[3663] – 101

T.E. (Civil) (Semester – I) Examination, 2009
THEORY OF STRUCTURES – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *Solve Que.* ***1*** *or Que.* ***2****, Que.* ***3*** *or Que.* ***4****, Que.* ***5*** *or Que.* ***6*** *from Section* ***I*** *Que.* ***7*** *or Que.* ***8****, Que.* ***9*** *or Que.* ***10****, Que.* ***11*** *or Que.* ***12*** *from Section* ***II****. Assume, E = 200 GPa* ***wherever*** *required.*

SECTION – I

1. Determine the support moment for the rigid jointed plane frame loaded and supported as shown in **Fig. 1**, using **Moment Distribution Method**. Draw BMD and SFD. Take I of members as shown. **18**

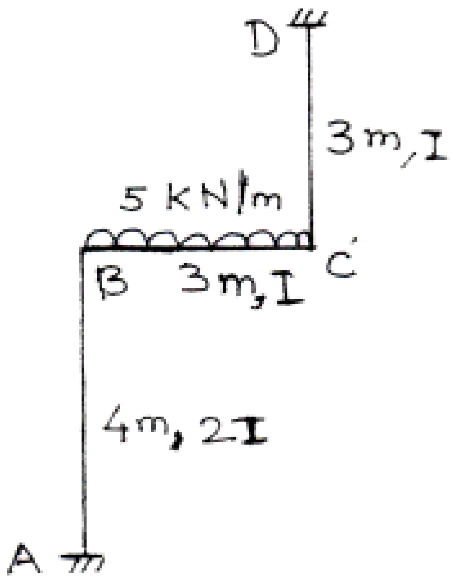

Fig. 1

OR

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2. Analyze the column ACB, fixed at support A and hinged at support C, and loaded as shown in **Fig. 2**, using **Slope Deflection Method**. Draw BMD and SFD. Take I of members as shown. **18**

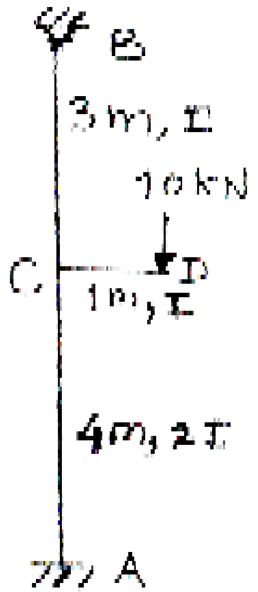

Fig. 2

3. a) Determine the support moment for the rigid jointed plane frame loaded and supported shown in **Fig. 1**. Use **Stiffness Matrix Method**. Draw BMD and SFD. Take I of members as shown. **12**

   b) Compare Flexibility Method with Stiffness Method of analysis of structure. **4**

OR

4. a) Analyze the column ACB, fixed at support A and hinged at support C, and loaded as shown in **Fig. 2**, using **Flexibility Matrix Method**. Draw BMD and SFD. Take I of members as shown. **12**

   b) Taking any suitable example (numerical or analytical), prove that product of flexibility matrix and stiffness matrix for the same structure is unity. **4**

5. a) Using portal method and cantilever method of approximate analysis, compare the end moments for beam ABC of rigid jointed multistoried plane frame loaded and supported as shown in **Fig. 3**. Comment on the results. Draw BMD, SFD and Axial Force Diagram for beam ABC only. Take same cross sectional area for all members. **12**

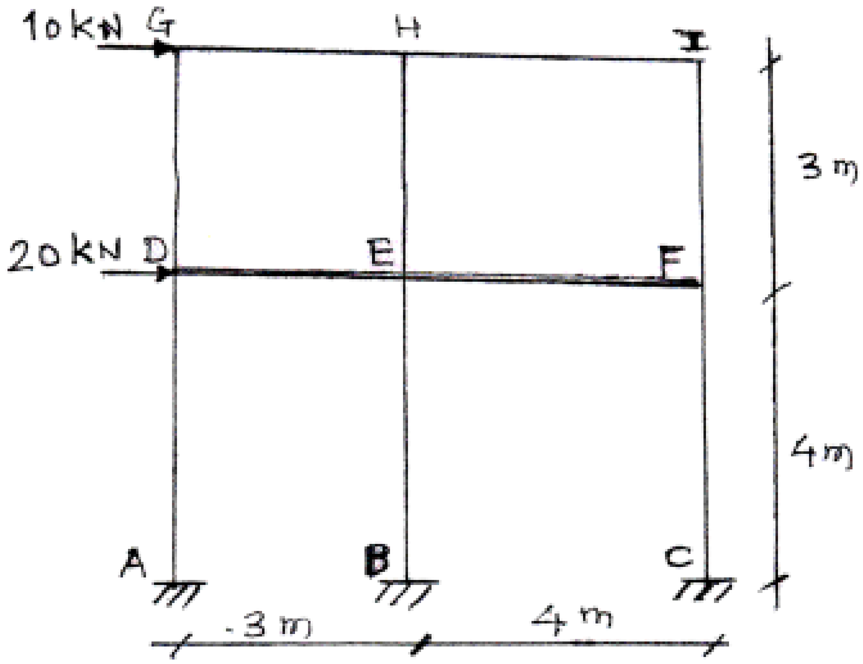

Fig. 3

b) Compare the portal method and cantilever method of approximate analysis giving clear-cut points of comparison. **4**

OR

6. For a semicircular continuous beam ABC curved in plan with radius, r, is simply supported at three equidistant points and loaded with uniformly distributed load, w per meter run. **16**

a) Derive the expression shear force, bending moment and torsion Moment in terms of w and r.

b) If w = 50 kN/m, r = 5 m, determine values of shear force, bending moment and torsion Moment and hence plot their respective diagram.

c) Determine the point on this beam (or angle of θ at origin), at which SF, BM and Torsion Moment is maximum.

SECTION – II

7. a) Derive the strain compatibility equation in 3 dimensions. **9**

b) Derive the Beam-Column differential equation in stability analysis. State the forms of solution of this equation. **9**

OR

8. a) A three element delta rosette was used to measure the strains at a point in a steel component. The observed strains are $\epsilon_0 = -845\ \mu$mm/mm, $\epsilon_{60} = 710\ \mu$mm/mm, $\epsilon_{120} = -1220\ \mu$mm/mm. Neglecting the transverse sensitivity effect, locate the principal planes and evaluate the principal stresses at this point. **9**

b) i) Explain Lateral instability of beam with example. **5**

ii) Explain the utility of south well plot. **4**

9. a) Define the following. **8**

a) Plastic hinge
b) Collapse laod
c) Plastic section Modulus
d) Upper bound and lower bound theorem

b) A cable of suspension bridge has a span of 60 m and a central rise of 7.5 m. Each cable is stiffened by a girder hinged the ends and also at the middle so as to retain the parabolic shape for the cable. The girder is subjected to a Dead load, 10 kN/m over full length and Live load, 20 kN/m over the 15 m length. Find the maximum tension in the cable when the leading edge of live load is just at the centre of girder. Draw SFD and BMD. **8**

OR

10. a) A beam subjected to a sagging BM has a cross section in the form of isosceles triangle with base = height = 5 m. Find shape factor if permissible yield stress in a compression and tension is σ_y. Hence assuming factor of safety 1.7, find load factor. **8**

b) Derive an expression for change in stress in cable due to temperature change. Hence, find change in tension in cable, due to rise in temperature by 10 °C for a cable of span, 100 m and dip, 10 m. A cable supports total load of 25, kN/m over a horizontal span. Assume $\alpha = 12 \times 10^{-6}$ per °C. **8**

11. a) Using **Finite Difference Method**, derive the central difference operator for bending moment and deflection at a point along the span of beam. **8**

b) For a prismatic fixed beam, AB of span, 10 m with udl, 25 kN/m over the half span, calculate central deflection in terms of EI using **Finite Element Method**. **8**

OR

12. a) i) Explain the formation of element stiffness matrix in **Finite Element Method**. **8**

ii) State the advantage of iso-parametric elements over conventional element.

b) Using **Finite Difference Method**, calculate the central deflection for simple supported beam AB of span 5 m subjected to udl, 10 kN/m over full span. **8**

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T.E. (Civil) (Semester – I) Examination, 2009
FLUID MECHANICS – II
(2003 Course)

Time: 3 Hours Total Marks: 100

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

SECTION – I

1. a) A steel pipe of diameter 120 cm, and 12 cm thick carries water at a rate of 4 m^3/s. What is the rise in pressure if the valve at the end of pipe which is 5000 m is closed in 5 secs. Take E_m for steel 2.07×10^{11} N/m^2 and $E_{water} = 2.075\times10^9$ N/m^2 ? **8**

b) What is gradual and rapid closure of valve in pipe flow ? What is its significance ? **4**

c) Why does water hammer occur in pipe flow ? What is its effect and what are the methods to reduce water hammer ? **6**

OR

2. a) Describe with neat sketch effect of Reynold's number on flow around cylinder placed in real fluid flow. **6**

b) What do you understand by stall ? Discuss the effect of angle of attack on stall with necessary sketch. **6**

c) Discuss the necessity of streamling a body placed in fluid flow. **2**

d) A tall chimney is 18 m in height and 1.2 m in diameter. A strong wind blow across it with a speed of 135 kmph. Find the overturning moment produce and also the Reynold number at the base. Take $C_D = 0.34$, Sp weight of air = 11.8 N/m^3 and viscosity of air = 0.00018 poise. **4**

3. a) Show that maximum efficiency developed by a jet striking moving symmetrical curved vane at its centre is given by $\frac{8}{27}(1+\cos\theta)$. **8**

b) A Jet of water, 10 cm diameter moves with a velocity of 25 m/s and strikes a series of flat plate fixed on the periphery of wheel. If due to impact the wheel rotate at 100 rpm, calculate **6**

1) Force exerted by jet on plate.

2) Work done on plate/sec

3) Torque exerted on wheel if the radial distance at which jet strikes plate and axis of wheel is 1 m.

Answer the following : **2**

c) i) Draft tube is used for ________________ type turbine

ii) Force exerted by jet on a stationary flat vane is ______________

OR

4. a) What is specific speed of centrifugal pump ? How does it differ from specific speed of turbine ? **3**

b) Why does the area of scroll casing reduce, whereas the area of draft tube increase gradually ? **3**

c) Name the type of pump in the following case : **2**

i) Pumping paper pulp and sewage water.

ii) Pumping large quantity of water under small head.

d) The outer diameter and outlet width of an centrifugal pump is 50 cm and 5 cm respectively. The pump develops total head of 25 m, when running under 1000 rpm. If the vane angle at outlet is 40° and manometric efficiency is 80%, find

i) Velocity of flow at outlet. **8**

ii) Velocity of water leaving vane

iii) Angle made by absolute velocity at outlet

iv) Discharge.

5. a) Why is it necessary that relative velocity at inlet and outlet of reaction turbine be tangent to blade tips ? **2**

b) With respect to reaction turbine explain

i) Speed ratio ii) Flow ratio iii) Ratio of width to diameter iv) Difference between inward and outward flow reaction turbine. **8**

c) A pelten turbine is working under a gross head of 930 m. A penstock 1.2 m diameter and 5.8 km length supplies water to turbine at 6.5 m/s, and has a friction factor of 0.032. The jet of water 20 cm strikes the bucket of wheel which gets deflected through 165°. The relative velocity of flow at outlet is reduced by 15% due to friction. If the velocity of bucket is 0.45 times jet velocity and mechanical efficiency is 80%, determine

i) Power imparted on runner **6**

ii) Shaft power

iii) Hydraulic efficiency.

OR

6. a) Compare Pelton and Francis turbine. **5**

b) Distinguish between unit and specific quantity. **3**

c) Draw neat sketch of pelton turbine and briefly indicate the function of each component. **8**

SECTION – II

7. a) Derive Chezy's formula for uniform flow in an open channel. **8**

b) Derive condition for maximum velocity in an efficient circular section. **8**

OR

8. a) The cross section of an open channel consists of semicircular bottom 1.2 m in diameter and with vertical sides. If the depth of water is 1.2 m and the bed slope in 1 in 2000, calculate the discharge. Take Chezy's const. C = 65 $m^{1/2}/s$. **8**

b) A trapezoidal channel has one vertical side wall and the other 45° sloping wall. If it is to deliver water at 25 m^3/s with a velocity of 0.8 m/s, compute bed width and flow depth for minimum lining area. **8**

9. a) Uniform flow occurs at a depth of 1.4 m in a long rectangular channel 3 m wide and laid to a slope of 0.0008. If Manning's n = 0.01; Calculate i) Maximum height of hump on the floor to produce critical depth ii) Width of contraction. Which will produce critical depth without increasing the upstream depth of flow ? **10**

b) Explain - What is a hydraulic jump ?

How are they classified ?

What are the uses of hydraulic jump ? **6**

OR

10. a) Sketch and explain the specific energy diagram for varying discharge. Show subcritical, supercritical region and alternate depth. **8**

b) Derive an expression for depth of flow after the hydraulic jump in terms of the depth of flow before jump. **8**

11. a) State the various methods of computation of GVF in prismatic channels and explain any one in detail. **8**

b) List the GVF profiles which are possible and sketch M1, M2 and M3 profile. **10**

OR

12. a) A rectangular channel has a bed width 5 m, slope S_o = 0.0004, Manning's const n = 0.02, normal depth = 3 m. If the channel empties into a pool at the d/s end and the pool elevation is 1.2 m higher than the canal bed elevation at d/s end. Calculate GVF. **10**

b) Explain a control section and its significance in GVF computations. **8**

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T.E. (Civil) (Semester – I) Examination, 2009
STRUCTURAL DESIGN AND DRAWING – I
(2003 Course)

Time : 4 Hours Max. Marks : 100

Instructions : *i) Answer Q.* ***1*** *or Q.* ***2****; Q.* ***3*** *or Q.* ***4*** *from Section –* ***I*** *and Q.* ***5*** *or Q.* ***6****; Q.* ***7*** *or Q.* ***8*** *from Section –* ***II****.*
ii) Answers to the ***two*** *Sections should be written in* ***separate*** *answer books.*
iii) Figures in bold to the ***right****, indicate* ***full*** *marks.*
iv) ***IS 800****,* ***IS 875*** *and steel table is* ***allowed*** *in the examination.*
v) If necessary, assume suitable data and indicate ***clearly****.*
vi) Use of electronic pocket calculator is ***allowed****.*

SECTION – I

1. a) What are the advantages of welded connections ? **5**

   b) Design a welded stiffened seated connection to join ISMB 250 @ 37.3 kg/m with ISMB 400 @ 61.6 kg/m to transmit a reaction of 265 kN. Sketch the details of connection. **10**

   c) The principal rafter of a truss carries an axial load of 80 kN. The supported length of the member is 1.6 m. Design the member. **10**

OR

2. a) Write the advantages and disadvantages of bolted connections. **5**

   b) An ISF 300, 6 mm thick is used as a tension member. It is connected to a 10 mm thick gusset plate by 12ϕ bolts. What will be its load carrying capacity, if

      a) Chain connection is done and

b) Zigzag connection is done as shown in Fig .2 (b) **10**

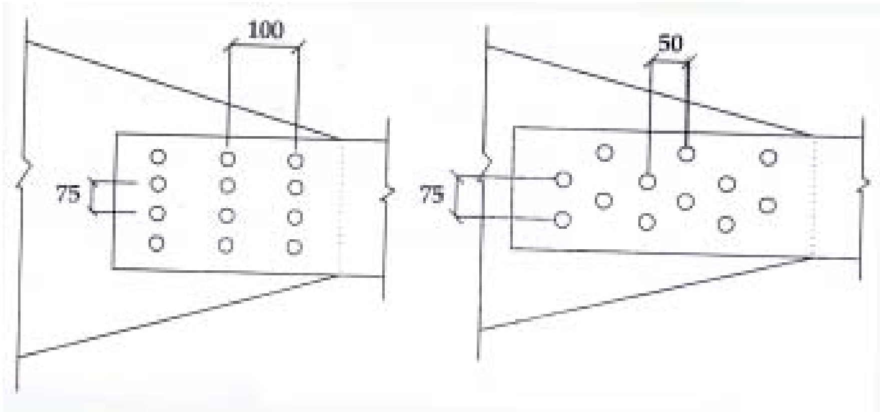


Fig.2 (b)

c) Explain moment resistant connections. Sketch a typical detail of a welded moment-resistant beam-to-beam connection. **10**

3. a) Fig. 3 (a) shows the floor plan of a building. The floor is an RCC slab of thickness 120 mm. Design the primary and secondary beams. Consider the unit weight of the RCC slab as 25 kN/m^3. **16**

