict the product (**1** mark each) : [6]

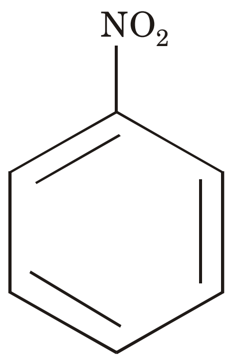
(*i*) $CH_3 - CH = CH_2 \xrightarrow[H_2O_2]{HBr} ?$

(*ii*)  $+ CH_3 - Cl \xrightarrow[AlCl_3]{Anhydrous} ?$

(*iii*) $2\ CH_3 - CHO \xrightarrow[NaOH]{dil.} ?$

(*iv*) $2\ CH_3 - Cl \xrightarrow[\Delta]{Na} ?$

(v) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-Br \xrightarrow[CH_3OH]{NaOH} ?$

(vi)  $\xrightarrow[\&\ \text{Conc. } H_2SO_4]{\text{Conc. } HNO_3} ?$

(c) Write Beckmann rearrangement with its mechanism. [4]

Or

4. (a) Write a note on E1 and E2 mechanism. [6]

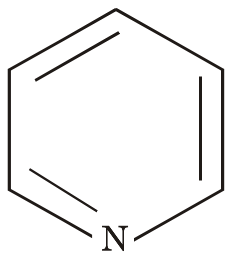
(b) Explain Friedel-Crafts alkylation and acylation with suitable example. [6]

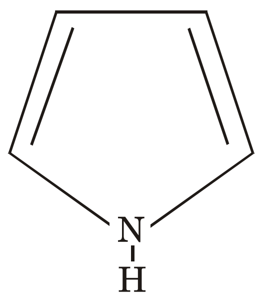
(c) Write mechanism of Claisen ester condensation reaction with suitable example. [4]

5. (a) Define conformational isomerism. Explain conformation in *n*-Butane. [6]

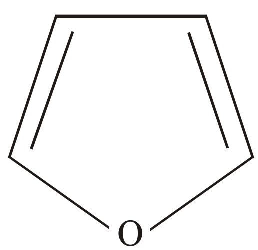
(*b*) Give *one* method of preparation of Furan, Pyrrole and Thiphene. [6]

(*c*) Predict the product (**1** mark each) : [4]

(*i*)  $\xrightarrow[300^{\circ}C]{KNO_3/H_2SO_4}$?

(*ii*)  $\xrightarrow[\Delta]{H_2/Ni}$?

(*iii*) $2C_2H_2 + H_2S \xrightarrow[-H_2]{}$?

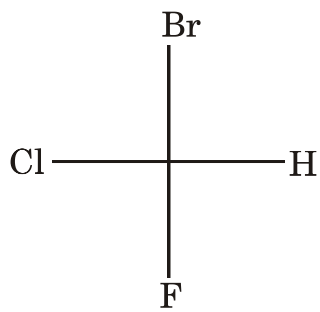
(*iv*)  $+ NH_3 \xrightarrow[\text{Steam}]{Al_2O_3}$?

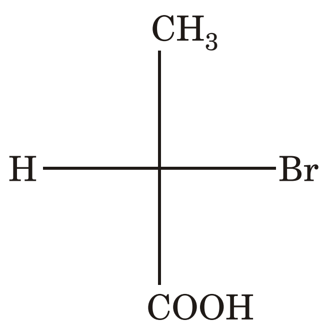
Or

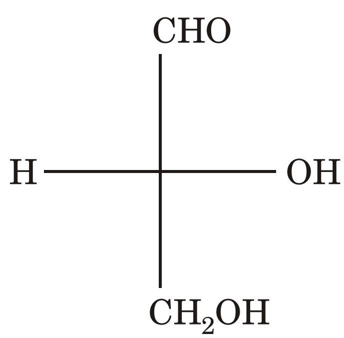
6. (*a*) Explain conformations of cyclohexane with energy profile diagram. [6]

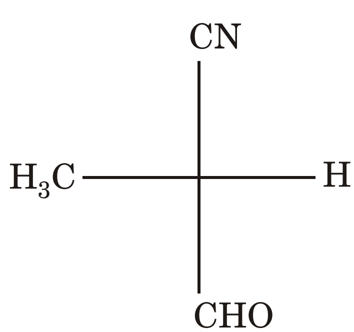
(*b*) Write Skraup synthesis of quinoline. [6]

(*c*) Assign R or S configuration of the following (**1** mark each) : [4]

(*i*) 

(*ii*) 

(*iii*) 

(*iv*) 

SECTION II

7. (*a*) What is vaporization of liquids ? Explain the use of Isotenescope apparatus to determine vapour pressure of liquid. [6]

(*b*) Derive Bragg's equation for studying internal structure of solid crystals. [6]

(*c*) (*i*) The time required to flow through Ostwald's viscometer is 2.52 minutes for water and for same volume of organic liquid having density 0.8 g/cc is 4.25 minutes. Find the viscosity of liquid relative to that of water. (Viscosity coefficient of water is 1.002 centipoise). [3]

(*ii*) Find the interplaner distance in a crystal in which a series of planes produce a first order reflection from a copper X-ray tube (λ = 1.424 Å) at an angle of 18.5°. [3]

Or

8. (*a*) Describe Powder method of measurement of diffraction angle. [6]

(*b*) Define surface tension and explain drop number method by use of stalagmometer to measure surface tension of liquid. [6]

(*c*) (*i*) At 300°K, surface tension of ethanol in contact with its vapour is 2.189×10^{-2} Nm^{-1} and its density is 0.584 g/cc. How far up the liquid will rise in a tube of internal radius of 0.02 cm. (g : 980 cm/sec^2). [3]

(*ii*) Calculate the angles at which first, second and third order reflections are obtained from planes 500 pm apart, using X-rays of wavelengths 100 pm. [3]

9. (*a*) Derive kinetic gas equation. [6]

(*b*) Describe experimental determination of critical constants. [6]

(*c*) Calculate collision diameter of CO_2, if at 20°C the coefficient of viscosity of CO_2 is 1.58×10^{-5} kg m^{-1} s^{-1}. [4]

Or

10. (*a*) Verify Boyle's law, Charles' law and Avogadro's law from kinetic gas equation. [6]

(*b*) Derive van der Walls' equation to explain the deviation of real gases from ideal gas behaviour. [6]

(*c*) Calculate RMS velocity of CO_2 at 37ºC. (At. wt. of C = 12 and O = 16). [4]

11. (*a*) State Raoult's law. How molecular weight of solute can be calculated using Raoult's law ? [6]

(*b*) Explain Berkeley and Hartley experiment to determine the osmotic pressure of dilute solutions. [6]

(*c*) A solution of 0.278 g of an organic substance in 60 g of ethanol had its boiling point raised by 0.482ºC. Find the molecular weight of that compound if Kb for 1000 gm of solvent is 1.82. [4]

Or

12. (*a*) Explain Landsberger's method to determine the elevation in boiling point with a neat labeled diagram. [6]

(*b*) Define the following : [6]

(*i*) Molarity

(*ii*) Molality

(*iii*) Mole fraction

(*iv*) Normality

(*v*) Ideal solution

(*vi*) Colligative property.