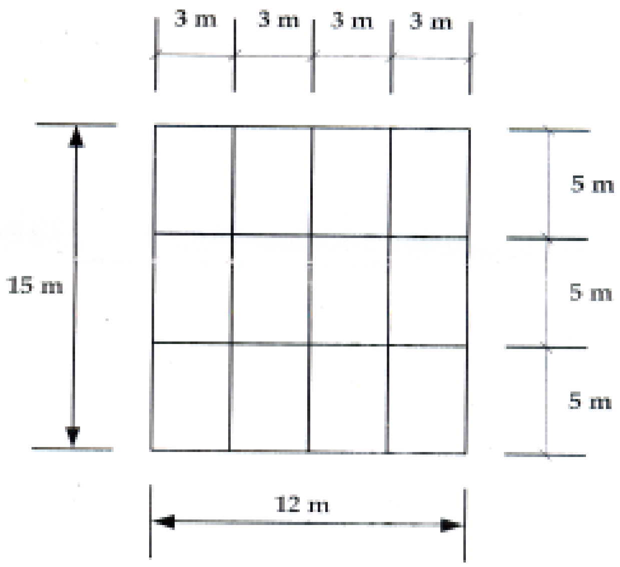


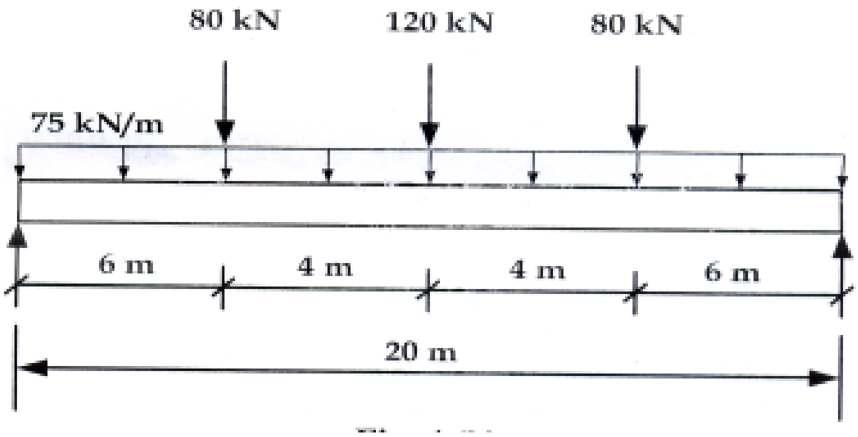
Fig. 3 (a)

b) Write the procedure for the design of gantry girder. Also sketch the various sections used as a gantry girder. **9**

OR

4. a) Explain curtailment of flange plates. **5**

b) Design a plate girder which is simply supported over a span of 20 m. It carries a uniformly distributed load of 75 kN/m and concentrated loads as shown in Fig. 4 (b). **20**



F.g. 4 (b)

SECTION – II

5. a) The foot-over bridge shown in Fig. 5 (a) has a floor slab precast concrete blocks, 150 mm thick with unit weight of 21 kN/m^3. The live load on the slab is 5 kN/m^2. Design the following components of the foot-over bridge.

a) An intermediate cross beam

b) Members U_1-U_2, U_2-L_2, U_2-L_1 and L_1-L_2

c) Joint U2

d) Sketch the details. **25**

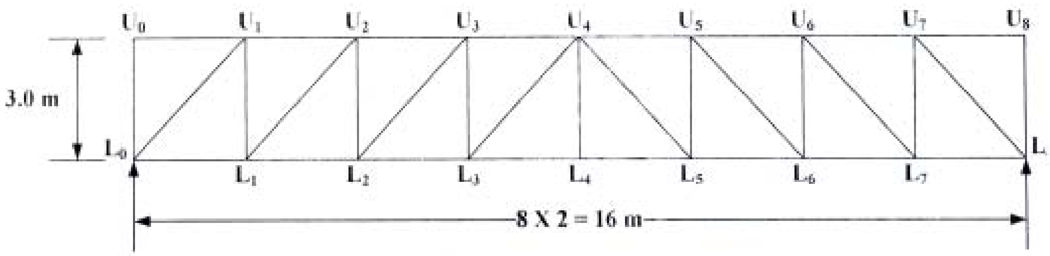


Fig. 5 (a)

OR

6. a) The roof truss shown in Fig. 6 (a) has the following data : **25**

- Spacing of truss = 6 m c /c
- Unit weight of roofing material = 150 N/m^2
- Basic wind pressure = 35 m/s
- k_1 = 1.0; k_2 = 0.88; k_3 = 1.0; C_{pe} = –0.70; C_{pi} = ±0.50

a) Calculate the panel point loads due to dead load, live load wind load.

b) Design the members L_0-U_1, U_1-U_2 and U_1-L_1

c) Design joint U_1

d) Sketch the details.

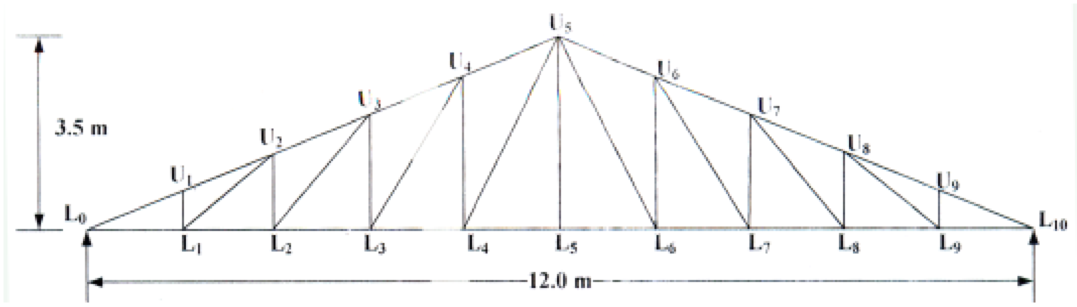


Fig. 6 (a)

7. a) An 8 m column fixed at both ends carries an axial load of 11000 kN. Design a built-up column. Suggest a suitable column base and design for the same. **25**

OR

8. a) Two channels (150×60) mm with bent lips are connectd with webs to act as column as show in Fig. 8 (a). Determine the safe load carrying capacity, if the effective length of column is 4.0 m. F_y = 235 MPa and E = 200 GPa. **15**

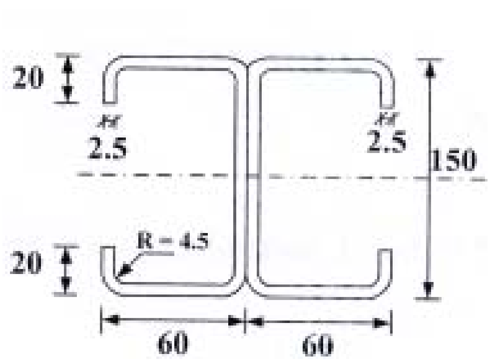


Fig. 8 (a)

b) List some of the common shapes of cold-formed light-gauge sections with neat sketches. Also explain stiffened and unstiffened elements. **10**

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T.E. (Civil) (Semester – I) Examination, 2009
GEOTECHNICAL ENGINEERING
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** inidcate **full** marks.*
5) Your answers will be valued as a whole.
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) What are the major soil deposits of India ? Explain their properties. **6**

b) Derive the relation $\gamma_b = \left(\frac{G-1}{1+e}\right)\gamma_w$. **6**

c) A saturated soil sample has a water content 35%. Assume G = 2.7. Calculate void ratio, dry density, saturated density and submerged density. **6**

OR

2. a) State the different methods to determine field density of Soil. Explain any one of them. **6**

b) Draw a typical grain size distribution curve for well graded and poorly graded sands and state how would you calculate three important parameters from the curve. **6**

c) The Liquid limit and plastic limit of a soil are 75% and 33% respectively. What is plasticity Index ? The void ratio of the soil on oven drying was found to be 0.63. What is shrinkage limit ? Assume Gs = 2.7. **6**

3. a) What is Laplace equation ? Derive it from the first principles for two diamentional flow. **6**

   b) What do you understand by critical hydraulic gradient ? Derive the expression for the same. **6**

   c) In order to compute the seepage loss through the foundation of cofferdam, flow nets were constructed. The result of the flow net study gave, Nf = 7, Nd = 18. The head loss during seepage was 10 m. If the coefficient of permeability of the soil is $k = 4\times10^{-5}$ m/min, compute the seepage loss per meter length of dam per day. **4**

OR

4. a) Explain the variable head permeability test for soils. For what type of soil it is used. **5**

   b) Explain how the permeability is affected by various factors. **5**

   c) A soil profile consists of three layers of thickness equal to 3m, 5m and 2m with coefficient of permeability equal to 2×10^{-4} cm/sec, 4×10^{-4} cm/sec and 1.5×10^{-4} cm/sec, find the equivalent coefficient of permeability, when the flow occurs paralled to the layers. **6**

5. a) Draw a typical curve showing the relation between MDD-OMC and explain the terms MDD, OMC and Air voids line. **5**

   b) Write a short note on field compaction control. **5**

   c) A concentrated load of 200 kN is applied at the ground surface. Compute the vertical pressure 1) at a depth of 5.0 M below the load 2) at a distance of 4 m at the same depth. Use Boussinesq's equation. **6**

OR

6. a) Distinguish between Boussinesq's theory and Westergaard theory of stress distribution. **5**

   b) What is contact pressure ? Explain the factors affecting contact pressure with suitable sketches. **5**

c) Draw the moisture-density curve and obtain MDD and OMC with following records **6**

Bulk density (kg/m^3)	1620	1730	1860	1910	1860	1475
Water content (%)	12.50	16.50	20.00	24.50	30.00	34.50

SECTION – II

7. a) Draw a line diagram showing set up for direct shear test. Label various parts. **6**

b) What are the advantages and disadvantages of triaxial test ? **6**

c) A sample of soil failed under the following triaxial stresses σ_3 = 200 kN/m^2, σ_1 = 700 KN/m^2. If soil has an angle of shearing resistance of 30°, what is its unit cohesion ? **6**

OR

8. a) What are the various factors affecting shear strength of soil ? **6**

b) Explain step by step, how unconfined compression strength of a soil sample is determined in Laboratory with suitable sketch. **6**

c) What is the shear strength in terms of effective stress on a plane within a saturated soil mass at a point where the total normal stress is 295 kN/m^2 and the pore water pressure 120 kN/m^2 ? The effective stress, shear strength parameters are c^1 = 12 kN/m^2 and 'ϕ' = 30°. **6**

9. a) Define the terms active earth pressure and passive earth pressure. **5**

b) What are the different modes of slope failure ? Give examples. **5**

c) Calculate the total active earth pressure on a smooth vertical wall; 6 m high which retains cohesionless backfill having bulk density 17 kN/m^3 and ϕ = 30°. The water table is at 3 m below the ground surface on the backfill side only. Sketch the pressure diagram. (Assume γ_{sat} = 20 kN/m^3 and γ_w = 10 kN/m^3). **6**

OR

10. a) What is Infinite and Finite slopes ? Give examples. **5**

b) Determine the critical height of slope for a vertical excavation in a c-ϕ soil. **5**

c) What is stability number ? Explain with examples, how the stability charts are used in the design of slopes. **6**

11. a) Write a short note on Geological classification of rocks. **8**

b) What are different modes of failure of rocks ? Give examples of each. **8**

OR

12. Write a short notes on **any four** :

a) Slake durability Index

b) Sonic velocity

c) Beam bending test

d) Triaxial compression test

e) Hardness of rock

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T.E. (Civil) (2003 Course) (Semester – I) Examination, 2009
CONSTRUCTION TECHNIQUES AND MACHINERIES

Time: 3 Hours Total Marks: 100

Instructions : *1) Answer Q.**1** or Q. **2** ; Q. **3** or Q. **4**; Q.**5** or Q. **6** from Section **I** and Q.**7** or Q.**8**; Q.**9** or Q.**10** and Q. **11** or Q. **12** from Section **II.***
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain the merits and demerits of Mechanisation of construction sector. **(2+2)**
   b) What do you understand by conveying equipments ? With the aid of a neat labelled sketch explain various components of Belt conveyor system. **(1+3)**
   c) Enlist the various equipments used for material handling and with a neat labelled sketch explain Derric crane. **(2+3)**
   d) With the help of a neat flow diagram explain the manufacturing process of siporex blocks. **(2+3)**

OR

2. a) Draw neat labelled sketches showing the various typical joints used in the precast/ prefabricated construction. **6**
   b) Discuss the merits and demerits of the precast and prefabricated construction giving suitable field examples. **6**
   c) Differentiate between labour oriented and equipment oriented works. **3**
   d) State the various factors considered for selection of crane in construction work. **3**

P.T.O.

3. a) With the aid of a neat labelled sketch explain the Tremie pipe method of concreting during under water constructions. Also state clearly the special precautions to be taken during concreting. **(6+2)**

   b) What do you mean by RMC ? What are the advantages of RMC ? Hence, describe the production process of RMC at the plant with the help of neat sketch. **(1+2+5)**

OR

4. a) With the help of a neat sketch explain the multistage well point system of dewatering in detail. **(4+4)**

   b) Write short note on i) Slip form Technique ii) Use of concrete pumps. **(4+4)**

5. a) Draw an illustrative schematic layout sketch of aggregate crushing plant and explain the functions of various units of the plant. **(4+4)**

   b) Describe in detail the pipe laying technique for sewage disposal works. State clearly the various precautions should be followed during laying work. **(5+3)**

OR

6. a) Enlist the various pneumatic equipments that are commonly used and also state various factors that are to be necessarily considered while making suitable selection of pneumatic equipment (s). **(2+2)**

   b) With the aid of a neat labelled and dimensioned sketch explain how you will construct the flooring structure for High duty industry. **(4+4)**

   c) What is Guniting and/or shotcreting ? State clearly these two terms and hence state 4 practical applications of guniting and/or shotcreting. **(2+2)**

SECTION – II

7. a) Write a brief note on (I) Types of Dumpers (II) cycle time of a scraper. **(2+2)**

   b) Discuss the concept of equipment sizing-matching as regards the earth moving equipment/machinery with suitable examples. **6**

   c) Discuss the various factors affecting the selection of earth moving machinery. (any **eight** factors). **8**

OR

8. a) Explain the specific advantages of trenching machines over any other excavators. Also, Justify your answer stating suitable examples. **(3+2)**

   b) Write a neat labelled sketches of (i) Back Hoe (ii) Ladder type trenching machine and (iii) Basic shovel with different front end attachments. **(3+3+3)**

   c) Explain the following terms (i) Bank volume (ii) operating factor (iii) optimum depth of cut and (iv) cycle time. **(1 each)**

9. a) Describe in detail the procedure of production of Bituminous concrete mix at a hot mix plant. Also, draw an illustrative schemeatic sketch of the plant. **(4+4)**

   b) Write short note on : (i) Dry lean concrete (ii) classification of asphalt. **(2+2)**

   c) What do you understand by the term P.Q.C. ? Also, explain this in brief with the aid of a neat sketch. **(1+3)**

OR

10. a) Explain the Road construction technique and elaborate the paving operation in detail. **(3+3)**

    b) Explain the important properties of aggregate required in asphalt mix production. **6**

    c) Write a note on slip form paver. **4**

11. a) Write notes on :

    i) Investment cost   ii) Repair and maintenance cost

    iii) Fuel and lubricant cost **(2+2+2)**

    b) Make a comparative study of the following 2 methods of determining depriciation of a piece of equipment w.r.t. any 4 points in a <u>Tabular form only</u>.

    i) Straight Line method   ii) Sum of years digit method. **8**

    c) What do you mean by the terms (i) Economic life of an equipment and (ii) salvage value. **(1+1)**

OR

12. a) Explain the following :

    i) Preventive maintenance and constructions equipment.   ii) Recording the information @ any **(3+3)**

    b) Write an explanatory note on equipment costs. **6**

    c) Write the Tabular format stating the formula in each column so as to determine the total annual depreciation cost and book value at the end of each year by S.O.Y. method of depreciation. You may assume economic life of a piece of equipment as 8 years. **4**

T.E. (Civil) (Semester – II) (2003 Course) Examination, 2009
ADVANCED SURVEYING

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**.*
*6) Solve Q. **1** or **2**, Q. **3** or **4**, Q. **5** or **6**, from Section – **I** and Q. **7** or **8**, Q. **9** or Q. **10,** Q. **11** or Q. **12** from Section – **II**.*

SECTION – I

1. a) What is meant by side equation ? State the equations of condition which must be satisfied in the adjustment of a geodetic quadrilateral without central station. **8**

b) Differentiate between : **4**

1) Triangulation and traversing

2) Triangulation and trialteration.

c) What do you mean by signal ? State its classification ? **6**

OR

2. a) What are the factors that affect selection of triangulation station. **4**

b) Derive an expression for reduction to centre for a satellite station, if the satellite station lies on the left of true station and also satellite station is outside the triangle ABC. **6**

c) Two triangulation stations A and B, 60 km apart, have elevations of 265 m and 282 m, respectively. The intervening ground may be assumed to have a uniform elevation of 220 m. Find the minimum height of signal at B so that the line of sight may not pass near the ground less than 3 m. **8**

3. a) What are different types of errors in surveying measurements ? Give one example of each. **4**

b) Define the following terms with suitable example.

1) Most probable value 2) Residual error

3) Standard deviation 4) True error. **4**

c) Adjust the angles P, Q, R and S which close the horizon. **8**

$\angle P = 100^\circ\ 30'\ 22''$ Wt. 1

$\angle Q = 80^\circ\ 40'\ 10''$ Wt. 2

$\angle R = 90^\circ\ 20'\ 08''$ Wt. 3

$\angle S = 88^\circ\ 29'\ 25''$ Wt. 4

OR

4. a) Determine the most probable values of A, B and C from the following observations of equal weight. **8**

$A = 30^\circ\ 24'\ 25.3''$

$B = 40^\circ\ 15'\ 14.2''$

$C = 70^\circ\ 39'\ 41.3''$

The angles fullfill the condition $A + B = C$.

(Use normal equation method).

b) Define the following terms : **3**

1) Independent quantity

2) Conditioned quantity

3) Direct observation.

c) What do you mean by weight of an observation ? State the rules of assigning weight to the field observations. **5**

5. a) Derive an expression for axis signal correction. **8**

b) Derive an expression to determine the difference in elevation by single angle observation for angle of elevation. **8**

OR

6. a) The following observation were taken in a trigonometric levelling survey. **10**

Angle of depression to P = 1º 45´ 32´´

Height of instrument at Q = 1.18 m

Height of signal at P = 4.22 m

Horizontal distance PQ = 6945 m

Coefficient of refraction = 0.07

If R.L. of Q is 345.32 m, calculate R.L. of P (Take R sin 1´´ = 30.88 m).

b) Explain how you will take into account the effect of curvature and refraction in trigonometric levelling. **6**

SECTION – II

7. a) In case of aerial photograph, define clearly the following terms : **4**

1) Vertical photograph 2) Tilted photograph

3) ISO-centre 4) Flying Height

b) What is meant by relief displacement ? Derive an equation for relief displacement with usual notations showing the relief displacement on sketch. **8**

c) Define parallax of a point in photogrammetry. Describe the procedure of measuring parallax difference using a parallax bar. **6**

OR

8. a) Explain in detail the procedure of measurement of airbase distance using mirror stereoscope which you have used during practical. **10**

b) Explain with a neat sketches the following terms : **8**

1) Fiducial mark 2) Isocentre

3) Principal point 4) Plumb point

9. a) State any four applications of aerial photogrammetry. **4**

b) Explain how GIS and GPS is useful in flood planning. **8**

c) Write a short note on classification of EDM instruments. **4**

OR

10. a) What is difference between EDM and Total Station ? State the various special functions available in Total Station. **4**

    b) Explain in brief how the remote sensing data is useful in disaster management. **4**

    c) What is GIS ? State and explain various components of GIS. **8**

11. a) List out various methods of locating the soundings by solving three point problem. Explain any one method with sketch. **8**

    b) Write short note on : **8**

       1) Echo sounder 2) Station pointer

OR

12. a) Under what circumstances method of intersecting ranges is used in locating sounding. Explain. **4**

    b) Explain in brief any two types of tidal gauges used in Hydrographic survey. **6**

    c) What is hydrographic surveying ? Explain in brief any three areas where hydrographic surveying is used. **6**

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T.E. (Civil) (Sem. – II) Examination, 2009
PROJECT MANAGEMENT AND COMPUTER APPLICATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Compare Gantt chart with CPM network. **6**
b) Explain, what is a Matrix Structure ? **6**
c) Explain with sketches, the various relationships in a Precedence Network. **6**

OR

2. A project has the following time schedule :

Activity i – j	**Duration (weeks)**
1 – 2	3
1 – 3	4
1 – 4	14
2 – 4	2
2 – 6	5
3 – 5	4
3 – 6	6
4 – 5	1
5 – 6	1

i) Draw AOA network and calculate the total project duration. Highlight the critical path. **6**
ii) Calculate EST, EFT, LST, LFT, total float and free float. **12**

P.T.O.

3. a) State the various types of costs involved in construction projects. Discuss with sketches, the variation of these costs with respect to time. **5**

b) Discuss the procedure for step by step network compression. **6**

c) Explain the term project updating. Under what circumstances do we need to update a project ? **5**

OR

4. a) The following table gives the time estimates of the various activities of a project : **10**

Activity i – j	Duration in Weeks		
	to	tm	tp
1 – 2	1	2	3
2 – 3	3	6	9
2 – 4	2	4	6
3 – 5	4	6	9
4 – 6	4	6	8
5 – 6	0	0	0
5 – 7	3	4	5
6 – 7	2	5	9

i) Draw the project network and find the total project duration.

ii) Calculate the variance along the critical path.

iii) What is the probability that the project will be completed in the estimated time ?

b) Explain the procedure of carrying out Resource Levelling. **6**

5. a) Discuss the contents of a contract document. **5**

b) What is the significance of Force Majeure and natural disaster condition in a contract document ? **6**

c) Discuss the merits of Arbitration process. **5**

OR

6. a) What are the objectives of Materials Management ? **5**

b) What is inventory ? Explain significance of inventory. What are the different types of inventories ? **5**

c) Explain the procedure of A – B – C Analysis. Plot the typical A – B – C curve. Give examples of materials being classified as A – B – C materials. **6**

SECTION – II

7. a) What are the responsibilities of a project manager with respect to safety management on construction sites ? **5**

b) Discuss various causes of accidents related to construction cranes. **5**

c) Design a safety guideline/checklist for High Rise Building Construction. **6**

OR

8. a) Draw a typical site layout for the construction of an Elevated Railway Track. **8**

b) State the factors affecting the selection of a site layout. **8**

9. a) Draw the flow chart and write the algorithm for two point Gauss Quadrature Method of Numerical Integration. **8**

b) The following are the values of f(x) for various values of x : **8**

x	=	5	6	9	10
f(x)	=	12	13	15	19

Find the value of f(10).

OR

10. a) Solve $I = \int_0^1 \frac{1}{x} \sin \frac{1}{x} \, dx$ using Gauss Quadrature Method. **8**

b) Explain and draw flow chart for Simpson's $\frac{3}{8}^{th}$ rule to find area under the curve y = f(x). **8**

11. a) Explain the use of computers in construction project management. **6**

    b) Write an algorithm to find critical path in a CPM network. **6**

    c) Discuss the procedure for generation of a purchase order. **6**

OR

12. a) Explain Quality Control and Quality Monitoring in construction projects. **6**

    b) With the help of an appropriate format explain how an indent order is made. **6**

    c) Explain the term computer aided project management with suitable examples. **6**

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T.E. (Civil) (Sem. – II) Examination, 2009
STRUCTURAL DESIGN – II
(2003 Course)

Time : 4 Hours | Max. Marks : 100

Instructions. : *1) Answer Q. **1** or Q. **2**, Q.**3** or Q. **4**, in Section **I**.*
*2) Answer Q. **5** or **Q. 6**, Q. **7** or Q. **8** in Section **II**.*
*3) Answer to **two** Sections should be written in **separate** answer books.*
*4) Figures to the **right** indicate **full** marks.*
*5) **Use** of IS 456-2000 and non-programmable calculator is **allowed**.*
*6) Neat diagrams must be drawn **wherever** necessary.*
*7) Mere reproduction from **IS** code as answer, will not be given full credit.*
*8) Assume any other data if **necessary**.*

SECTION – I

1. A) Calculate the design constants for the following materials considering the balanced design for singly reinforced section. The materials are grade M_{20} concrete and mild steel reinforcement. **8**

B) Calculate the moment of resistance by working stress method for the flanged beam section detailed as below :

Width of web	=	250 mm
Width of flange	=	1500 mm
Thickness of flange	=	150 mm
Effective depth	=	400 mm
Tension steel	=	4 No-20 mm ϕ

Use M_{20} and Fe_{415} materials. **9**

C) A reinforced concrete beam of rectangular section 200 mm wide by 550 mm deep is reinforced with 4 bars of 25 mm ϕ at an effective depth of 500 mm. Calculate safe moment of resistance of the section. Materials – M_{20} and Fe_{415} HYSD bars. Use L.S.M. **8**

OR

2. A) A rectangular beam 230 mm wide × 400 mm effective depth is subjected to a moment at 55 KN.m. The effective cover of compressive reinforcement is 40 mm. Find out the reinforcing steel.
   Materials : $\rightarrow$ M_{20} and mild steel reinforcement
   Method $\rightarrow$ W.S.M. **8**

   B) A reinforced concrete beam of rectangular section 300 mm wide by 600 deep is reinforced with 4 bars of 20 mm diameter at an effective depth of 550 mm. The effective span of the beam is 7 m.
   Material – M_{20}, Fe_{415}
   Method – L.S.M.
   Find the uniformly distributed ultimate load on the beam. **8**

   C) Explain :
   i) Balanced section
   ii) Under-reinforced section
   iii) Over-reinforced section. **9**

3. A) What do you mean by redistribution of moments ? **3**

   B) "The limitation of 30% on redistribution of moments have been imposed". Explain. **5**

   C) A R.C. beam 300 mm wide and 600 mm deep is fixed at one end and simply supported at the other end and has span 6 m, carries a superimposed load of 42 kN/m. Design the reinforcement at fixed end and near midspan by allowing 30% redistribution of moments.
   Use M_{20} and Fe_{415}
   Effective cover = 40 mm for both tension and compression side
   Take $F_{sc} = 347.8\ N/mm^2$
   $F_{cc} = 0.45\ F_{ck}$. **17**

OR

4. A) A R.C. beam (250 × 400 mm) is reinforced with 12 Tor 3 Nos. as a tension reinforcement and 6 mm, 2 legged stirrups about 100 mm c/c throughout the beam are provided. Find the maximum shear capacity of beam which it can resist.

   Use M_{25}, Fe_{415}.

   Span of the beam = 3.8 m. **9**

   B) A rectangular beam 230 mm wide × 550 mm

   Depth is subjected to the following actions.

   Factored bending moment = 60 kN.m.

   Factored shear force = 45 kN.

   Factored Torsional moment = 17.25 kN.m.

   Effective cover = 45 mm.

   Materials → M_{20} and mild steel reinforcement.

   Design the beam. **16**

SECTION – II

5. The central line plan of a residential building is as shown in Fig. 1. Classify the slabs structurally and design slab S_1, S_2 and S_3 only for flexure. Draw neat sketches showing details of main reinforcement and torsional reinforcement for two-way slab. Take L.L. on all slabs = 2.5 kN/m^2 F.F.L. = 1.25 kN/m^2. Material M_{20} and Fe_{500}. **25**

OR

6. Design two consecutive flights of a dog-ledged staircase for residential building as shown in fig. 1 with the following details.

   1) Height of each floor = 3.3 m.

   2) No. of risers in each flight = 11 Nos.

   3) Live load = 3.0 kN/m^2

   4) Material = M_{20} and Fe_{415}

   5) Span of I^{st} flight = 4.5 m.

   6) Span of II^{nd} flight = 6.0 m

   Show details load and design moments calculations. Draw neat sketches giving geometrical details and reinforcement details (Plan & section of I and II flights) **25**

7. Design an axially loaded short column at 'A' as shown in fig. 1 for G + 2 building with isolated footing for the following data :

   i) Floor to floor height = 3.3 m

   ii) Height of plinth above ground level = 0.6 m

   iii) Depth of foundation below G.L. = 1.2 m

   iv) L.L. on all slabs = 2.5 kN/m^2

   v) F.F.L. on all slabs =1.25 kN/m^2

   vi) Thickness of slab = 150 mm

   vii) Size of all wall = 230 mm × 3 m

   viii) Size of all beams = 230 mm × 450 mm

   ix) S.B.C. of soil = 225 kN/m^2

   x) Use M_{20}, Fe_{415}.

   Assume same load acting on beam AB from staircase and slab S_2. Show details load and design calculations. Draw neat sketches giving reinforcement details of column and footing. **25**

OR

8. Design a rectangular column subjected to a working load of 650 kN and working moment of 50 kNm about major axis. The unsupported length of column is 3.5 m. Assume column effectively held in position but not restrained against rotation. Also design its footing considering above moment. Take S.B.C. of soil = 200 kN/m^2. Use M_{20} concrete and Fe_{500} steel. Show design calculations and reinforcement details of column and footing. (Use charts). **25**