(*c*) Osmotic pressure of cane sugar at 27ºC is 4.42 atm. Calculate its concentration in grams per litre. [4]

(R = 0.082, At. wt. of C = 12, H = 01 and O = 16)

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-222

S.E. (Biotechnology) (I Sem.) EXAMINATION, 2012

FLUID FLOW AND UNIT OPERATIONS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) How is pressure measured with the help of manometers ? Derive the expression for determining pressure using a differential U-tube manometer. [6]

(*b*) A horizontal pipe discharges water into the atmosphere. The inlet has a bore area of 600 mm^2 and the exit has a bore area of 200 mm^2. Calculate the flow rate when the inlet pressure is 400 Pa. [6]

(*c*) Explain the formation of boundary layer. [6]

Or

2. (*a*) Explain the concept of viscosity and also state the units. Also describe in brief the effect of temperature on the viscosity of fluids. [6]

(*b*) The volumetric flow rate of beer flowing in a pipe is 1.8 lit/sec. The inside diameter of the pipe is 3 cm. The density of beer is 1100 kg/m^3. Calculate the average velocity of beer and its mass flow rate in kg/s. If another pipe with a diameter of 1.5 cm is used, what will be the velocity for the same volumetric flow rate ? [6]

(*c*) A venturi meter is used to measure the flow rate of water. Calculate the flow rate of water in lit/sec., if mercury manometer reads 18 cm. The pipe diameter is 75 mm while throat diameter is 25 mm. Take coefficient of venturi as 0.97. [6]

3. (*a*) Derive the expression for energy loss taking place due to sudden expansion in the flow area. [6]

(*b*) A fluid is flowing under laminar conditions in a cylindrical pipe of 2 cm diameter. The pressure drop is 330 Pa, the viscosity of the fluid is 5 Pas, and the pipe is 300 cm long. Calculate the mean velocity and the maximum velocity of fluid in this pipe. [6]

(*c*) A short horizontal pipe carrying water is enlarged from 10 cm to 20 cm diameter. If the flow through pipe is 1360 kg/min, determine loss of head due to sudden enlargement. [4]

Or

4. (*a*) Determine the rate of flow of water through a pipe of diameter 20 cm and length 50 m when one end of pipe is connected to a tank and the other end is open to the atmosphere. The pipe is horizontal and the height of water in tank is 4 m above the center of pipe. Take f = 0.009 in the formula $4fLv^2/2gD$. [6]

(*b*) An oil of viscosity 0.1 Pas and specific gravity 0.9 is flowing through a circular pipe of diameter 60 mm and length 10 m. The velocity measured with a pitot tube at the centre of the pipe is 3.5 m/s. Find the pressure drop in the pipe for the entire length and shear stress at the wall. [6]

(*c*) Differentiate between major and minor energy losses taking place during fluid flow. [4]

5. (*a*) With the help of a neat sketch explain the difference between axial and radial flow impellers. [5]

(*b*) A fermentation broth with viscosity 10^{-2} Pas and density 1000 kg/m^3 is agitated in a 50 m^3 baffled tank using a marine propeller 1.3 m in diameter. Calculate the power required for a stirrer speed of 4/s. Power curve data is as follows : [6]

Impeller Type	**Np (N_{Re} = 1)**	**Np (N_{Re} = 10^5)**
Rushton turbine	70	5-6
Paddle	35	2
Marine propeller	40	0.35

(*c*) With the help of a neat sketch, explain the construction and working of a ribbon blender. [5]

Or

6. (*a*) What is cavitation ? How does Net Positive Suction Head (NPSH) affect pump performance ? [6]

(*b*) What causes swirling in agitated vessels and what are the different ways of preventing it ? [5]

(*c*) Describe in brief the operation of reciprocating pump. [5]

SECTION II

7. (*a*) A steel sphere of diameter 4 mm falls in glycerin at a terminal settling velocity of 0.04 m/s. Assuming Stokes' law is applicable, determine :

(*i*) Dynamic viscosity of glycerin

(*ii*) Drag force

(*iii*) Drag coefficient for the sphere

Take density of steel as 7500 kg/m^3 and that of glycerin as 1250 kg/m^3. [6]

(*b*) How is centrifugal settling different than gravity settling ? [4]

(*c*) With the help of neat diagrams, explain the different stages of a batch sedimentation test. [6]

Or

8. (*a*) With the help of appropriate expressions, explain how the area of a batch sedimentation tank is calculated ? [8]

(*b*) Quartz and pyrites are to be separated in a hydraulic free settling classifier. The feed to the classifier ranges in size between 10 microns and 300 microns. Assume specific gravity of quartz as 2.65 and that of pyrite as 5.1. If the mixture is best separated in three fractions such as one contains only quartz, another contains only pyrites and the third contains a mixture of two, extimate the size ranges of the two materials in these fractions. Assume the flow to be essentially laminar. [8]

9. (*a*) What is minimum fluidization velocity ? Derive expression for the same in laminar and turbulent flow regimes. [8]

(*b*) Explain the formation of spouted beds. [6]

(*c*) What is a filter aid ? Enlist characteristics of a good filter aid. [4]

Or

10. (*a*) What is fluidization ? What are its salient characteristics ? [6]

(*b*) What is meant by constant rate and constant pressure filtration ? Give expressions for calculating pressure drop in both the cases. [6]

(*c*) Enlist the differences between particulate and aggregate fluidization. [6]

11. (*a*) What is equivalent size of a particle ? What are the different ways in which it can be expressed ? [6]

(*b*) A material is crushed in a Blake jaw crusher such that the average size of particle is reduced from 50 mm to 10 mm with the consumption of energy of 13.0 kW. What would be the consumption of energy needed to crush the same material of average size 75 mm to an average size of 25 mm :

(*i*) Assuming Rittinger's law applies ?

(*ii*) Assuming Kick's law applies ?

Which of these results would be regarded as being more reliable and why ? [6]

(*c*) Crushed ore is fed to a vibrating screen at the rate of 100 kg/hr. The desired product has a size of 20 mm. The mass fraction of the desired product in the feed, product and the reject is 0.3, 0.6 and 0.1 respectively. Calculate the effectiveness of screen in this case. [4]

Or

12. (*a*) Derive the expression for determining the screen efficiency. [6]

(*b*) A ball mill has a diameter of 400 mm and the diameter of the balls used for crushing is 40 mm. Calculate the critical speed of this ball mill. Also calculate the operating speed if it is 50% of the critical speed. [6]

(*c*) Differentiate between the following : [4]

(*i*) Coarse and fine grinding

(*ii*) Ideal and actual screens.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-223

S.E. (Biotechnology) (I Sem.) EXAMINATION, 2012

MICROBIOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I and Answer Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

SECTION I

1. List and explain the role of each part of a bacteria cell. [18]

Or

2. Classify the methods of sterilization and disinfection. Describe sterilization methods by autoclave. [18]

3. Describe the important contributions of the following scientists : [16]

(*i*) Robert Koch

(*ii*) Edward Jenner

(*iii*) Alexander Fleming

(*iv*) Joseph Lister.

Or

4. Answer the following : [16]

(*i*) What was the significance of Christian Gram's contribution to microbiology ?