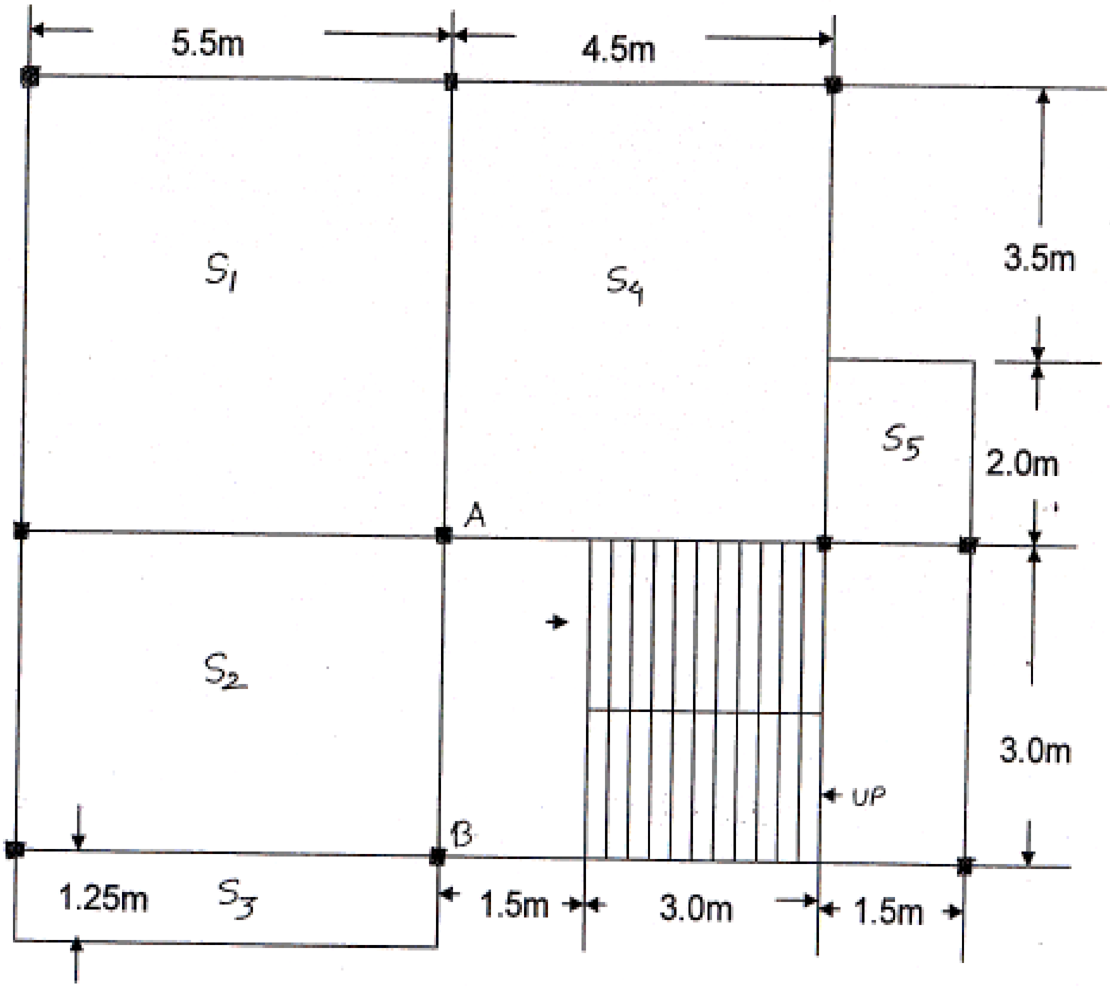
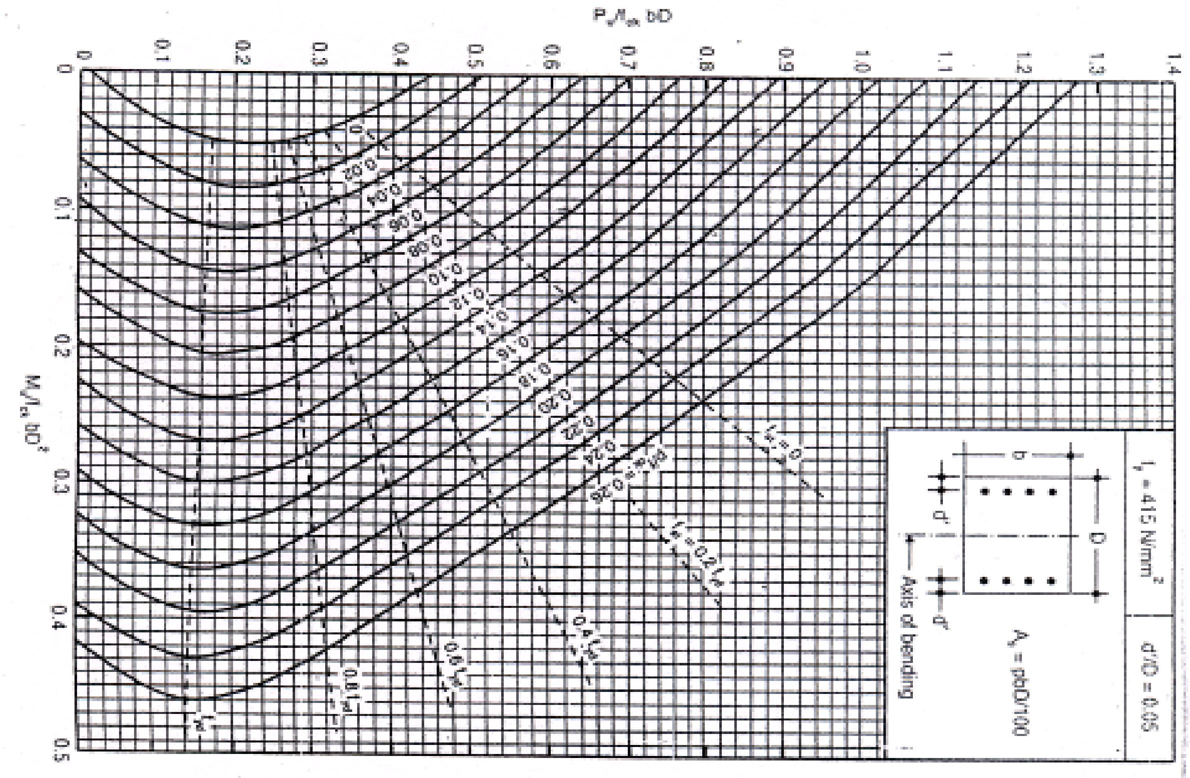
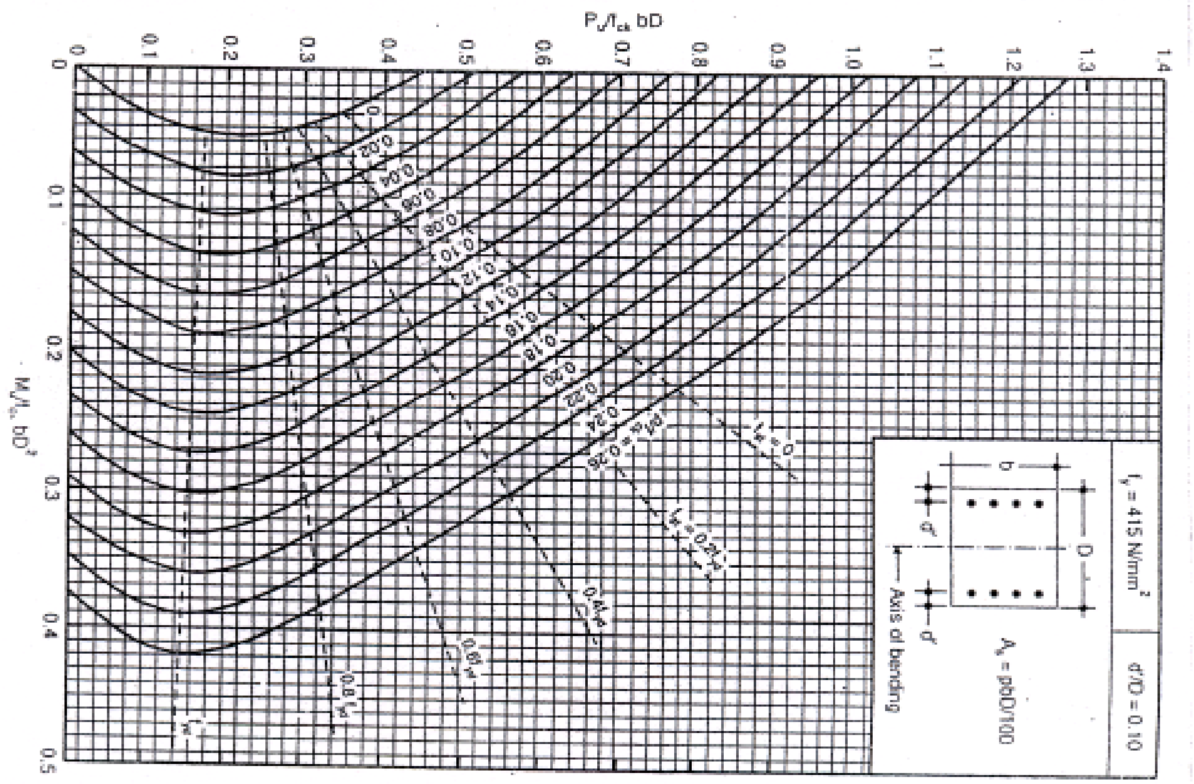
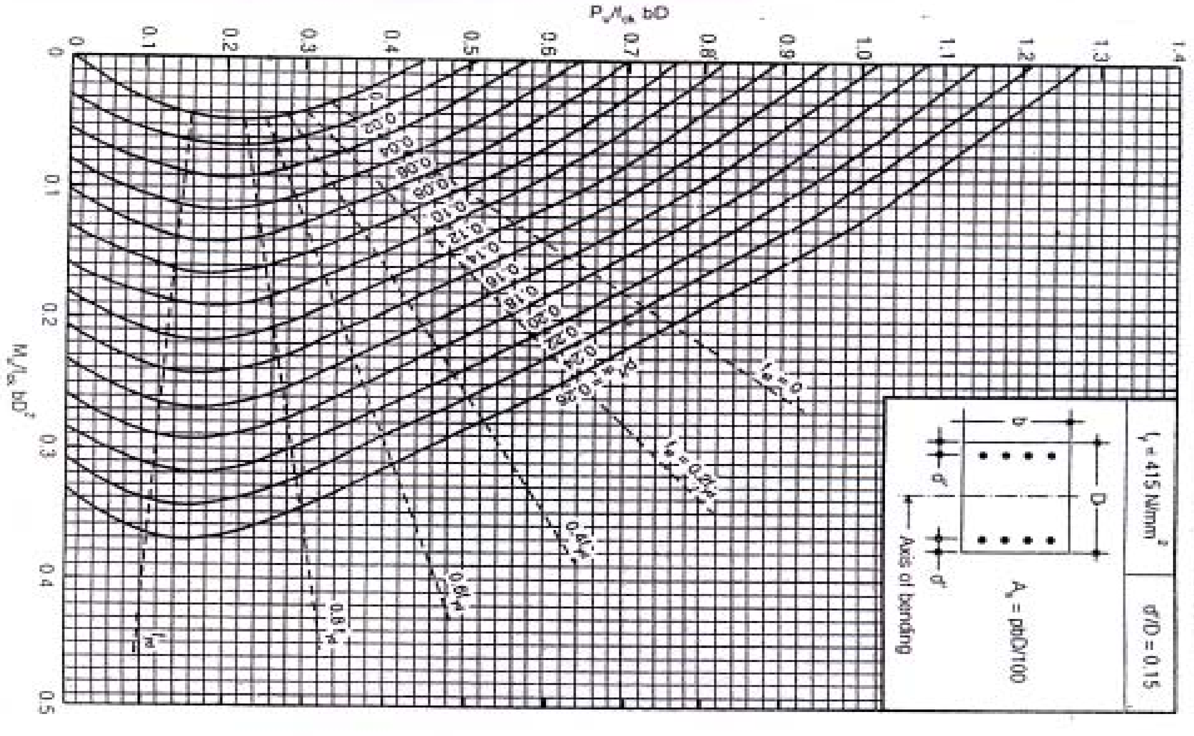
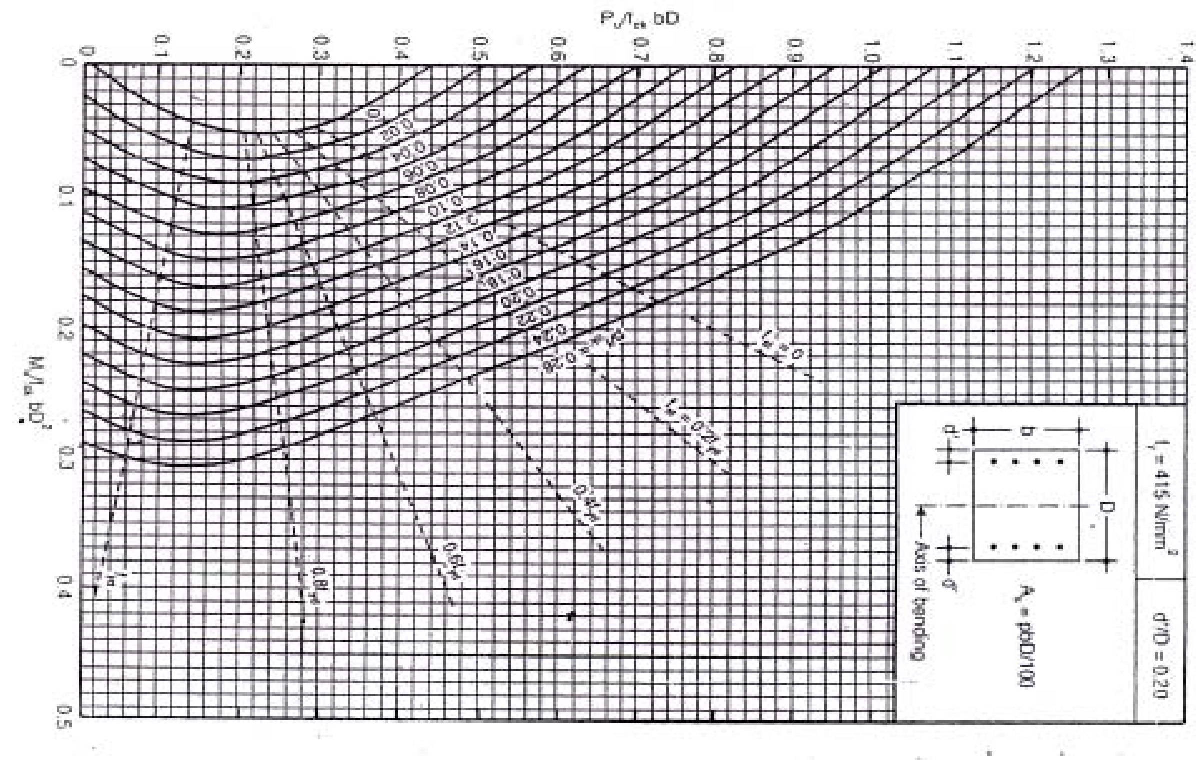


Fig. 1


$P_u/f_{ck}\,bD$
$M_u/f_{ck}\,bD^2$
f_y = 415 N/mm²
d'/D = 0.05
A_s = pbD/100
Axis of bending


$P_u/f_{ck}\,bD$
$M_u/f_{ck}\,bD^2$
f_y = 415 N/mm²
d'/D = 0.10
A_s = pbD/100
Axis of bending


$P_u/f_{ck}\,bD$
$M_u/f_{ck}\,bD^2$
f_y = 415 N/mm²
d'/D = 0.15
A_s = pbD/100
Axis of bending


$P_u/f_{ck}\,bD$
$M_u/f_{ck}\,bD^2$
f_y = 415 N/mm²
d'/D = 0.20
A_s = pbD/100
Axis of bending

T.E. (Civil) Semester – II Examination, 2009
ENVIRONMENTAL ENGINEERING – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Solve Q.* ***1*** *or Q.* ***2****, Q.* ***3*** *or Q.* ***4****, Q.* ***5*** *or Q.* ***6*** *from Section* ***I*** *and Q.* ***7*** *or Q.* ***8****, Q.* ***9*** *or Q.* ***10****, Q.* ***11*** *or Q.* ***12*** *from Section* ***II.***
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Figures to the ***right*** *indicate* ***full*** *marks.*
5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is ***allowed****.*
6) Assume suitable data, if ***necessary.***

SECTION – I

1. a) Explain the sources of noise. **6**
   b) Describe the classifications of solid wastes. **6**
   c) Define : **4**
      i) Air Pollution ii) Water Pollution

OR

2. a) Explain various techniques used to control noise pollution. **6**
   b) Write short notes on : **6**
      i) Composting ii) Incineration
   c) Explain manual component separation method of processing technique. **4**

3. a) What are the effects of particulate matter on human health and materials ? **6**
   b) Explain working principle of Electrostatic precipitator with a neat sketch. **6**
   c) What are the sources of air pollutants ? **4**

OR

4. Write short notes on **(any four)** : **16**
   a) Cyclone.
   b) Plume behaviour.
   c) Wind rose.
   d) Ozone depletion.
   e) Acid rain.

5. a) State the permissible limit as per Govt. of India norms for drinking water for the following : **6**

i) Hardness ii) pH iii) Chlorides

iv) Iron v) Turbidity vi) Colour

b) Explain factors affecting water demand. **6**

c) With the help of following data, estimate the future population of a town in the year 2030, using incremental increase method. **6**

Year	1960	1970	1980	1990	2000
Population (in thousands)	320	470	690	795	980

OR

6. a) What are the benefits of Rain Water Harvesting system ? **6**

b) Explain Rain Water Harvesting System. Draw a sketch of Roof Top Rain Water Harvesting System for a bungalow. **6**

c) Describe different phases involved in a water supply scheme. **6**

SECTION – II

7. a) Prove that theoretically, the surface loading (Q/A) and not the depth is a measure of effective removal of particles in a sedimentation tank. **6**

b) The maximum daily demand of water is 10 MLD. Design a plain sedimentation tank rectangular in shape, assuming the detention time of 4 hours and flow through velocity of 20 cm/minute. Also check up the flow rate. **6**

c) Draw a flow diagram of river water treatment process. **4**

OR

8. a) What is the purpose of aeration of water ? Explain with a neat sketch cascade aerator. **6**

b) What is stoke's law ? What are its limitations ? **6**

c) Explain the theory of coagulation. Give chemical equations of coagulation by alum. **4**

9. a) Draw a neat sketch of rapid sand gravity filter showing various components. **6**

b) Explain advantages and disadvantages of lime-soda process of water softening. **6**

c) Explain any one method of desalination. **4**

OR

10. a) What do you understand by loss of head and negative head in a rapid sand filter ? What are their permissible values ? What will happen if the negative head is excessive ? **6**

b) Explain : **6**

a) Combined available chlorine. b) Free available chlorine and

c) Residual chlorine.

c) Explain theory of chlorination. State the factors affecting chlorine demand. **4**

11. a) What is the purpose of providing an ESR ? Explain how its capacity is calculated. **6**

b) Draw a line sketch of R.C.C. Elevated Service Reservoir (ESR) and give the list of accessories provided for ESR. **6**

c) Compare continuous and intermittent systems of water supply. **6**

OR

12. Write short notes on : **18**

a) Appurtenances used in the water distribution system.

b) Mass curve method.

c) Zoning of areas.

d) Pressure in distribution system.

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T.E. (Civil) (Semester – II) Examination, 2009
TRANSPORTATION ENGINEERING – I
(2003 Course)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer Q. **1** or Q. **2**; Q. **3** or Q. **4**; Q. **5** or Q. **6** from Section **I** and Q. **7** or Q. **8**; Q. **9** or Q. **10** and Q. **11** or Q. **12** from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
5) Use of logarithmic tables, electronic pocket calculator and steam tables is allowed.
6) Assume suitable data, if necessary.

SECTION – I

1. a) Explain the ideal requirements of the permanent way. **6**

   b) State the reccommended values for depth of ballast cushion for all the 3 gauges. Also give the formula to calculate the ballast cushion and define the terms. **(3+1)**

   c) What is creep ? What are its effects ? State also the maximum permissible values of the same on Indian Railways. How it is adjusted ? **(1+2+1+2)**

OR

2. a) Discuss the various factors governing the choice among the different gauges. **4**

   b) Write an illustrative sketch to show the cross section of a B.G. track on embankment. **4**

   c) Explain in brief 4 different methods to control rail wear. **4**

   d) State the reasons for the preference of flat-footed rails (any 4). Also draw a suitable sketch of flat footed rail showing its dimensions. **(2+2)**

3. a) Calculate the maximum permissible speed on a curve of high speed BG track having the following particulars. **10**

   i) Degree of the curve = 1°

   ii) Amount of super elevation = 8.0 cm

   iii) Length of transition curve = 130 mtr.

   iv) Max. speed of the section likely to be sanctioned = 165 Kph.

   b) With the aid of neat sketches differentiate between under cut and overriding sketches. **4**

   c) Write a note on types of Gradients. **4**

OR

4. a) Explain : **(2+2+2)**

   (i) SWR (ii) LWR (iii) CWR

   b) Explain negative super elevation and also state clearly under what circumstances, its use become an obligation. **(4+2)**

   c) i) State the different functions of a switch. **3**

   ii) State the requirements of elastic fastenings. **3**

5. a) Explain the advantages of modern directed track maintenance. **4**

   b) Explain tram line method of plate laying in detail. **6**

   c) With the help of sketches, state the uses of : **(3+3)**

   i) Turntable ii) Triangle

OR

6. a) Write an explanatory note on mechanised methods of track maintenance. **4**

   b) Discuss the use and location of the following :

   i) Outer signal

   ii) Warner signal

   iii) Home signal

   Write suitable line sketch to show their locations. **(2+2+2)**

   c) Write in detail about :

   i) Sky bus

   ii) Metro rails. **(3+3)**

SECTION – II

7. a) Compare the advantages and disadvantages of Tunnels with open cuts in the tabular form only. **6**

b) Explain Needle beam method with sketches. **6**

c) Explain how alignment of tunnel through shaft can be transfered. Draw sketches. **6**

OR

8. a) What is mucking ? Describe the various mucking facilities in tunnels. **(2+4)**

b) Draw neat sketches showing **five** different shapes of tunnels stating their suitability. **(1 each = 5)**

c) Describe with neat labelled sketches heading and benching method of tunnelling. **7**

9. a) Write short notes on :

i) Advantages and disadvantages of TBM

ii) Shotcreling as tunnel support system

iii) Drill blast method

iv) Cherry picker method for mucking. **(4 each = 16)**

OR

10. a) Explain the concept of drilling pattern. **4**

b) Explain Grass Hopper method for mucking in brief with the aid of a suitable sketch. **4**

c) How ventilation are carried out in Tunnels ? Explain. **4**

d) Briefly explain shotcreting and rock bolting. **(2+2)**

11. a) Explain the difference between the following :

i) Slipway and dry dock

ii) Quadripods and Hexapods

Also write sketches. **(4+4)**

b) Draw **only** neat labelled sketches to explain : **(4+4)**

i) Layout of Harbour

ii) Fenders

OR

12. a) Explain the difference between the following : **(4+4)**

i) Jetty and Wharf

ii) Military and Fishery harbour

b) Write short note on the following :

i) Dolphins

ii) Wet docks

iii) Break water and

iv) Quay **(2 each = 8)**

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T.E. (Mechanical) (Sem. – I) Examination, 2009
(2003 Course)
HEAT TRANSFER
(Common with Mech. S/W for Sem. – II)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

Unit – 1

1. A) State the Fourier law of heat conduction and by using it derive an expression for steady state heat conduction through a plane wall of thickness L and maintaining its two surfaces at temperatures, T_1 and T_2. **8**

B) A long cylindrical rod of radius 12 cm, consists of nuclear reacting material (k = 2 W/m.K) generating 30 kW/m^3 uniformly throughout its volume. The rod is encapsulated within another cylinder (k = 5W/m.k) whose outer radius is 24 cm and surface is surrounded by air at 30 °C with heat transfer coefficient of 20 W/m^2.k. Find the temperature at the interface between the two cylinders and at the outer surface. **8**

OR

2. A) Derive a general three dimensional heat conduction equation in Cartesian coordinate system. Reduce it as 1) Poisson equation, 2) Fourier equation, 3) Laplace equation. **8**

B) A solid with thermal conductivity 38 W/m.K is having a temperature gradient of –350 °C/m. Determine the steady state heat flux. If the heat is exchanged by radiation from the surface (black) to the surrounding at 30 °C, determine the surface temperature of solid. **8**

P.T.O.

Unit – 2

3. A) Explain the following :
   1) Thermal contact resistance
   2) Critical radius and economic thickness of insulation
   3) Variation of thermal conductivity with temperature in gases. **9**

   B) Derive an expression for the temperature distribution in a hollow cylinder having inner radius R_1 and outer radius as R_2 with uniformly distributed heat sources and inner face maintained at a temperature T_1 while the outer face is maintained at T_2. **7**

OR

4. During the ripening process of an orange, the energy released is estimated as 563 W/m^3. If the orange is assumed to be homogeneous sphere with k = 0.15 W/m.K. Compute the temperature at the centre of orange and the heat flow from the outer surface. Assume a diameter of orange as 8 cm and outer surface temperature as 2 °C. Derive the equation you use. **16**

Unit – 3

5. A) Explain the following :
   1) Design criteria for thermo wells
   2) Biot and Fourier numbers
   3) Fin efficiency and fin effectiveness. **12**

   B) Derive the expressions for temperature distribution in a body at time t during Newtonian heating or cooling. **6**

OR

6. A) It is better to use 10 fins of 5 cm length than 5 fins of 10 cm length. State and prove correctness of the statement. Use following data :
   Diameter of fin = 10 mm
   Thermal conductivity = 45 W/m.K
   Heat transfer coefficient = 95 W/m.K. **8**

   B) The steel ball bearing (k = 50 W/m.K, $\alpha = 1.3 \times 10^{-5}\ m^2/s$), 40 mm in diameter is heated to a temperature of 650 °C. It is then quenched in a oil bath at 50 °C, where the heat transfer coefficient is estimated to be 300 $W/m^2.K$. Calculate (a) the time required for bearing to reach 200 °C, (b) the total amount of heat removed from a bearing during this time, and (c) the instantaneous heat transfer rate from the bearing when it is first immersed in oil bath and when it reaches 200 °C. **10**

SECTION – II

Unit – 4

7. a) Consider a human body in vertical position of height 167 cm at an average temperature of 37.3° C exposed to atmospheric air at –5.7° C at Nainital during winters. Human body can be approximated to a cylinder of diameter 40 cm having surface emissivity of 0.3. Calculate total heat loss rate from the body by convection and radiation. Neglect heat loss from the feet (bottom surface). You may use the following empirical correlations :

$Nu = 0.56\ (Gr.Pr)^{0.25}$ for vertical surface

$Nu = 0.14\ (Gr.Pr)^{0.34}$ for horizontal upper surface

$Nu = 0.27\ (Ra)^{0.25}$ for horizontal lower surface.

Take the following air properties : Pr = 0.715; k = 0.025 W/mK; $v = 13.55 \times 10^{-6}\ m^2/s$. Characteristic length for horizontal surface can be taken as A/P; where A is the area of the surface and P is its perimeter. **8**

b) Explain physical significance of any four Dimensionless Number used in Forced Convection. **8**

OR

8. a) Air at temperature of 10° C flows through a square duct of side 20 cm with a velocity of 12 m/s and leaves the duct at 30° C due to heating by duct surface uniformly maintained at 50° C. Find heat transfer rate to air, if the length of the duct is 5 m.

Use the following correlations :

$Nu = 0.023\ Re^{0.8} Pr^{0.4}$ for turbulent flow

Nu = 3.66 for laminar flow.

Air properties can be taken from Q.7 a) above. **8**

b) Differentiate between Natural Convection and Forced Convection. **4**

c) Draw Boundary Layers (Natural Convection currents only) for horizontal and vertical cylinders exposed to ambient air. Horizontal cylinder is colder than air while vertical cylinder is hotter than air. **4**

Unit – 5

9. a) Define Shape Factor. Find the shape factor of a cylindrical cavity of diameter D and depth H with respect to itself. **4**

b) Explain the following :

i) Lambert Cosine Law

ii) Wien's Displacement Law. **4**

c) Calculate heat transfer rate by radiation between the surfaces of two long cylinders of radii 100 mm and 200 mm kept one inside the other. The axes of the cylinders are parallel to each other but separated by a distance of 20 mm. Outer surface of inner cylinder and inner surface of the outer cylinder are maintained at 127° C and 27° C having emissivities of 0.07 and 0.7 respectively. Assume the medium between the two cylinders as non-absorbing. **8**

OR

10. a) Using the concept of 'Surface Resistance' and 'Space Resistance', derive the expression for steady state heat transfer rate by radiation between the two long gray diffused parallel plates maintained at temperatures T_1 and T_2 of emissivities of ε_1 and ε_2 having a thin radiation shield of emissivity ε_3 inserted in parallel between the two plates. **8**

b) Why does error occur in measuring the temperature by thermocouple of hot gases flowing through a conduit ? Explain. **4**

c) Calculate the error in measurement of temperature by using thermocouple ($\varepsilon = 0.6$) of exhaust gases flowing through a tube. Temperature of the tube is 20° C and thermocouple measures a temperature of 500° C. Take h = 200 W/m^2K between the thermocouple and exhaust gases. **4**

Unit – 6

11. a) Explain the Six Regimes of pool boiling with the help of neat curve. **9**

b) A hot fluid at 200° C enters a heat exchanger at a mass flow rate of 10000 kg/hour. Its specific heat is 2 kJ/kgK. It is to be cooled by another fluid entering at 25° C with a mass flow rate of 2500 kg/hour and specific heat of 400 J/kgK. The overall heat transfer coefficient based on outside area of 20 m^2 is 250 W/m^2K. Find exit temperature of both the fluids when fluids are in parallel flow arrangement. **9**

OR

12. a) Draw labelled temperature profiles of the following types of Heat Exchangers :

i) Direct transfer type parallel flow

ii) Direct transfer type counter flow

iii) Condenser

iv) Evaporator. **4**

b) Differentiate between Film Wise Condensation and Drop Wise Condensation. **4**

c) Saturated steam at 80° C condenses on outside of a horizontal tube of 10 cm diameter maintained at a temperature of 70° C. When the tube was kept vertical, it was observed that the rate of condensation was same as before. Find the length of the tube and rate of condensation per hour. Take latent heat for steam as 2300 kJ/kg and the following properties of condensate : ρ = 977.8 kg/m^3; k = 0.668 W/mK; v = 0.415 × 10^{-6} m^2/s. **10**

T.E. (Mech.) (Semester – I) Examination, 2009
(2003 Course)
THEORY OF MACHINES AND MECHANISMS – II

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) A 150 mm diameter valve against which a steam pressure of 2 MN/m^2 is acting is closed by means of square threaded screw of 50 mm external diameter and 6 mm pitch. If coefficient of friction is 0.12. Find the torque required to turn the handle. **10**

b) Derive the expression for efficiency of screw threads for raising and lowering the load. **6**

c) Define the friction circle. **2**

OR

2. a) Explain the concept of slip and creep in belt drive. **4**

b) Derive the expression for limiting tension ratio for V belt drive. **6**

c) A flat belt 8 mm thick and 100 mm wide transmits power between two pulleys running at 25 m/s. The mass of belt is 0.9 kg/m length. The angle of lap for smaller pulley is 165° and coefficient of friction is 0.30. The maximum permissible stress for belt material is 2×10^6 N/m^2. Calculate the maximum power that can be transmitted. **8**

3. a) Derive the expression for frictional torque for uniform pressure and wear theory for flat pivot bearing. **8**

   b) Determine the time required to accelerate a counter shaft of rotating mass 500 kg and radius of gyration of 200 mm to the full speed of 250 rpm from rest through a single plate clutch of internal and external radii 125 mm and 200 mm, taking coefficient of friction as 0.3 and axial spring force of 600 N. Assume that only one side of clutch is effective. **8**

OR

4. a) A simple band brake is applied to a shaft carrying a flywheel of mass 250 kg and radius of gyration 300 mm. The shaft speed is 200 rpm. The drum dia is 200 mm and coefficient of friction is 0.25. The free end of band is attached at 100 mm from fulcrum and effort of 120 N is applied on lever at 280 mm from fulcrum. The angle embraced by belt is 225°. Determine for counter clockwise rotation of drum.

      i) Braking Torque.

      ii) The number of turns of flywheel before it come to rest.

      iii) The time taken by flywheel to come to rest. **10**

   b) Write short notes on Epicyclic transmission dynamometer. **6**

5. A flat faced follower is operated by a uniformly rotating cam. The follower is raised through a distance of 25 mm in 120° rotation of cam, remains in rest for the next 30° and lowered through further 120° rotation of cam. The raising is by SHM and lowering with uniform acceleration and decceleration. The least radius of cam is 25 mm which rotates at 300 rpm. Draw the cam profile and determine the value of maximum velocity and acceleration for rise and return. **16**

OR

6. a) What is jump phenomenon ? Derive the expression for jump velocity for the eccentric cam follower system. **8**

   b) What is polynomial curve CAM ? Derive the expression for displacement, velocity and acceleration for 2-3 polynomial D-R-D cam. **8**

SECTION – II

7. a) A certain engine develops an output torque of $(1600 + 300 \sin 2\theta)$ N.M, where θ is the crank angle. This engine drives a machine which requires a driving torque of $(1600 + 170 \sin\theta)$ N.M. The rotating parts have a mass of 240 kg with a radius of gyration of 0.5 m. The maximum speed of rotation is observed to be 200 rpm. Determine :

   i) Draw T-θ curve.

   ii) The minimum speed of rotation.

   iii) Coefficient of fluctuation of speed.

   iv) Power developed by engine at its mean speed. **12**

   b) Compare flywheel and Governor. **4**

OR

8. a) A Hartnell governor having a central sleeve spring and two right angled bell crank levers moves between 290 rpm and 310 rpm for a sleeve lift of 15 mm. The sleeve arms and ball arms are 80 mm and 120 mm respectively. The levers are pivoted at 120 mm from the governor axis and mass of each ball is 2.5 kg. The ball arms are parallel to the governor axis at lower equilibrium speed. Determine

   i) loads on the spring at the lowest and highest equilibrium speed.

   ii) stiffness of the spring. **10**

   b) Explain with neat sketch inertia governor. **6**

9. a) Define law of gearing and prove it and also derive the expression for velocity of sliding. **8**

   b) The number of teeth on each of the two equal spur gear in mesh is 40. The teeth have 20° involute profile and the module is 6 mm. If the arc of contact is 1.75 times the circular pitch, find the addendum. **8**

OR

10. a) Derive the expression for velocity ratio and centre distance for helical gear. **6**

b) Two gears mesh externally and are to give a velocity ratio of 3 to 1. The teeth are of involute type with module of 6 mm. Addendum is one times module, pressure angle is 20° and pinion rotates at 90 rpm.

Find :

i) The number of teeth on the pinion to avoid the interference and number of teeth on wheel.

ii) Lengths of path and arc of contact.

iii) The number of pairs of teeth in contact.

iv) The maximum velocity of sliding. **10**

11. a) Define the terminologies

i) Axial pitch

ii) Circular pitch

iii) Lead

iv) Lead angle related to worm and worm wheel. **4**

b) Considering worm and worm wheel as a special case of spiral gears, derive the expression for the efficiency. **4**

c) A drive is made of two spiral gears wheel of same hand, same diameter and normal pitch of 14 mm. The centre distance between the axes of the shaft is approximately 150 mm. The speed ratio is 1.6 and angle between the shaft is 75°. Assuming friction angle of 6°. Determine :

i) The spiral angle of each wheel.

ii) The number of teeth and each wheel.

iii) The efficiency and maximum efficiency. **10**

OR

12. a) Derive the expression of speed reduction for epicyclic arrangement of sun, planet and arm by using tabulation method. Compare the speed reduction for simple and epicyclic gear train if sun and planet has equal number of teeth. **8**

b) Explain the differential gear box with neat sketch. How the differential action takes place prove with tabulation method. **10**

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T.E. (Mechanical) (Semester – I) Examination, 2009
(2003 Course)
INDUSTRIAL ENGINEERING AND MANAGEMENT

Time : 3 Hours Max. Marks : 100

Instructions : *i)* ***All*** *questions are* ***compulsory****.*
ii) Neat diagram should be drawn ***wherever*** *necessary.*
iii) Figures to ***right*** *indicate* ***full*** *marks.*
iv) Use of pocket calculator is ***allowed****.*

SECTION – I

1. a) Discuss the different tools and techniques used in industrial engineering. **9**

b) Explain the importance of method study with the help of suitable examples. **9**

OR

2. a) Explain the merits and demerits of work sampling over time study. Which is mostly preferred ? Why ? **9**

b) Following data refers to the time study carried out in medium scale industry for grinding machine. The relaxation allowances are separately given for each activity is indicated in following table. If contingency allowance is 3%, calculate the standard time of operation. **9**

Element No.	Description	Perform Rating (%)	Observed time (min)	Relaxation Allowance (%)
1	Pick up job from bin	80	0.56	11
2	Clamp it on machine table	90	1.25	12
3	Grinding operation	100	3.75	–
4	Unclamp job from table	90	0.80	13
5	Put job in new bin	85	0.45	10

P.T.O.