(*ii*) What is drug resistance ? Describe the mechanism of development of drug resistance in bacteria.

5. Write briefly on : [16]

(*i*) What are the *three* domains in the tree of life and what are the *four* kindgoms in eukarya domain ?

(*ii*) John Needham's experiments on spontaneous generation.

(*iii*) The structure and symmetry of bacterial cytoplasmic membranes as suggested by the Fluid Mosaic Model.

(*iv*) Germ theory and its importance in understanding of infectious diseases.

Or

6. Define and explain in short : [16]

(*i*) Growth requirement of bacteria and methods of anaerobic culture.

(*ii*) The differences in the curves resulting from the growth of bacterial and viral populations.

SECTION II

7. List the steps involved in the lytic life cycle of a virus using the bacteriophage as an example. Explain what is happening at each step. [18]

Or

8. Explain the Ecological association/Interactions among soil micro-organisms, giving examples. [18]

9. Answer the following : [16]

(*i*) Describe the morphology and cultural characteristics of Vibrio cholera. Mention the laboratory diagnosis and prophylaxis of cholera.

(*ii*) Describe the embryonated egg technique and the plaque assay.

Or

10. Elaborate on : [16]

(*i*) Principle of sewage treatment

(*ii*) Air-borne illness

(*iii*) Tuberculin test

(*iv*) Important features of viruses.

11. Answer in brief : [16]

(*i*) Describe the organisms called viroids and prions. Do they cause human disease ?

(*ii*) How does food become contaminated ?

Or

12. Write notes on : [16]

(*i*) Laboratory diagnosis of tuberculosis

(*ii*) Oncogenic viruses

(*iii*) Quality tests for water

(*iv*) Pathogenesis of Rabies.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-224

S.E. (Biotechnology) (First Sem.) EXAMINATION, 2012

BIOCHEMISTRY—I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

SECTION I

1. Answer the following : [18]

(*i*) What are the :

(*a*) H^+ ion concentration

(*b*) pH

(*c*) OH^- ion concentration

(*d*) pOH of a 0.001 M solution of HCl ?

(*ii*) Describe in detail about storage polysaccharides and structural polysaccharides.

Or

2. Depict the flow chart for glycolysis with all the enzymes and co-enzymes involved in it. Draw the structures of the intermediates as well. Give the significance of phosphorylated intermediates in glycolysis. [18]

3. Explain the step that connects glycolysis and TCA cycle ? Draw a schematic to TCA with enzymes. What is substrate level phosphorylation ? Explain the step in TCA cycle which has substrate level phosphorylation. [16]

Or

4. Answer the following : [16]

(*a*) Draw a neat labeled schematic for Cori cycle and ETC.

(*b*) What is the significance of pentose phosphate pathway ? Describe the oxidative reactions of the pentose phosphate pathway.

5. What is a peptide bond and give its characteristics ? Explain Ramachandran plot and also explain the various configuration possible in the plot ? [16]

Or

6. Answer the following : [16]

(*a*) Draw a schematic of Urea cycle.

(*b*) Describe in short about non-protein, essential and non-essential amino acids.

SECTION II

7. Answer the following : [18]

(*a*) What are lipids ? Describe some important membrane lipids ?

(*b*) Describe in detail about vitamin D synthesis.

Or

8. Answer the following : [18]

(*a*) What is beta oxidation of fatty acid ? Explain in detail about conversion of fatty acids into acetyl-CoA.

(*b*) Write a short note on phospholipids and sphingolipids.

9. Answer the following : [16]

(*a*) Draw the structure of DNA ? Describe its various forms A, B, Z DNA ?

(*b*) Describe in detail about enzymatic hydrolysis of nucleic acid.

Or

10. What is the difference between de novo and salvage pathway for nucleotide synthesis ? Explain in detail salvage pathway for nucleotide synthesis. [16]

11. Answer the following : [16]

(*a*) Functions and deficiencies of vitamin A and D.

(*b*) What are dietary fibers ? Enlist its various types and explain about its uses.

Or

12. Explain the role and deficiency of the following : [16]

(*a*) Any *two* water soluble vitamins

(*b*) Any *two* minerals.

Total No. of Questions—**12**] [Total No. of Printed Pages—**4**

Seat No.	

[4262]-225

S.E. (Biotechnology) (Second Sem.) EXAMINATION, 2012

BIOCHEMISTRY—II

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

SECTION I

1. Answer the following (9 marks each) : [18]

(*i*) What is alpha helix in protein ? Explain it in detail with emphasis on the bonds involved in stabilizing the structure of alpha helix. Depict the hydrogen bonding scheme of alpha helix.

(*ii*) Explain the allosteric property of hemoglobin. What is the physiological significance of the cooperative binding of oxygen by hemoglobin ?

Or

2. Answer the following (9 marks each) : [18]

(*i*) What is a prion ? Write down the characteristics of the prion. Describe in detail about amyloid fibers.

(*ii*) Enlist the different structure levels of protein. Describe in detail about the structure of parallel and antiparallel beta sheet.

3. How do enzymes use non-covalent binding energy to catalyze the reaction ? How binding energy does contribute to reaction specificity and catalysis of an enzyme ? Explain in detail about how the substrate concentrations affect the rate of a reaction catalyzed by an enzyme. [16]

Or

4. Answer the following (8 marks each) : [16]

(*i*) Explain with suitable example how the catalytic activity of an enzyme is regulated by means of covalent modification.

(*ii*) Elucidate in detail about the effect of pH and temperature on enzyme activity.

5. Explain in detail about coenzymes thiamine diphosphate and biotin with one biochemical reaction where these coenzymes play a vital role. [16]

Or

6. What is an enzyme inhibition ? Describe in detail about reversible and irreversible inhibition of enzyme. What is the significance of enzyme inhibition study ? [16]

SECTION II

7. Answer the following (9 marks each) : [18]

(*i*) How do the G proteins operate during signal transduction ? Draw a schematic for the same.

(*ii*) Draw and explain the schematic of Epinephrine cascade.

Or

8. How are the hormones chemically diverse ? Give the example of each type of hormone with its synthetic path and mode of action. [18]

9. What are the factors which determine whether a molecule will cross a membrane ? Describe in detail about active and passive transport of molecules across membrane. [16]

Or

10. Answer the following (8 marks each) : [16]

(*i*) Draw and describe the structure and function of sacromere.

(*ii*) Describe in detail about movement of Kinesin molecule along a microtubule.

11. Define the following terms and explain the symptoms of same (8 marks each) : {16}

(*i*) Keratomalacia

(*ii*) Dementia.

Or

12. Answer the following (8 marks each) : [16]

(*i*) What is water and electrolyte balance ? Describe its significance in detail.

(*ii*) Application of biochemistry in monitoring liver diseases.

Total No. of Questions—**12**] [Total No. of Printed Pages—**8+4**

Seat No.	

[4262]-226

S.E. (Biotechnology) (II Sem.) EXAMINATION, 2012

MATERIAL BALANCES AND STOICHIOMETRY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answer to the two Sections should be written in separate answer-books.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of electronic pocket calculator is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Ambient air on a particular day in a city has the following conditions :

Total pressure = 100 kPa(750 torr)

Dry bulb temperature = 308.15 K(35°C)

Dew Point = 294.45 K(21.3°C)

Find the absolute humidity of the air.

Data : Vapor pressure of water at 294.45 K = 2.5326 kPa = 19 torr. [6]

(*b*) A solution of sodium chloride in water contains 20% NaCl(by mass) at 333 K (60°C). The density of the solution is 1.127 kg/L. Find the molarity, normality and molality of the solution. [6]

(*c*) A sample of light diesel oil (LDO) from a refinery is found to contain 0.68 mass % sulphur (as S). Its density is 0.85 kg/L at 303.15 K (30°C). Convert this impurity into ppm. [4]

Or

2. (*a*) Find the moles of :

(*i*) oxygen present in 250 g

(*ii*) nitrogen present in 1.4 kg. [2]

(*b*) The analysis of a sample of glass yields 7.8 % Na_2O, 7% MgO, 9.7% ZnO, 2% Al_2O_3, 8.5% B_2O_3 and 65.0% SiO_2 (by mass). Convert this composition into mole %. [6]

(*c*) Calculate the molar mass of :

(*i*) $C_6H_{12}O_6$

(*ii*) $CaCO_3$. [4]

(*d*) How many grams of carbon is present in : [4]

(*i*) 300 g $CaCO_3$

(*ii*) 200 g $NaHCO_3$.

3. (*a*) A pressure swing adsorption (PSA) unit produces nitrogen for inerting purpose. It is fed with compressed air at 7 bar g and 313 K (40°C) at the rate of 170 Nm^3/h. Unit consists of carbon molecular sieves which adsorbs nitrogen under pressure. Nitrogen is produced from the unit at the rate of 50 Nm^3/h having 99% purity (by volume). Calculate the average composition of the reject stream. [4]

(*b*) In a batch process, the reaction takes place in the presence of an acid medium. The process is illustrated in Fig. 1. The acid is drained from the reaction vessel at the rate of 15 mL/s as a result of the density difference of the acid from the reacting component. To avoid wastage of acid, it is recycled to an acid tank which has 1000 L capacity. The acid, drained from the reaction vessel, picks up 50 g/L of solids from the reactor. Acid is fed once again to the process from the acid tank. When the batch is started, the acid is almost pure in the tank as a result of filtration. As the reaction proceeds, acid in the tank gets more contaminated with the solids. The concentration of the solids should not exceed 100 g/L from the process point of view. The batch time is 16 h. Check whether the concentration of the solids will exceed 100 g/L during the batch reaction. [12]

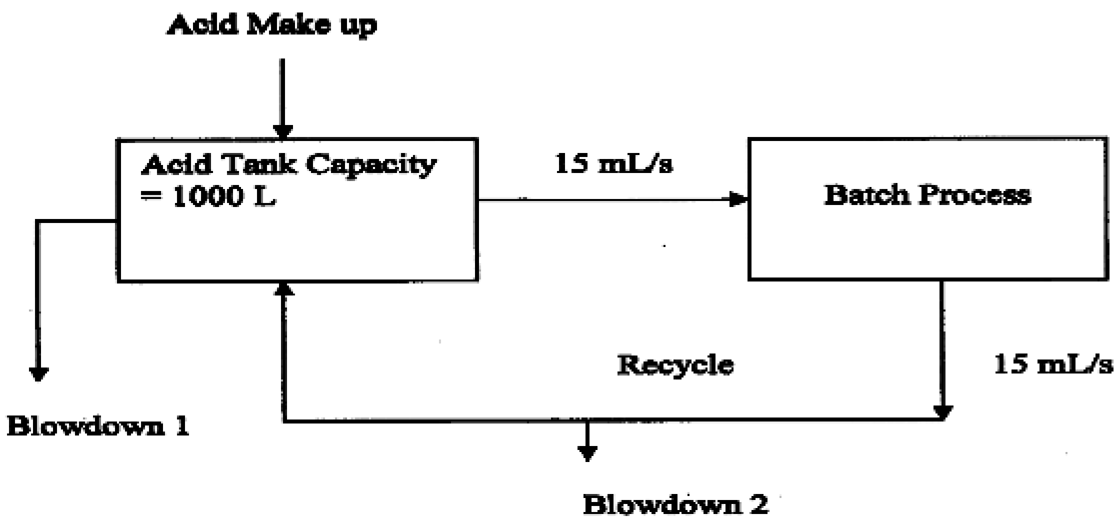


Fig. 1.

Or

4. (*a*) A quadruple effect evaporator system has a capacity of processing one tonne per day of solid caustic soda when it concentrates weak liquor from 4 to 25% (both on mass basis). When the plant is fed with 5% weak liquor and if it is concentrated to 50% (both on mass basis), find the capacity of the plant in terms of solid caustic soda, assuming the water evaporating capacity to be the same in both cases. [6]

(*b*) It is required to make 1000 kg mixed acid containing 60% H_2SO_4, 32% HNO_3, and 8% water by blending :

(*i*) the spent acid containing 11.3% HNO_3, 44.4% H_2SO_4 and 44.3% H_2O

(*ii*) aqueous 90% HNO_3 and

(*iii*) aqueous 98% H_2SO_4.

All percentages are by mass. Calculate the quantities of each of the three acids required for blending. [6]

(*c*) Explain the concept of steady state and unsteady state process. [4]

5. (*a*) On heating 1 mol of N_2 and 3 mol of H_2 to 400°C and allowing the mixture to reach equilibrium at 10.13 bar, 0.148 mol of NH_3 is formed. Calculate :

(*i*) how many mol of N_2 have reacted ?

(*ii*) how many mol of H_2 remain unreacted ? [6]

(*b*) In manufacturing soda ash the wet sodium bicarbonate is dried and calcined in a single stage :

$$2NaHCO_3 \rightarrow Na_2CO_3 + CO_2 + H_2O$$

In an experimental investigation wet $NaHCO_3$ containing 8% water is premixed with dry soda ash (Na_2CO_3, 0% water) so as to reduce the water content to 4%, before introducing into the calciner. The calciner is fed with 100 kg of wet bicarbonate per hour. Calculate :

(*i*) kg of soda ash produced per hour as the final product

(*ii*) the total quantity of the off gases (containing CO_2 and H_2O only) produced per hour

(*iii*) kg of soda ash recycled per hour

(*iv*) the mol ratio CO_2/H_2O in the off gas. [12]

Or

6. (*a*) Define the following terms :

(*i*) Limiting reactant

(*ii*) Conversion

(*iii*) Yield. [6]

(*b*) In the process of manufacture of hydrochloric acid from common salt and sulfuric acid, the two components are heated together in a retort. The HCl gas coming out is cooled and absorbed in water to produce 31.5% HCl by weight. Some amount of HCl is lost during absorption.

To produce 1 tonne of 31.5% HCl a retort is charged with 550 kg of NaCl and 480 kg of 98% H_2SO_4. The reaction is allowed to go to completion :

(*i*) Which is the limiting reactant ?

(*ii*) What percentage of HCl formed is lost during absorption ?