3. a) Explain the characteristics of man-machine system. **8**

   b) Discuss the significance of Ergonomics. **8**

OR

4. a) A work place for CNC machining centre is to be designed. State the important factors to be considered for work place design. **8**

   b) Explain the relationship between Ergonomics and Anthropometry. **8**

5. a) State various principles of management. Explain any two in detail. **8**

   b) Explain how productivity helps to enhance the performance of an organization. **8**

OR

6. a) Explain the importance of motivation as management tool. **8**

   b) Discuss the advantages of having a good leader in an organisation. **8**

SECTION – II

7. a) Explain various factors to be considered while preparing a budget for an organisation. **9**

   b) Discuss various types of variances. **9**

OR

8. a) Explain different methods used for capital evaluation. **9**

   b) "Transfer pricing and responsibility accounting are two sides of a coin", explain. **9**

9. a) Explain selection criteria for material handling equipments. **8**

   b) How production optimization can be achieved with the help of good plant layout ? **8**

OR

10. a) Write a short note on facility planning. **8**

b) Explain the relationship between plant layout and material handling system. **8**

11. a) Explain the significance of EOQ. Calculate EOQ from following information.

Annual Demand	= 9000
Procurement and order cost	= Rs. 50
Unit cost	= Rs. 10
Percentage inventory carrying cost	= 15% of total inventory cost. **8**

b) Explain any one selective inventory technique. **8**

OR

12. a) Explain the importance of material management in an industry. **8**

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

i) JIT technique

ii) KANBAN system.

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T.E. (Mechanical) (Semester – I) Examination, 2009
COMPUTER ORIENTED NUMERICAL METHODS
(Common with Mech. S/W for Semester – II)
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*3) **Use** of logarithmic tables, slide rule, electronic pocket calculator is **allowed**.*
*4) Assume suitable data **if necessary**.*

SECTION – I

1. a) Explain **any four** types of errors with suitable example from following : **6**

   i) Inherent Error

   ii) Rounding Error

   iii) Truncation Error

   iv) Algorithmic Error

   v) Absolute Error

   vi) Relative Error

   b) Use Simplex method to solve the following problem, **10**

   Maximize, $Z = 2X_1 + X_2$

   Subject to, $X_1 + 2X_2 \leq 10$

   $X_1 + X_2 \leq 6$

   $X_1 - X_2 \leq 2$

   $X_1 - 2X_2 \leq 1$

   $X_1, X_2 \geq 0.$

OR

2. a) Explain with suitable example **6**
   i) Error Propagation
   ii) Concept of convergence

   b) A plant manufactures two products A and B using three operations Punching, Welding and Assembly. Time required for each product for each operation is listed in table given. Also the capacity in minutes/week for each process is given. If the profit for Product A is Rs. 0.6 and that for product B is Rs. 0.7. Determine the quantities of products A and B so that the profit is maximum. **10**

Product Operation	**A**	**B**	**Capacity (Min/Week)**
Punching	2.4	3	1200
Assembly	5	--	1500
Welding	--	2.5	600
Profit (Rs.)	0.6	0.7	

3. a) The observed values of a function are respectively 168, 120, 72 and 63 at the four positions 3, 7, 9 and 10 at the independent variable. What is the best estimate for the value of the function at the variable 6 ? **8**

   b) Explain Least Square Technique.
   Draw Flowchart and write a computer program for the same. **8**

OR

4. a) The values of x and y obtained in an experiment are as follows, the law controlling them is $y = ax^b$, find the best values of the constants. **8**

x	1	2	3	4	5
y	0.5	2.0	4.5	8	12.5

   b) Prepare 'Newton's Backward Difference Interpolation' Table for the given set of points and Draw a flow chart for the same. **8**

x	100	150	200	250	300
y	10.63	13.03	15.04	16.81	18.42

5. a) Using Gauss Jordan method, solve the following set of simultaneous. Do Partial Pivoting. **8**

$2X - 3Y + 5Z = 10$

$X + 4Y + Z = 12$

$3X - 2Y + Z = -2$

b) Draw a flow chart to find first derivative using 'Newton's Backward Difference' Method Formula. **5**

c) Draw Flow Chart for finding values of unknown variables by Back Substitution in Gauss Elimination method, when the coefficient matrix is available in upper triangular format. **5**

OR

6. a) Using Gauss Siedel method, solve the following set of simultaneous equations upto three decimal place accuracy. Do Partial Pivoting. **10**

$X + 3Y + Z = 10$

$X + 2Y + 5Z = 12$

$4X + Y + 2Z = 16$

b) Following data gives values of Pressure and Specific Volume of superheated steam, find the rate of change of pressure with respect to volume. **8**

Sp. Volume	3	4	6	8	10
Pressure	105	42.7	25.3	16.7	13

SECTION – II

7. a) Draw a Flow Chart and Write a computer program for 'Secant Method', to find root of an equation. **8**

b) A circular shaft having one meter length has varying radius 'r' as follows.

x(m)	0	0.25	0.50	0.75	1.00
r(m)	1.00	0.9896	0.9589	0.9089	0.8415

An axial pull of 300 KN is applied at one end of the shaft whose modulus of elasticity is $200 \text{ X } 10^9 \text{ N/m}^2$. The axial elongation of the shaft (Δx) is given by, $\Delta x = (P/E)_0 \int^1 (1/A)dx$. Where A is cross sectional Area of shaft. Determine elongation of shaft over the entire length by Simpson's rule. **8**

OR

8\. a) Draw a flow chart and write a computer program for 'Simpson's 3/8 Rule', to find area under a curve. **8**

b) Use Newton's method to find the smallest root of the equation $e^x - \sin(x) = 1$ to four decimal places of accuracy. **8**

9\. a) Using 'Runge Kutta method of order 4', find $y(0.2)$ with $h = 0.1$ for the following equation $\frac{dy}{dx} = 3x + \frac{1}{2}y,$ where $y(0) = 1$. **8**

b) Draw a Flow Chart and write a computer program for 'Euler's Method'. **8**

OR

10\. a) Draw a Flow Chart and write a computer program for solution of simultaneous differential equations. **8**

b) Use modified Euler's method to find $y(0.2)$ with $h = 0.1$ for the equation $\frac{dy}{dx} = \sqrt{x+y},$ given that $y(0) = 0.36$ with accuracy as 0.001. **8**

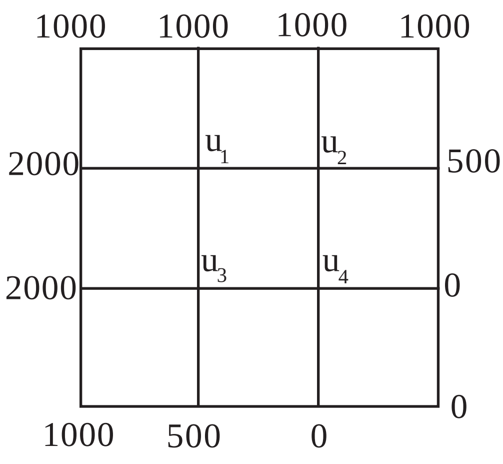
11\. a) Draw a flow chart for solving parabolic equation. **8**

b) Evaluate the pivotal values of the equation $u_{tt} = 16\,u_{xx}$ taking $\Delta x \equiv 1$ upto $t = 1.25$. The boundary conditions are $u(0, t) = u(5, t) = 0$, $u_t(x, 0) = 0$ and $u(x, 0) = x^2(5 - x)$. **10**

OR

12\. a) Draw a flow chart for solving 1 D Heat equation. **8**

b) Given the values of $u(x, y)$ on the boundary of the square in the figure given below, evaluate the function $u(x, y)$ satisfying the Laplace equation $\nabla^2 u = 0$ at the pivotal points of given figure. **10**



T.E. (Mech.) (Semester – II) Examination, 2009
TRANSMISSION SYSTEM DESIGN
(2003 Course)

Time : 4 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section – **I** and **3** questions from Section – **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
5) Assume suitable data, if necessary.

SECTION – I

Unit – I

1. a) Explain the procedure of Bearing selection from manufacturer's catalogue. **6**

b) Explain the designation of rolling contact bearing. **2**

c) A 25 mm diameter shaft is transmitting 10 kW at 720 rpm. The shaft is supported on two indentical cylindrical roller bearings. The shaft is attached with a flat pulley midway the bearing. Diameter of the pulley is 250 mm. The coefficient of friction between the pulley and the belt is 0.3 and angle of lap is 180°. The belt is vertical. Overload factor is 1.75 and expected life for the bearings is 76000 hours. Select the bearing using following data : **10**

Bearing No.	NU 2205	NU 2305
Basic Dynamic Capacity 'C' kN	15.99	31.39

OR

2. a) Discuss 'Reliability' of rolling contact bearing. **4**

b) Discuss the different methods of mounting for rolling contact bearing. **4**

c) A single row deep-groove ball bearing operates with following work cycle. If expected life is 20000 hours calculate basic dynamic load rating of the bearing so that it can be selected from manufacturer's catalogue.

Work cycle is as follows :

Element time, %	Radial load kN	Thrust load kN	Radial factor 'X'	Thrust factor 'Y'	Race Rotating	Service factor	Speed rpm
50	2.8	1.2	0.56	1.4	Inner	1.5	720
20	2.8	0.8	0.56	1.6	Outer	2.0	1440
Remaining	Nil	Nil	-	-	Outer	-	720

10

Unit – II

3. a) Derive a relation between torque transmitted by a clutch and operating force using uniform pressure theory and uniform wear theory. **8**

b) An automotive plate clutch having two contacting surfaces is having torque capacity of 550 Nm. The coefficient of friction is 0.25 and the permissible intensity of pressure is 0.5 N/mm^2. Outer diameter of friction disk is 250 mm. Using uniform wear theory.

Calculate :

i) Inner diameter of friction disk.

ii) Spring force required to keep the clutch in engaged position. **8**

OR

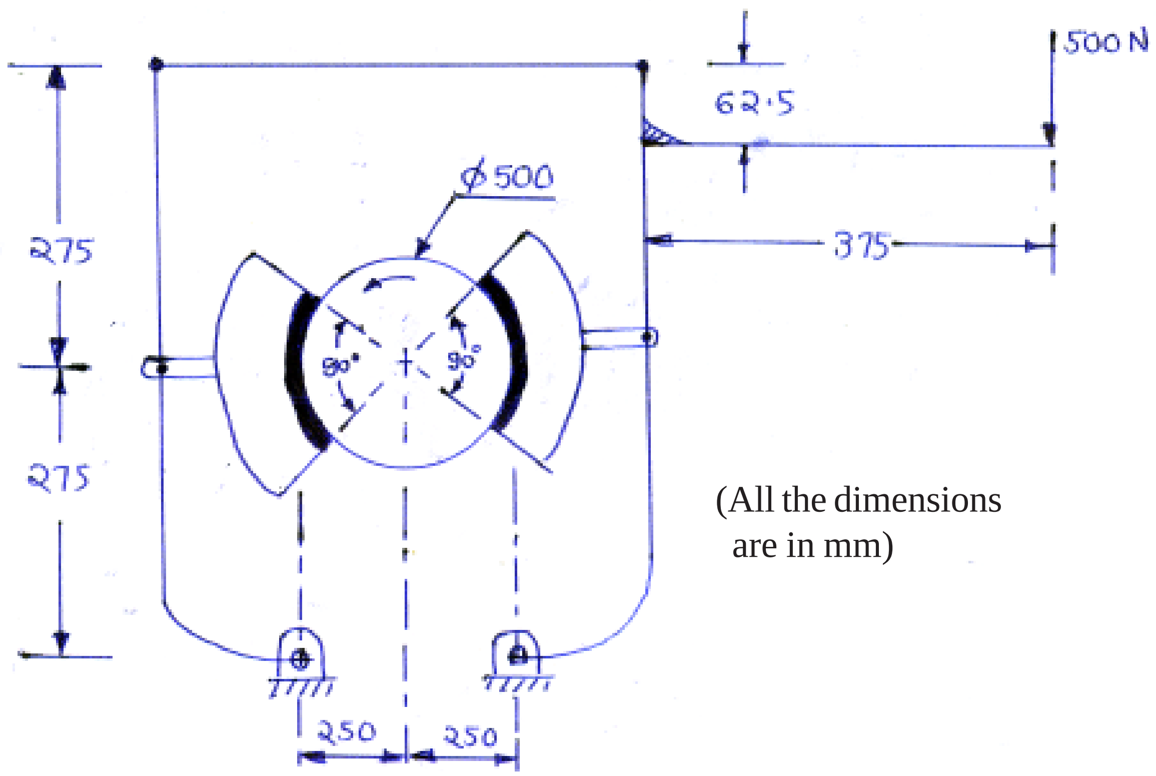
4. a) Discuss different types of the brakes. **3**

b) A pivoted double block brake as shown in fig. 1 has a face width of 50 mm and coefficient of friction as 0.25. The pivot of each shoe is located such that the moment of frictions force on shoe about the pivot is zero. If the brake drum rotates at 600 rpm. Calculate :

i) Maximum intensity of pressure on each shoe

ii) Braking torque capacity of the brake

iii) Rate of heat generation at the beginning of the braking operation. **13**



(All the dimensions are in mm)

Figure 1 [Q. 4 (b)]

Unit – III

5. a) Discuss 'Polygon effect' in chain drives. **3**

b) Discuss applications of wire ropes. **2**

c) A pulley of 750 mm diameter is driven by an open flat belt from a 20 kW, 720 rpm electric motor. The pulley on motor shaft is of 400 mm diameter and central distance between the shafts is 2.5 m. Allowable tensile stress for the belt material is 2 N/mm^2 coefficient of friction between the belt and the pulley is 0.3. The density of belt material is 900 kg/m^3. If width of the belt is 100 mm determine :

i) Thickness of the belt

ii) Length of the belt

iii) Initial tension required in the belt. **11**

OR

6. a) Derive relation between velocity and initial tension of belt for maximum power transmission capacity. **5**

b) A V-belt drive is used to transmit 30 kW power from an electric motor running at 1440 rpm to a machine running at 480 rpm. The central distance between the shafts is 1 m. Groove angle for pulley is 38° and coefficient of friction between the belt and the pulley is 0.2. The density of the belt material is 1000 kg/m^3 and allowable tensile stress for the belt is 1.53 N/mm^2. The cross-sectional dimensions of the belt are as follows :

Width of the belt at the top : 37 mm

Width of the belt at the bottom : 19 mm

Depth of the belt : 25 mm.

Find :

i) Diameters of the pulleys

ii) Minimum number of belts required.

Assume maximum power transmission capacity condition for belts. **11**

SECTION – II

Unit – IV

7. a) Discuss different types of gear tooth failure. **3**

b) For a gear pair, number of teeth on pinion is 18 and that on gear is 36. Using the following data calculate Beam and Wear strength of gear teeth, rated power the pair can transmit and maximum static load on gear.

Ultimate tensile strength of pinion material 660 MPa.

Ultimate tensile strength of gear material 510 Mpa

Module 5 mm

Face width is ten times the module

Surface hardness of pinion 330 BHN

Surface hardness for gear 280 BHN

Velocity factor is given by $\frac{5.6}{5.6+\sqrt{V}}$

Service factor 1.5.

Factor of safety 2

Pinion speed 1440 rpm

Lewis form factor $Y = 0.484 - \frac{2.87}{Z}$. **14**

OR

8. a) Discuss lubrication of gears. **3**

b) A pinion having 22 number of teeth is to mesh with a gear having 60 number of teeth. Both the pinion and the gear made up of steel having ultimate tensile strength of 600 MPa and 300 MPa respectively. The pinion is connected to a 10 kW, 1440 rpm three phase induction motor. Design the gear pair and specify the surface hardness required on gear teeth using following data.

Starting torque of motor is 56% greater than the rated torque

Face width is ten times the module

Deformation factor C is 11000 N/mm^2

Sum of the errors between meshing teeth e = 7.3 microns

Factor of safety 1.75

Velocity factor is given by $\frac{6}{6+v}$

Lewis form factor Y = 0.484 – $\frac{2.87}{Z}$

Buckingham's Equation for dynamic load is $Pd = \frac{21V\,(Ceb + P_t)}{21V + \sqrt{Ceb + P_t}}$

Standard module series --- 3, 4, 5, 6, 8, 10, 12, --- **14**

Unit – V

9. a) Discuss procedure to decide direction of different force components of helical gears. **3**

b) Helical rack and pinion arrangement is used to operate a machine tool table. The table speed required is 2.1 m/s and tangential force required to be applied is 600 N. Speed of the pinion is 720 rpm and number of teeth on pinion is 25. Assuming velocity factor accounts for the dynamic load, design the rack and the pinion and calculate the motor power rating.