(*iii*) Calculate the composition and quantity of residue left in the retort assuming that 50% of the water distills over. [12]

SECTION II

7. (*a*) The gases entering sulfur converter contains 2.1% SO_3, 8.5% SO_2, 9.6% O_2 and 79.8% N_2. Only the reaction $SO_2 + ½O_2 \rightarrow SO_3$ takes place.

No materials are added or removed except by the single process stream. The outlet gases contain 82.46% N_2. How much heat is evolved per 100 mol of entering gas, if the reaction takes place isothermally at 720 K ?

Data :

Heat of formation of SO_3 at 290 K = –98.18 J

Mean specific heat of SO_3 = 51.58 J/(mol) (K)

Mean specific heat of SO_2 = 45.67 J/(mol) (K)

Mean specific heat of $½O_2$ = 30.98 J/(mol) (K). [6]

(*b*) Explain : [4]

(*i*) heat of formation

(*ii*) heat of reaction.

(*c*) What is the enthalpy of 150 g formic acid at 70°C and 1 atm relative to 25°C and 1 atm ?

C_p for formic acid in the temperature range of interest is 0.524 cal/g °C. [6]

Or

8. (*a*) In the production of sulphuric acid from anhydrite, the gypsum is roasted with clay to obtain sulfur dioxide and cement clinker. The reaction proceeds as follows : [6]

$3CaSO_4(s) + SiO_2(s) \rightarrow 3CaO\ SiO_2(g) + 3SO_2(g) + 3/2O_2(g)$

Data :

Component	Phase	ΔHf
$CaSO_4$	Solid	–1432.7
SiO_2	Solid (amorphous)	–903.5
$3CaO.SiO_2$	Solid (clinker)	–2879
SO_2	Gas	–296.81
O_2	Gas	0.0

(*b*) Diphenyl A-30 is heated from 313 K (40°C) to 553 K(280°C) at the rate of 4000 kg/h in an indirectly fired heater. In this particular temperature range the heat capacity of the fluid is given by the equation :

$$C_1 = 0.7511 + 1.465 \times 10^{-3} \text{ T kJ/(kg.K)}$$

where T is in K.

Also, the heat capacity of Diphenyl A-30 at 313 K(40°C) and 553 K(280°C) are 1.1807 and 1.5198 kJ/(kg.K) respectively. Calculate the heat to be supplied to the fluid in the heater using the heat capacity equation. Also, calculate the % error involved in using the mean heat capacity data for the heat change calculations. [6]

(*c*) Define :

(*i*) Latent heat of fusion

(*ii*) Latent heat of vaporization

(*iii*) Latent heat of condensation

(*iv*) Heat capacity. [4]

9. (*a*) A multiple contract countercurrent extractor is employed to extract oil from a feedstock with the help of ethyl ether. The fresh feed is charged to the extractor at the rate of 1000 kg/h and contains 25.7% oil (by mass). Pure ether enters the bottom of the extractor. The overflow from the extractor contains 70% oil (by mass). The underflow rate is 0.23 kg solution/kg of oil free solids and is known to contain 12.8% oil (by mass). Based on these operating conditions, make the complete material balance and find the flow rate of ether to the extractor. Also, find out the percentage recovery of oil. [10]

(*b*) Continuous distillation column is fed with 1000 kg/h ethanol solution (containing 8.6% alcohol). Distillate (product) is a solution containing 95.5% alcohol. The waste solution from the column carries 0.1% of alcohol. All percentages are by mass. Calculate :

(*i*) the mass flow rates of distillate and bottom products in kg/h and

(*ii*) the percentage loss of alcohol. [6]

Or

10. (*a*) Aqueous two-phase extraction is used to recover alpha-amylase from solution. A polyethylene glycol-dextrin mixture is added and the solution separates into two phases. The partition coefficient is 4.2. Calculate the maximum possible enzyme recovery when :

(*i*) the volume ratio of upper to lower phases is 5 and

(*ii*) the volume ratio of upper to lower phases is 0.5. [6]

(*b*) Fermentation slurry containing *Streptomyces kanmyceticus* cells is filtered using a continuous rotary vacuum filter. 120 kg/h slurry is fed to the filter; 1 kg slurry contains 60 g cell solids. To improve filtration rates, particles of diatomaceous-earth filter aid are added at a rate of 10 kg/h. The concentration of kanamycin in the slurry is 0.05% by weight. Liquid filtrate is collected at a rate of 112 kg/h; the concentration of kanamycin is 0.045% (w/w). Filter cake containing cells and filter aid is continuously removed from the filter cloth.

(*i*) What percentage liquid is the filter cake ?

(*ii*) If the concentration of kanamycin in the filter cake liquid is the same as in the filtrate; how much kanamycin is absorbed per kg filter aid ? [10]

11. The steam raising plant of a refinery uses 500 kg/h of tar as a fuel. An analysis of the tar indicates that it contains 88% carbon and 0.5% sulfur by weight; the remaining being combustible hydrogen, moisture and ash. The ash content of this tar is usually four times the moisture content. For a given test run, the following data were obtained.

Flue gas Orsat analysis : CO_2 – 14.5%, CO – 1.5%, O_2 – 2.5% and N_2 – 81.5%.

Air inlet condition : 30°C and 1.1 bar

Calculate :

(*i*) the combustible hydrogen, moisture and ash content of the tar

(*ii*) the percent excess air used

(*iii*) the kg of water per kg of dry flue gas (assume air to be dry)

(*iv*) the kg of sulfuric acid that could have been produced per hour if all the sulfur in tar were converted into sulfuric acid.

(**Note :** In Orsat analysis SO_2 is detected as CO_2). [18]

Or

12. (*a*) Explain in detail about proximate analysis. [6]

(*b*) The coal (Carbon – 50.22%, hydrogen – 2.79%, sulfur – 0.37% and oxygen 18.04%, moisture – 7%, Ash – 19.53%, nitrogen – 2.05%) (data on mass % basis) is burnt with 100% excess air. Calculate :

(*i*) the theoretical oxygen requirement per unit mass of coal,

(*ii*) the theoretical dry air requirement per unit mass of fuel and

(*iii*) the wet and Orsat analyses of flue gases when the coal is burnt with 100% excess dry air. [12]

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

Seat No.	

[4262]-227

S.E. (Biotechnology) (II Sem.) EXAMINATION, 2012

CELL BIOLOGY AND TISSUE CULTURE

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer Q. No. **1** *or* Q. No. **2**. Answer Q. No. **3** *or* Q. No. **4**. Answer Q. No. **5** *or* Q. No. **6** from Section I and Answer Q. No. **7** *or* Q. No. **8**. Answer Q. No. **9** *or* Q. No. **10**. Answer Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

SECTION I

1. Explain sub-cellular compartmentalization and organelles of a eukaryotic cell. [18]

Or

2. Write a note on the Intracellular signalling and communication. [18]

3. With a neat labelled diagram, explain the mechanism of exocytosis. [16]

Or

4. Write notes on : [16]

   (*i*) Transport of molecules across the membrane.

   (*ii*) Different types of cell membrane proteins.

5. Explain the functions of fatty acids in living cells. [16]

Or

6. Define and explain in brief : [16]

   (*i*) Extracellular matrix

   (*ii*) Cell surface receptor.

SECTION II

7. What is programmed cell death ? Explain the steps involved in apoptosis. [18]

Or

8. Describe karyokinesis and cytokinesis. [18]

9. What is heamatopoeisis ? Explain stem cell technology. [16]

Or

10. Explain Landsteiner's blood grouping system. [16]

11. Elaborate on adherent cell lines and suspension cell cultures. [16]

Or

12. Write notes on : [16]

(*i*) Transgenic plants

(*ii*) Preservation of animal cells.

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4262]-228

S.E. (Biotechnology) (Second Semester) EXAMINATION, 2012

THERMODYNAMICS

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of programmable pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) State and explain the first law of thermodynamics along with its mathematical statement. How will you calculate work done in a constant volume process, constant pressure process and reversible adiabatic process ? [8]

(*b*) It is planned to maintain a large lecture hall at 25°C in summer as well as in winter. The minimum temperature in winter is 3°C while the maximum temperature in summer is 40°C. The rate of energy loss through the walls and roofing is estimated at 20 kJ/s. Determine the minimum power required to maintain the hall in summer and in winter if the same device is used as a refrigerator in summer and as a heat pump in winter. [8]

Or

2. (*a*) What is the Carnot cycle and its significance with respect to thermodynamics ? Describe the different steps of the cycle in detail. [8]

(*b*) Heat is transferred to 10 kg of air which is initially at 100 kPa and 300 K until its temperature reaches 600 K. Determine the change in internal energy, the change in enthalpy, the heat supplied and the work done in the following :

(*i*) Constant volume process

(*ii*) Constant pressure process

Assume :

PV = nRT for air

R = 8.314 kJ/kmolK

C_P = 29.099 kJ/kmolK

C_V = 20.785 kJ/kmolK

Mol wt. of air = 29. [8]

3. (*a*) The standard heat of combustion of benzene at 298 K is –3269.5 kJ/mol, when burnt completely to CO_2 and liquid water. The standard heat of combustion of hydrogen to liquid water is –286.04 kJ/mol and that of carbon to carbon dioxide is –393.78 kJ/mol. Calculate the standard heat of formation of liquid benzene. [8]

(*b*) The industrially important water gas shift reaction is given by :

$$CO(g) + H_2O(g) \rightarrow CO_2(g) + H_2(g)$$

Determine the standard enthalpy change of this reaction at 298.15 K from the following standard enthalpy change of combustion data :

$$CO(g) + \tfrac{1}{2}O_2(g) \rightarrow CO_2(g); \quad \Delta H°_c = -283.18 \text{ kJ}$$

$$H_2(g) + \tfrac{1}{2}O_2(g) \rightarrow H_2O(l); \quad \Delta H°_c = -286.03 \text{ kJ}$$

$$H_2O(l) \rightarrow H_2O(g); \quad \Delta H° = -43.966 \text{ kJ}$$ [8]

Or

4. (*a*) Industrial grade alcohol can be produced according to the reaction : [8]

$$C_2H_4(g) + H_2O(g) \rightarrow C_2H_5OH(g)$$

Calculate the standard enthalpy of change of the above reaction at 400 K. The enthalpy of vaporization of the ethanol at 298.15 K is 43.82 kJ/mol.

Data :

Compound	ΔH°_{r298}**(kJ)**	**a**	$\mathbf{b \times 10^3}$	$\mathbf{c \times 10^6}$
$C_2H_4(g)$	52.335	4.196	154.565	–81.076
$H_2O(g)$	–241.997	28.850	12.055	—
$C_2H_5OH(g)$	—	20.691	205.346	–99.79
$C_2H_5OH(l)$	–277.819	—	—	—

(*b*) Using Hess's law, calculate the heat of formation of chloroform ($CHCl_3$) with the following given data : [8]

$CHCl_3(g) + \frac{1}{2}O_2(g) + H_2O(l) \rightarrow CO_2(g) + 3HCl(g)$; $\Delta H^{\circ}_{298} = -509.93$ kJ

$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$; $\Delta H^{\circ}_{298} = -296.03$ kJ

$C(s) + O_2(g) \rightarrow CO_2(g)$; $\Delta H^{\circ}_{298} = -393.78$ kJ

$\frac{1}{2}H_2(g) + \frac{1}{2}Cl_2(g) \rightarrow HCl(g)$; $\Delta H^{\circ}_{298} = -167.57$ kJ

5. (*a*) What are Maxwell's relations and their significance ? Derive any *one* Maxwell equation. [10]

(*b*) Write short notes on the following : [8]

(*i*) Criterion for phase equilibrium

(*ii*) Excess Gibbs free energy.

Or

6. (*a*) The partial molar volume of ethanol in a 60 mole % ethanol water solution is 57.5×10^{-6} m^3. The density of the mixture is 849.4 kg/m^3. Calculate the partial molar volume of water is the mixture. [8]

(*b*) Write short notes on the following : [10]

(*i*) Ideal solution

(*ii*) Significance of Activity coefficient.

SECTION II

7. (*a*) Explain the difference between "steady state" and "equilibrium". [4]

(*b*) Define the following terms : [10]

(*i*) Bubble point

(*ii*) Dew point

(*iii*) Superheated vapour

(*iv*) Subcooled liquid

(*v*) Saturated liquid.

(*c*) Calculate the number of degrees of freedom for the following systems : [4]

(*i*) Liquid water in equilibrium with a mixture of water vapour and N_2.

(*ii*) A liquid solution of alcohol in water in equilibrium with its vapour.

Or

8. (*a*) State and derive the Duhem's theorem for non-reacting systems. [5]

(*b*) An equimolar solution of benzene and toluene is totally evaporated at a constant temperature of 363 K. At this temperature the vapour pressures of benzene and toluene are 135.4 and 54 kPa respectively. What are the pressures at the beginning and at the end of vaporization process ? [8]

(*c*) Explain Raoult's law and its significance. [5]

9. (*a*) Explain in detail effect of temperature on the equilibrium constant. [8]

(*b*) The standard heat of formation and standard free energy of formation of ammonia at 298 K are –46,100 J/mol and –16,500 J/mol respectively. Calculate the equilibrium constant for the reaction : [8]

$$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g).$$

Or

10. (*a*) Explain in detail phase rule and Duhem's theorem for reacting system. [8]

(*b*) A mixture which contained 1 mol CO, 1 mol water vapour and 1 mol CO_2 is undergoing the following reaction at a temperature of 1100 K and a pressure of 1 bar.

$$CO(g) + H_2O(g) \rightarrow CO_2(g) + H_2(g)$$

The equilibrium constant for the reaction K = 1. Assuming the gas mixture to behave as an ideal gas, calculate the fractional dissociation of steam. [8]

11. (*a*) Explain in brief different types of biochemical reactions. [8]

(*b*) What is Bioenergetics ? Explain the role of ATP in providing energy to cells. [8]

$$K = \frac{y_{CO_2} \cdot y_{H_2}}{y_{CO} \cdot y_{H_2O}}$$

Or

12. Write short notes on : [16]

(*i*) Applications of Gibbs' free energy

(*ii*) Enzyme participation and feasibility of individual steps in pathways.

Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

Seat No.	