Use the following data :

Ultimate tensile strength for Rack and pinion material is 630 MPa and 720 MPa respectively.

Surface hardness for Rack and pinion is 400 BHN

Starting torque is 35% greater than the rated torque

Face width is twelve times the normal module

Helix angle is approximately equal to 27°

Factor of safety is 1.5

Velocity factor is given by $\frac{5.6}{5.6+\sqrt{v}}$ **14**

Also find a actual factor of safety achieved.

OR

10. a) Explain Formative number of teeth for bevel gears. **3**

b) Derive relation for Beam strength of bevel gears. **6**

c) A pair of Bevel gear transmits 7.5 kW at 300 rpm. The pressure angle is 20°. Pitch circle diameter for the pinion and the gear is 150 mm and 200 mm respectively. Face width is 40 mm. Determine the components of gear tooth force and draw a free body diagram of forces acting on the pinion and the gear. **8**

Unit –VI

11. a) Explain with a neat diagram, the difference between Single-Enveloping and Double-Enveloping worm gear pair. **3**

b) A worm gear drive 4/40/10/4 is used to transmit 10 kW power. The worm is having left hand helix and it is rotating at 1440 rpm in anti-clockwise sense as viewed from right side. The coefficient of friction for worm and worm-gear pair is 0.04 and normal pressure angle is 20°. Determine and show different force components acting on the worm and worm-gear. Assume worm is located below the worm-gear. Also find efficiency and power lost in friction. **13**

OR

12. a) Discuss the thermal considerations in worm-gear drive. **3**

b) A worm gear pair 2/40/10/4 is having phospher-bronze gear with ultimate tensile strength 300 MPa. The worm is made of steel with ultimate tensile strength of 740 MPa. The coefficient of friction between the worm and worm-gear is 0.03 and normal pressure angle is 20°. For the worm gear, wear factor is 0.9 N/mm^2. The overall heat-transfer coefficient for the gear box is 18 W/m^2 °C. The permissible temperature rise for the lubricating oil is 50°C. The worm rotates at 720 rpm and service factor is 1.5. Determine input power rating based on Beam strength, wear strength and thermal consideration. Assume effective surface area of the gear box as 0.8 m^2 and factor of safety as 1.5. **13**

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T.E. (Mechanical) (Semester – II) Examination, 2009
(2003 Course)
TRIBOLOGY

Time : 3 Hours Marks : 100

Instructions : *1) Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*
2) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
3) ***Use*** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
4) Assume suitable data, ***if necessary****.*

SECTION – I

1. a) Explain the effect of temp. and pressure on the viscosity of lubricating oil. **6**

b) State the different ways of disposal of used oil. **6**

c) Determine the viscosity of lubricant in centi-poise and centi-stokes, having viscosity 200 SUS and specific gravity 0.8. **4**

OR

2. a) What is viscosity index ? Explain the method to find the viscosity index of a test oil. **6**

b) What are desirable properties of lubricating oil ? **4**

c) Write short notes on : **6**

i) Oxidation Inhibitors

ii) Pour point depressants.

3. a) Explain the modified adhesion or Junction Growth theory of friction. **6**

b) What is surface fatigue wear ? Where it is observed ? **4**

c) Write a short note on - Archard's theory of adhesive wear. **6**

OR

4. a) Explain the stick-slip friction. **4**

b) Explain the method of friction measurement by Pin-on-Disk apparatus. **4**

c) Show that the volume of abrasive wear per unit sliding distance with conical abrasive particles is given by

$$Q = \left[\frac{2\,Kw\,Cot\alpha}{\pi}\right]\frac{W}{P}$$

where , α = semi-cone angle. **8**

5. a) Starting from two dimensional Reynold's equation, derive following expressions for infinitely short journal bearing using usual notations :

i) Pressure distribution

ii) Volume flow rate of fluid in axial direction. **12**

b) Explain the heat balance for hydrodynamic journal bearings with feed lubrication. **6**

OR

6. a) A 360° hydrodynamic bearing has the following data :

Journal diameter = 50 mm

Length of journal = 50 mm

Radial load on journal = 15 kN

Journal speed = 1450 rpm

Eccentricity ratio = 0.75

Radial clearance = 20 μm

Specific gravity of the oil = 0.86

Specific heat = 2.09 kJ/kg°C.

Evaluate :

i) Coefficient of friction

ii) Viscosity of oil

iii) Minimum oil-film thickness

iv) Quantity of oil in circulation

v) Oil leakage through sides and

vi) The average oil temp. if the oil is supplied at 28ºC.

Use the data given below :

Dimensionless parameters for full journal bearings with side leakage.

[l/d = 1]

$\in$	$\frac{ho}{c}$	S	$f\left(\frac{r}{c}\right)$	$\frac{Q}{r.c.N_s.l}$	$\frac{Q_s}{Q}$	$\frac{P}{P_{max}}$	Ψ
1.0	0	0	0	0	1.0	-	0
0.97	0.03	0.00474	0.514	4.82	0.973	0.152	15.47
0.9	0.1	0.0188	1.05	4.74	0.913	0.247	26.45
0.8	0.2	0.0446	1.70	4.62	0.842	0.313	36.24
0.6	0.4	0.121	3.22	4.33	0.680	0.415	50.58
0.4	0.6	0.264	5.79	3.99	0.497	0.484	63.10
0.2	0.8	0.631	12.8	3.59	0.280	0.529	74.02
0.1	0.9	1.33	26.4	3.37	0.150	0.540	79.5
0	1.0	∞	∞	3.142	0	-	85

Note : Assume linear interpolation for intermediate values. **12**

b) Explain the following terms with reference to hydrodynamic journal bearings.

i) Design variables

ii) Performance variables

iii) Sommerfeld number. **6**

SECTION – II

7. a) Derive an expression for load carrying capacity and oil flow rate for hydrostatic step bearing. State the assumptions made. **8**

b) Derive an expression for optimum oil-film thickness to minimize the total power loss in case of hydrostatic step bearing. Plot the variation of power loss against oil-film thickness. **8**

OR

8. a) The following data is given for the hydrostatic step bearing :

Thrust load = 450 kN

Shaft speed = 750 rpm

Shaft diameter = 400 mm

Recess diameter = 250 mm

Viscosity of lubricant = 30 cP

Specific gravity of lubricant = 0.86

Specific heat of lubricant = 2 kJ/kg°C

Calculate :

i) the optimum oil film thickness for minimum power loss

ii) the frictional power loss

iii) the pumping power loss

iv) the temperature rise, assuming the total power loss in bearing is converted into the frictional heat.

Show the variation of power loss against the oil-film thickness. **10**

b) Explain the following arrangements of hydrostatic lubrication system :

i) Lubrication at constant pressure

ii) Lubrication at constant flow. **6**

9. a) Derive the expressions for load carrying capacity and time of approach in case of two parallel square plates separated by the fluid-film. **12**

b) Why lubrication is required in metal working ? Explain the type of lubrication in metal working. **4**

OR

10. a) A rectangular plate having length to width ratio of 0.25 is approaching towards a fixed plane with an initial oil-film thickness between the plate and plane as 0.05 mm. Load supported by plate is 12 kN for 4 seconds. The viscosity of oil is 35 cP. Calculate bearing length and width for final oil-film thickness as 0.01 mm. Also find maximum pressure value. **8**

b) State and explain any two practical examples of squeeze film action. **4**

c) Explain merits and demerits of gas-lubricated bearings. **4**

11. a) The following data refers to the hydrodynamic narrow tapered - Pad bearing.

Thrust load on bearing = 600 kN

Length of bearing = 900 mm

Width of bearing = 200 mm

Inclination of pad = 1.75×10^{-3} degree

Sliding velocity = 4 m/s

Minimum oil-film thickness = 20 microns

Calculate :

i) the viscosity of lubricating oil

ii) the tractive effort on bearing

iii) the power lost in friction

iv) the maximum pressure and

v) the ratio of maximum pressure to average pressure. **10**

b) Explain the phenomenon of elastohydrodynamic lubrication. State the applications where EHD lubrication is observed. **8**

OR

12. a) Derive the following expressions for finite width tapered - pad bearings :

    i) pressure distribution

    ii) load carrying capacity. **12**

    b) What are tilting pad bearings ? Why tilting pad bearings are preferred over fixed pad bearings ? **6**

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T.E. (Mechanical) (Sem. – II) Examination, 2009
FLUID MACHINERY
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

UNIT – I

1. A) Derive the fundamental energy equation and Degree of Reaction for the turbine. Also show that no turbine is 100% reaction turbine. **10**

B) A jet coming out of a nozzle 0.1 m in diameter strikes to an stationery inclined flat plate and exerts a force of 3500 N in the direction of flow. If the inclination of the plate is 30° to the jet axis, find the normal force acting on the plate. Also find out the required jet velocity and mass flow rate. **6**

OR

2. A) A jet has a direct impact on a series of flat plates mounted on a large wheel. Prove that the force acting on the plate is given by $F = \rho av(v - u)$. Further prove that the efficiency of the system is given by $\eta = \frac{2(v-u)u}{v^2}$. The notations carry the usual meaning. **8**

B) A water jet with a velocity of 40 m/s strikes a blade moving with a velocity of 20 m/s. The jet makes an angle of 30° with the direction of motion of the blade at inlet and leaves at an angle 90° to the direction of the motion of the blade at outlet. Find out the blade angles at inlet and outlet so that the water enters and leaves the blade without shock. **8**

P.T.O.

UNIT – II

3. A) Differentiate between gross-head and net head. Also, define hydraulic efficiency, mechanical efficiency and overall efficiency for the Pelton wheel. **8**

B) Design a Pelton wheel to develop 200 kW shaft power when running at 250 RPM. Available head is 100 m. Assume $C_v = 0.98$, overall efficiency 85%

$\frac{u}{v_1} = 0.45$, notations carry usual meaning. **8**

OR

4. A) Explain the jet velocity, jet ratio, and speed ratio for Pelton wheel. How do you determine the minimum number of buckets and number of jets for Pelton wheel ? **8**

B) In a test on Pelton wheel, following observation are made : d = 3.9 cm, $Q = 0.02\ m^3$, $H_{net} = 15$ m, B.P = 2.35 kW. Find :

a) Power lost in nozzle

b) Power rejected to tailrace

c) Power lost in mechanical friction.

Assume mechanical efficiency of 90%. **8**

UNIT – III

5. A) For a draft tube, prove that the pressure head at the outlet of turbine is given by

$$\frac{p_2}{w} = \left[\frac{p_a}{w} - H_d\right] - \left[\frac{v_2^2 - v_3^2}{2_z} - h_f\right]$$

Notations carry usual meaning. **6**

B) The internal and external diameter of an inward flow reaction turbine are 0.6 m and 0.9 m respectively. The head on the turbine is 40 m. The flow velocity at outlet is 3 m/s and the outlet blade angle is 15°. The width of the blade at inlet and outlet is 0.1 m. Assume radial discharge at outlet; and hydraulic efficiency of 85%.

Find out :

a) Speed of turbine

b) Inlet blade angle and inlet guide vane angle

c) Flow rate through the turbine and power developed by turbine. **12**

OR

6. A) Explain the cavitation in the turbine and its control. **4**

B) With the help of neat sketch, explain the working of Francis turbine. **6**

C) Compare Francis turbine, Kaplan turbine and Propellar turbine. Explain why Kaplan turbine is preferred where load on the turbine is fluctuating. **8**

SECTION – II

UNIT – IV

7. a) What is governing of water turbine ? Describe with sketch the working of a system to regulate the speed of Francis turbine. **8**

b) A model of turbine developed 13 KW at a speed of 450 rpm under a head of 12m. The scale ratio for the model is 10. Determine for actual turbine, the speed of runner and power developed if the overall efficiency for model and actual turbine are equal. State the turbine for which the model was tested. **8**

OR

8. a) Explain significance of model testing. State its advantages. **4**

b) Explain various unit quantities. **4**

c) A $\frac{1}{4}$ scale turbine model is tested under a head of 12 m. The full scale turbine is required to work under a head of 36 m and to run at 428 rpm. At what speed must the model be run and if it develops 100 KW and uses 1 m^3/s of water at this speed; what power will be obtained from the full scale turbine assuming its efficiency is 3% better than that of model ? **8**

UNIT – V

9. a) Show that the pressure rise in the impeller of centrifugal pump is given by

$$\frac{u_1^2 + v_f^2 - v_{f_1}^2 \operatorname{cosec}^2\phi}{2g}.$$ **6**

b) Impeller of a pump is 175 mm in diameter and its width at outlet is 50 mm. The blades of impeller are curved back at an angle of 22°. The H.Q. characteristic of pump is given by

$H = 40 + 140\,Q - 1200\,Q^2$

The pump is used to deliver water through 150 mm diameter pipe, 80 m long to a static lift of 30 m. Calculate the head developed, discharge and manometric efficiency.

The speed of pump is 2880 rpm. Also determine the power input required if volumetric and mechanical efficiencies are 0.96 and 0.94 respectively. Take coefficient for pipe as 0.028. **10**

OR

10. a) Describe necessity and methods of primary in pump. **4**

b) Write short note on cavitation in centrifugal pump. **4**

c) A centrifugal pump impeller has outer diameter 1.2 m and ratio of diameters is 2.0. It delivers 2 m^3/s of water. The effective area of flow at outlet is 8000 cm^2. The vane angle at outlet is 30°. Determine the minimum starting speed of the pump against a head of 82 m.

If this pump runs at 720 rpm, find the manometric efficiency and power required. **8**

UNIT – VI

11. a) With a neat sketch explain construction and working of hydraulic ram stating its advantages and disadvantages. Explain also the various efficiencies related to it. **10**

b) Sketch and explain indicator diagram for a reciprocating pump with and without air vessels. What is slip in reciprocating pump ? **8**

OR

12. a) Describe torque converter with sketch and its characteristic curves. **6**

b) Write short note on : **12**

i) Jet pump

ii) Air lift pump

iii) Vertical turbine pump.

T.E. (Mechanical) (Sem. – II) Examination, 2009
(2003 Course)
REFRIGERATION & AIR CONDITIONING

Time : 3 Hours Max. Marks : 100

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

SECTION – I

Unit – I

1. a) Write a note on steam jet refrigeration. **6**

b) Define 'One Ton Refrigeration'. **2**

c) Explain Belt Colemn cycle with the help of p-V and T-S diagram and derive an expression for cop of the cycle. **8**

OR

2. a) Explain : COP, EER, SEER. **6**

b) An aircraft refrigeration plant has a capacity of 30 TR . The ambient temperature is 10°C and cabin temperature is 25°C. The ambient air is compressed to 0.9 bar and 35°C in the ram diffuser. This air is then further compressed in the main compressor to 5 bar. It is cooled in the heat exchanger to 20°C. The isentropic efficiency of compressor and turbine is 90% and the cabin pressure is 1 bar. Calculate mass flow rate of air in kg/min, Cop and heat exchanger effectiveness. Sketch the process on T-S diagram. **10**

Unit – II

3. a) Explain actual VCR cycle with the help of T-S diagram. **6**

   b) What are the limitations of Air Refrigeration Systems ? **4**

   c) Explain :

      i) ODP

      ii) TEWI. **6**

OR

4. a) Explain the effect of decrease in condenser pressure and increase in evaporator pressure on COP of VCR cycle using p-h diagram. **8**

   b) A ammonia refrigeration plant has a capacity of 2STR. The enthalpy of the refrigerant at the inlet and outlet of the evaporator is 375 kJ/kg and 1440 kJ/kg respectively. It is compressed to a condition when enthalpy is 1725 kJ/kg. Calculate the mass flow rate of refrigerant, power required to drive the plant and diameter and stroke at compressor running at 240 rpm if $L/D = 1$ and volumetric efficiency = 80%. Actual cop of the cycle is 70% of the theoretical cop. Specific volume at suction = 0.65 m^3/kg. **8**

Unit – III

5. a) Explain cascade system with the help of p-h diagram. **6**

   b) Derive an expression for cop of an ideal vapour absorption system. Hence calculate percentage change in cop of the system when generator temperature changes from 150°C to 200°C, refrigeration temperature changes from = 20°C to – 40°C. Assume that condensation takes place at 30°C. **6**

   c) Explain electrolux system with a neat sketch. **6**

OR

6. a) When multistage compression in refrigeration becomes essential ? Explain two stage compression with flash gas removal with a neat sketch and p-h diagram. **8**

   b) Discuss the desirable properties of absorbent and refrigerant - absorbent mixture of a vapour absorption system. **6**

   c) Explain the function of analyser and rectifier in a vapour absorption system. **4**

SECTION – II

7. A) Select correct answer/answers (Do not write sentences. Write **only** statement number and choice code letter.) **2**

i) A humidity ratio or specific humidity of a given air-vapor mixture is

a) mass of water vapor per m^3 of dry air in the mixture.

b) mass of water vapor per kg of dry air in the mixture.

c) mass of water vapor per kg of moist air.

d) all of the above

ii) The lowest temperature that can be attained by the air when cooled by evaporative cooling is

a) D.B.T. of inlet air

b) D.P.T. of inlet air

c) W.B.T. of inlet air

d) None of the above

iii) The wet bulb depression will be zero if relative humidity of air equals to

a) 25% b) 100%

c) 90% d) Can not be predicted

iv) The saturation temperature of water vapor at its partial pressure is equal to

a) dew point temperature

b) dry bulb temperature

c) wet bulb temperature

d) adiabatic saturation temperature

B) Explain energy balance of air washer and show the following processes taking place in it when

a) spray water is heated externally

b) spray water is cooled externally below the WBT of inlet air.