[4262]-229

S.E. (Biotechnology) (II Sem.) EXAMINATION, 2012

GENETICS AND MOLECULAR BIOLOGY

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

***N.B.* :—** (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

SECTION I

1. Describe DNA packaging with explanation of the following points : [16]

(*a*) Chromosome

(*b*) Chromatin

(*c*) Chromatid

(*d*) Euchromatin and Heterochromatin.

Or

2. Explain the following two model systems in detail : [16]

(*a*) Drosophila

(*b*) Zebra Fish.

3. What is DNA ? Who discovered the structure of DNA ? Explain A, B and Z type of DNA structure. [16]

Or

4. Explain nucleic acid structure present in mitochondria and chloroplast. Explain its significance. Differentiate between cellular DNA and organelle DNA structure. [16]

5. Describe in detail all the enzymes involved in DNA replication with its function. [18]

Or

6. Describe the process of DNA replication in detail. [18]

SECTION II

7. What are introns and exons ? What is their function ? Explain process of splicing in detail. [16]

Or

8. Explain the following types of RNA in detail (**4** marks each) : [16]

(*a*) *m*RNA

(*b*) *t*RNA

(*c*) *r*RNA

(*d*) *s*iRNA.

9. Explain gene structure. Describe in detail the functioning of his operon. [16]

Or

10. What are oncogenes ? Explain the concept of gene amplification. [16]

11. Explain the process of protein biosynthesis in detail. [18]

Or

12. What is genetic disorder ? Explain Thalassemia in detail. [18]

Total No. of Questions : 12]

P935

SEAT No. :

[Total No. of Pages : 7

[4262] - 110

S.E. (Civil)

STRUCTURAL ANALYSIS - I

(2008 Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Answer Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6 from Section - I & Q.No.7 or 8, Q.No.9 or 10, Q.No.11 or 12 from Section - II.***
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) A simply supported beam of span 6m is loaded and supported as shown in figure 1. Using Macaulay's method, determine slope and deflection at 'C'. Assume EI = 4×10^4 kN-m^2. **[7]**

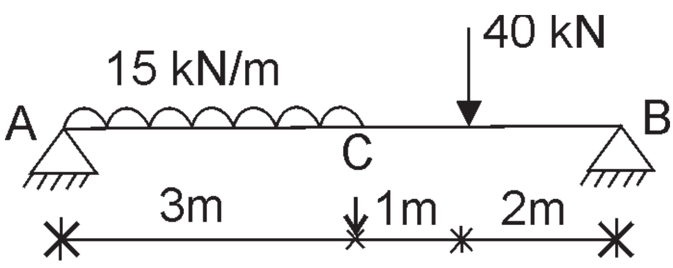


Figure 1

b) Differentiate static and kinematic indeterminacy. **[4]**

P.T.O.

c) Find slope and deflection at 'C' for cantilever beam of uniform section as shown in figure 2. using moment area method. $E = 2 \times 10^5$ MPa and $I = 5 \times 10^8$ mm^4. **[7]**

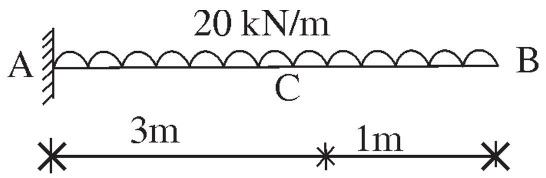


Figure 2

OR

Q2) a) Explain relation between actual beam and conjugate beam. **[4]**

b) A cantilever beam of span 6m is carrying load of 10 kN at the free end another 10 kN at its centre as shown in figure 3. Determine slope and deflection of the cantilever at the free end using conjugate beam method. Take EI = Constant. **[7]**

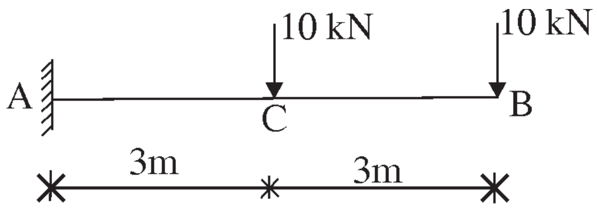


Figure 3

c) A continuous member ABCD is bent in one plane as shown in figure 4. The member is rigidly fixed at A and carries a vertical load of 20kN at free end. Find vertical deflection at free. Take $EI = 30 \times 10^3$ kN-m^2.**[7]**

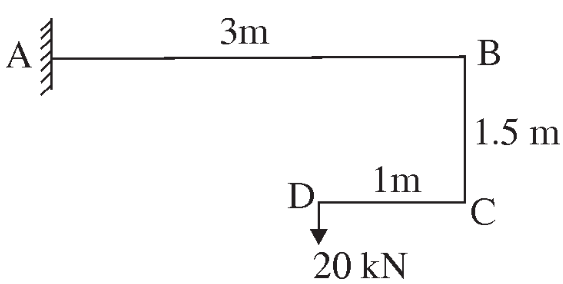


Figure 4

Q3) a) A fixed beam AB of span 9m carries uniformly distributed load of 70 kN/m over span of 3m from A. Find fixed end moments from first principle. Draw SFD and BMD. **[8]**

b) A continuous beam ABCD supported and loaded as shown in figure 5. Find moments and reactions at supports using theorem of three moments. Draw SFD and BMD. **[8]**

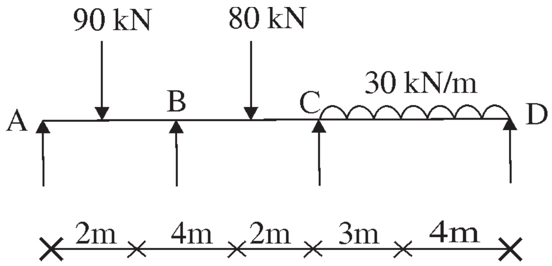


Figure 5

OR

Q4) a) Analyze the prop cantilever beam of span 5m subjected to udl of 10kN/m throughout the span and draw SFD and BMD. **[8]**

b) A fixed beam of span 10m carries two point loads of 50kN and 60kN acting at 3m and 6m from left support. Find fixed end moments by first principle and check the values with standard formula. **[8]**

Q5) A steel truss as shown in figure 6. The modulus of elasticity 210 GPa. The cross-sectional area of member AB is 200 mm^2, BC is 300 mm^2 and CA is 350 mm^2. Calculate horizontal and vertical deflection at joint A. **[16]**

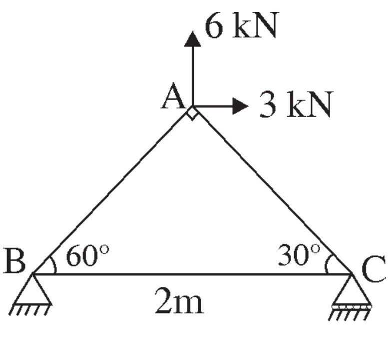


Figure 6

OR

Q6) Find the forces in the various members of the truss as shown in figure 7.**[16]**

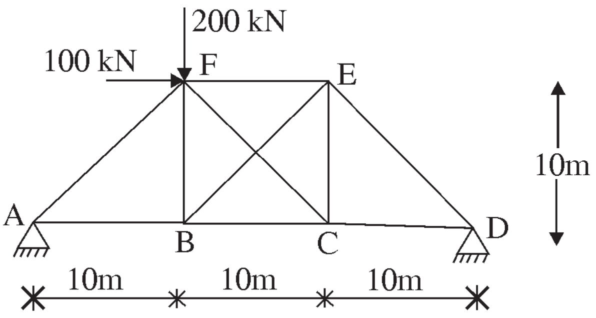


Figure 7

SECTION - II

Q7) a) Write assumptions made in plastic theory. **[4]**

b) Cross-Section of beam shown in figure 8 is subjected to sagging bending moment. Find shape factor if permissible yield stress in compression and tension are 230 MPa and 280 MPa respectively. **[7]**

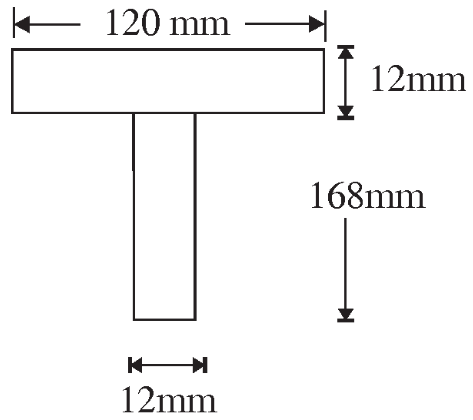


Figure 8

c) A continuous beam ABC is simply supported at A and C and continuous over B. If AB = 5m and BC = 7m Span AB is loaded with udl 40kN/m and span BC with udl 30kN/m. There act a point load of 80kN at 3m from left of C. If all loads are ultimate. Find plastic moment and BMD at collapse. Assume same Mp throughout. **[7]**

OR

Q8) a) Determine the plastic moment at collapse for continuous beam ABC loaded with ultimate load and supported as mention below with constant Mp. Support A is fixed B and C are roller. AB = 3m, BC = 5m. Span AB is subjected to 50kN/m and BC is subjected to point load of 100kN at centre. **[8]**

b) The frame is supported and loaded with ultimate loads as shown in figure 9. Find plastic moment and collapse load. **[10]**

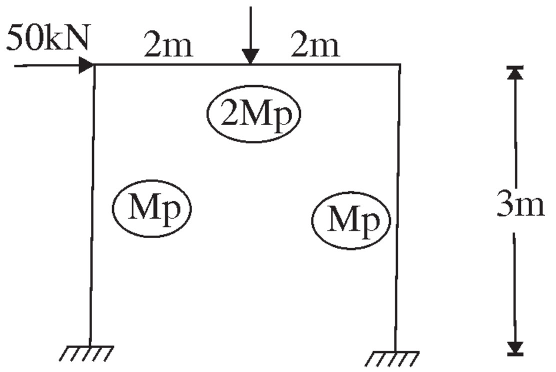


Figure 9

Q9) a) Draw I.L.D. for the reaction at A, B and C. Also draw I.L.D. for S.F. at midpoint of AB for the beam as shown in figure 10. **[8]**

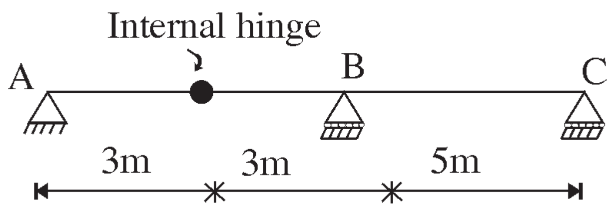


Figure 10

b) Construct I.L.D for forces in members U_3U_4, L_3L_4, L_3U_4 and U_3L_3 for the truss shown in figure 11. **[8]**

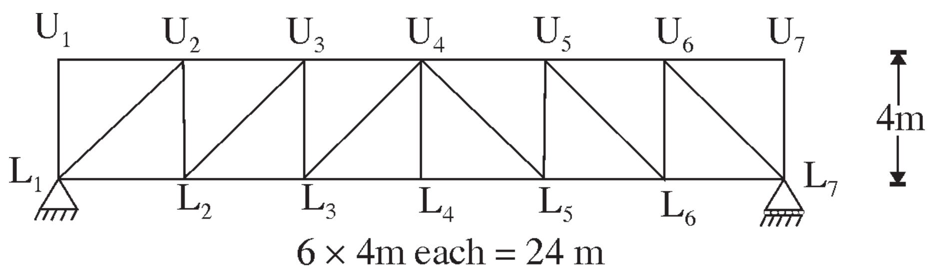


Figure 11

OR

*Q10)*a) A simply supported beam loaded as shown in figure 12. Find reactions using I.L.D. **[8]**

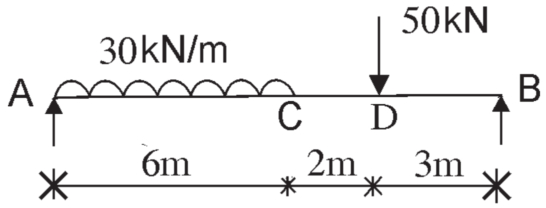
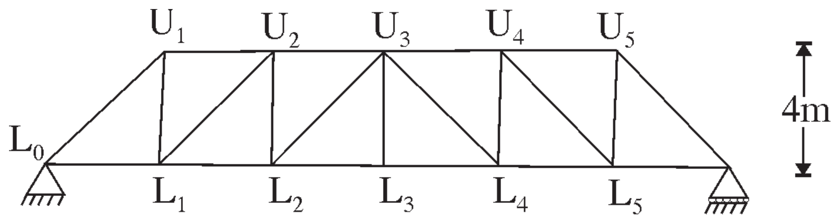


Figure 12

b) Draw I.L.D. for forces in members U_2U_3, L_2L_3, L_2U_3 and U_2L_2 for the truss shown in figure 13. **[8]**



6 × 5m each = 30 m

Figure 13

*Q11)*a) Uniformly distributed load of 50kN/m 8m long crosses a girder AB having span 25m. Calculate maximum shear force and bending moment at a section 10m from left hand support A. **[8]**

b) Five point loads 80kN, 80kN, 150kN, 150kN and 90kN space at 2.1m, 2.4m, 2.1m and 1.8m in order to cross girder of 26m span from left to right with 80kN load leading. Determine bending moment at 8m from left hand support. Also determine shear force at same point. **[8]**

OR

*Q12)*a) Two wheel loads 100kN and 120kN spaced at 0.8m apart roll on the girder as shown in figure 14. Find the maximum positive and negative shear force at section C. **[8]**

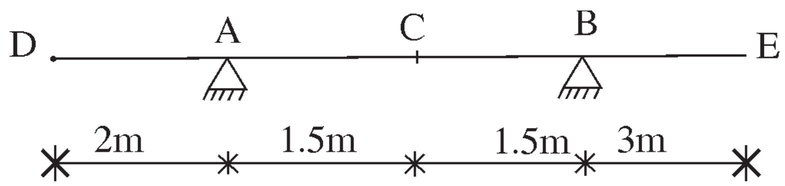


Figure 14

b) Simply supported distributed load of 8kN/m length 4m moves on a girder of span 20m. Find maximum positive and maximum negative shear force at 8m from support A. Also find maximum bending moment at same point. **[8]**

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