Show the above processes on same schematic psychrometric chart. **6**

C) Using Carrier correlation :

$$P_v = P_v' - \frac{(P - P_v')\,(DBT - WBT)(1.8)}{2800 - 1.3\,(1.8DBT + 32)}$$

Where P_v' = Saturation pressure at WBT

P = Barometric pressure

Find

i) Relative humidity

ii) Humidity ratio

iii) DPT

iv) Density and

v) Specific enthalpy for the moist air when its DBT = 41°C and WBT = 27°C and barometric reading is 740 mm of mercury. **8**

D) List (minimum five) factors influencing the human comfort and explain any one of them. **2**

OR

8. A) Select correct answer/answers (Write **only** statement number and choice code letter) **2**

i) Which of the following parameters can not be calculated theoretically or using steam table ?

a) partial pressure of water

b) dew point temperature

c) humidity ratio

d) wet bulb temperature

ii) For sensible cooling process, which of the followings statement is not correct ?

a) DPT of inlet and outlet air is same

b) DBT and WBT of inlet air decrease

c) Specific humidity remains constant

d) Relative humidity remains constant

iii) For evaporative cooling process, in air washer, the temperature of outlet air may be
   a) equal to WBT of inlet air
   b) less than WBT but greater than DPT of inlet air
   c) less than WBT but greater than DBT of inlet air
   d) all of the above

iv) In air conditioning, mixing of two or more streams of moist air takes place
   a) isothermally b) polytropically
   c) adiabatically d) isobarically

B) 10 cmm of air at DBT = 30°C and 55% RH is mixed adiabatically with 2.5 cmm of outside air. Outside conditions are DBT = 5°C and WBT = 1°C. The mixture is further passed over the steam coil whose surface temperature is 100°C and 70% of mass of air is in contact with coil surface.

Find :
   i) the outlet condition of air
   ii) total amount of heat absorbed
   iii) represent the process on psychrometric chart. **8**

C) Explain, in detail, the concept of thermodynamic wet bulb temperature, with sketch, energy balance etc. **8**

Thermodynamics Properties of Water

Temperature$_{sat}$ (°C)	**Pressure$_{sat}$ (kPa)**	**Temperature$_{sat}$ (°C)**	**Pressure$_{sat}$ (kPa)**
0.01	0.611	22	2.64
2	0.705	24	2.98
4	0.813	26	3.17
6	0.935	28	3.36
8	1.072	30	3.78
10	1.2276	32	4.246
12	1.401	34	4.75
14	1.597	36	5.32
16	1.817	38	5.94
18	2.062	40	6.62
20	2.34	42	7.384
		44	8.20

9. A) Explain the working of Automatic expansion valve. State its limitations. **6**

B) The building cooling load is estimated as RSH = 375 kW, RLH = 120 kW. The space is to be maintained at DBT = 25°C, RH = 50%. Outdoor air is DBT = 30°C and 60% RH. Total mass of air supplied to building consist of 10% of outside air. If the air supplied to room space should not be at a temperature lower than 18°C, Find :

i) minimum amount of air supplied to space in cmm. Sketch the process on psychrometric chart.

ii) volume flow rates of outside air, recirculated air and exhaust air.

iii) state and volume flow rate of air entering the cooling coil when outside air is mixed with return air before it enters the cooling coil.

iv) capacity, ADP, bypass factor, GSHF of cooling coil. **10**

OR

10. A) Explain the refrigerant charging process used for small capacity system and large capacity systems. Draw sketch if any. **4**

B) For a small theatre sensible heat load is 1,05,001 kJ/h and latent heat load is 37,800 kJ/h. Ventilation air required is estimated 2592 m^3/h. Outside condition DBT 42°C and specific humidity 0.02 kg w.v./kg d.a while inside condition 26°C DBT 50% RH. The air enters the room at 19°C. Supply duct heat gain = 800 kJ/h. Return air is mixed before cooling coil, 70% of total return and remaining 30% return air is mixed at inlet of the blower after cooling coil.

Find :

i) amount of air supplied to theatre

ii) state of air at inlet and exit of the blower.

iii) state of air at inlet of the cooling coil

iv) ADP of coil

v) by-pass factor of coil

vi) GSHF.

Show the process on schematic psychrometric chart. **12**

11. A) Describe the major and minor losses in the duct with suitable sketch. **6**

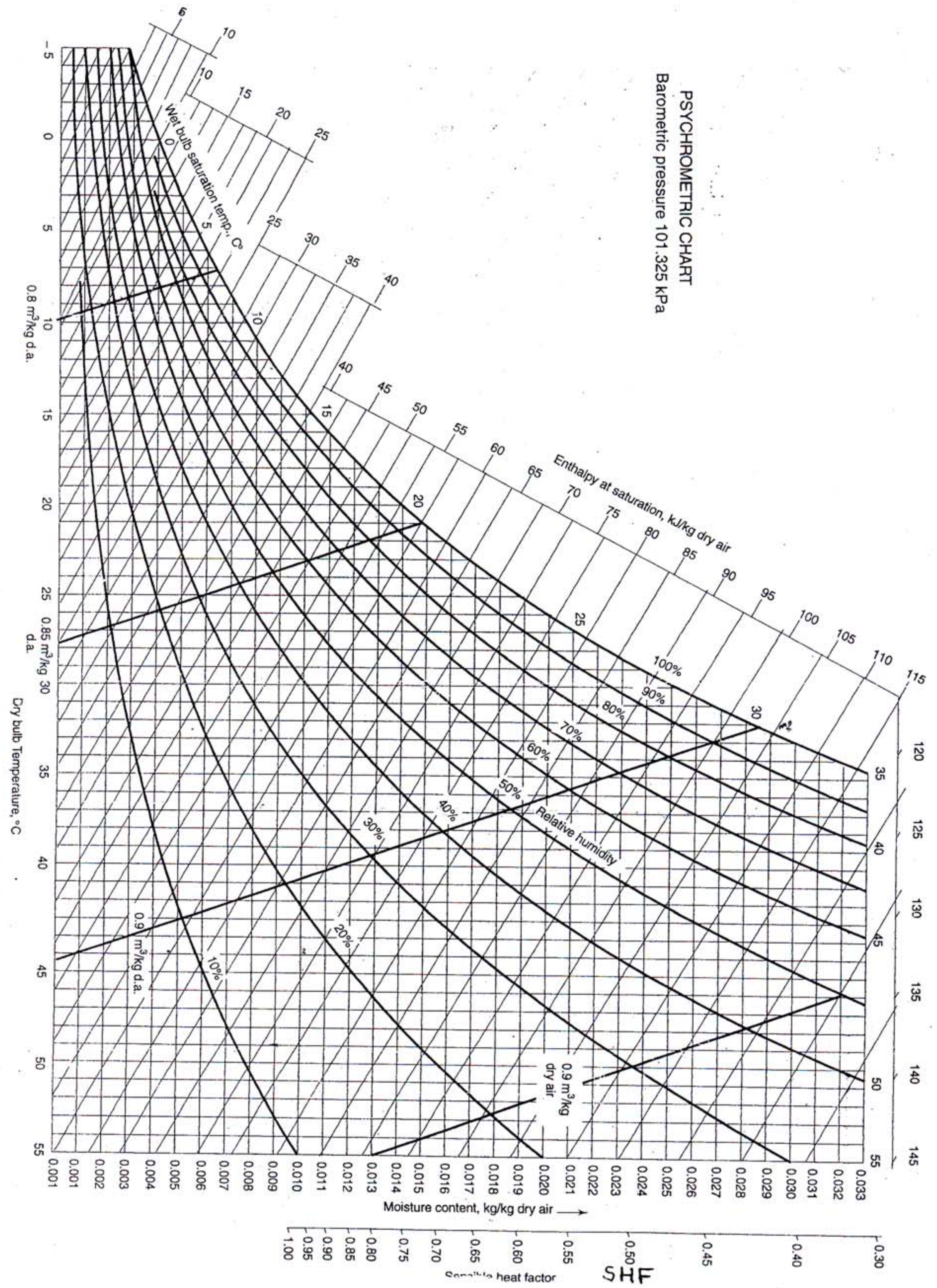
B) State different insulations used in air conditioning /refrigeration systems. Give the typical property values for them. Mention the applications and advantages of each. (minimum three). **6**

C) Briefly describe car air conditioning. **4**

OR

12. A) Explain Static Regain Method, its advantages and limitations. Draw sketch, if required. **8**

B) Describe with sketch working of multistoreyed cold storage. **8**



Sensible heat factor

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T.E. (Mech.) (Semester – II) (2003 Course) Examination, 2009
METROLOGY AND QUALITY CONTROL

Time: 3 Hours Total Marks: 100

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) Figures to the ***right*** *indicate* ***full*** *marks.*
3) Assume suitable data, ***if necessary****.*

SECTION – I

1. a) Explain the term 'Sine and cosine error' giving a suitable example. **8**

b) Describe the use of fourballs and height gauge for finding the diameter of the base. **8**

OR

a) Explain Taylor's principle of Gauge design. **6**

b) Design a plug and ring gauge to control the production of 90 mm shaft and hole pair H_8 e_9.

Data given :

i) 90 mm lies in diameter step of 80 to 100 mm.

ii) Upper deviation for 'e' shaft = $-11D^{0.41}$

iii) Tolerance limit i (micron) = $^\circ 45\sqrt[3]{D} + 0.001D$ (D is in mm).

iv) $IT_8 = 25i$, $IT_9 = 40i$. **10**

2. a) Sketch the optical arrangement of NPL gauge length interferometer and explain how it is used to compare the thickness of the slip gauge. **8**

b) A 1.5 mm of surface is being measured on an interferometer. A lamp is used which emit wavelength as follows :
Red : $0.842\,\mu m$; Blue = $0.6628\,\mu m$. Calculate nominal fractions expected for gauge for two wavelengths. **8**

OR

a) Derive the relation for calculating the chord length and depth of gear by using constant chord method. **10**

b) Calculate chord length and its distance below tooth tip for a gear of module 5 mm and pressure angle 20° . **6**

3. Write short notes (**any three**) : **18**

   1) Laser Telemetric System.

   2) Pneumatic comparator.

   3) Tomlinson's surface meter.

   4) Flatness measurement using slip gauge.

SECTION – II

4. a) Distinguish between quality of design and quality of conformance. Explain the economics of quality of design. **8**

   b) What is 'Cost of quality' ? Explain cost of failure, cost of appraisal and cost of prevention. **8**

OR

   a) What do you understand by 'Field complaints' ? What is the significance of field complaints in quality assurance function ? **8**

   b) Explain Juran's and Deming's approach of quality. **8**

5. a) 1) Compare 'P' chart and 'C' chart.

   2) Compare Attribute and variable chart. **10**

   b) Control charts for $\overline{X}$ and R are maintained for control of an important dimension of a component. The sub-group size is settled as 5. The values of $\overline{X}$ and R are computed for each subgroup and the value of $\Sigma\overline{X}$ and ΣR after 25 sub-groups are found to be 614.8 and 120.0 respectively. Compute the values of 3-sigma limits, for the $\overline{X}$ -chart; Assume $\overline{R} = 2.3266'$. **6**

OR

   a) Compare single, double and multiple sampling plan. **5**

   b) Explain OC curve. **5**

c) For the following data, calculate sample size and AOQ for a single sampling plan.

Data given as :

i) Probability of acceptance for 0.4% is 0.558.

ii) Lot size N = 10,000 units.

iii) Acceptance number C = 1.

iv) np = 1.5

Assuming that defective found to be not replaced. **6**

6. Write short notes (**any three**) : **18**

a) FMECA

b) Pareto-analysis

c) ISO 900 : 2001

d) QFD

e) MTTF, MTBF.

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T.E. (Mechanical S/W) (Semester – I) Examination, 2009
WELDING TECHNOLOGY (Elective – I)
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Attempt **one** question from **each** Unit in Section – **I** and Section – **II**.*
*2) Answer to the Sections should be written on **separate** answer books.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Assume **suitable** data if **necessary**.*

SECTION – I

Unit – I

1. a) What is meant by Welding arc ? Explain with figure the arc initiation methods. **8**
   b) Explain V-I characteristics of arc. **8**

OR

2. a) What are the type of residual stresses ? Explain the causes of residual stresses in Welding. **8**
   b) Why edge preparation is required before Welding ? Explain different type of Weld joints. **8**

Unit – II

3. a) What is electrode ? Explain classification of welding electrode. **8**
   b) Explain with neat sketch the gas tungsten arc welding. **8**

OR

4. a) Explain concept of metallurgical aspect of pre and post heat treatment. **8**
   b) Explain with neat sketch plasma arc welding. **8**

Unit – III

5. a) Explain a flame cutmting torch with figure. **9**
   b) Explain different types of solders and soldering fluxes used in soldering. **9**

OR

6. a) Explain with suitable joint and suggest a welding process for it for welding of steel material. **9**
   b) Explain – Torch brazing and vacuum brazing process. **9**

SECTION – II

Unit – IV

7. a) Explain temperature distribution in resist an welding. **9**

b) Explain different types of flames in gas welding. **9**

OR

8. a) Write note on : **10**

i) Projection welding

ii) Thermite welding

b) What mean by backward and forward welding in gas welding ? **8**

Unit – V

9. a) Explain mechanism of cold welding. State which materials are welded by this process. **8**

b) With neat sketch explain ultrasonic welding process and which type of weld can be produced. **8**

OR

10. a) Write note on : **12**

i) Laser welding

ii) Electro beam welding

b) Draw only sketch and write advantages for explosive welding process. **4**

Unit – VI

11. a) Discuss the defects inwelding and their remedies. **10**

b) Explain tonque bend test for pipes after welding. **6**

OR

12. a) Write note on non destructive testing of welds : **12**

i) Ultrasonic testing

ii) Eddy current testing

b) In short explain how will you calculate cost of welding. **4**

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T.E. (Mechanical S/W) (Semester – I) Examination, 2009
MANUFACTURING MANAGEMENT – Elective – I (2)
(2003 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Define and explain what is manufacturing management. State its importance. **(8)**

b) Explain PPC, how it helps in working of Marketing and R and D departments in engineering industry. **(8)**

OR

2. a) Discuss how different resources and allocations are planned to optimize production, in an industry. **(8)**

b) Explain concept of **(8)**

i) Job order production

2) Batch production.

What are their salient features ?

3. a) Explain break-even point analysis [BEP] used to find cost-volume-profit analysis, in industry. **(8)**

b) Explain plant location. Why the problem of plant location arises ? Discuss how plant location problems are classified. **(8)**

OR

4. a) A company producing a single article sell it at Rs. 10 each. The variable cost of production is Rs. 6 each and fixed cost is Rs. 400 per annum. Find

   1) Sales at break even point

   2) Sales to earn profit of Rs. 50

   3) Profit at sales of Rs. 3,000

   4) New BEP if sales price is reduced by 10%. **(8)**

   b) Define the following in brief : **(8)**

   1) Techniques of plant layout

   2) Group layout.

5. a) Production planning and control functions are divided into 1) Pre-planning 2) Planning 3) Control. Explain. **(10)**

   b) Explain what are various inputs and outputs to MRP. **(8)**

OR

6. a) What are various elements of JIT ? Explain. **(8)**

   b) What do you understand by aggregate planning ? What are different goals of aggregate planning ? Explain. **(10)**

SECTION – II

7. a) Describe briefly the various steps involved in selection of forecasting. **(8)**

   b) Discuss the term 'Material Management' and explain the functions of material management. **(8)**

OR

8. a) Define the following with reference to EOQ : **(8)**

   1) Reorder level point 2) Lead time

   3) Safety stock 4) Average Inventory.

   b) Describe the procedure for ABC analysis. Bring out merits and demerits of ABC analysis. **(8)**

9. a) Explain briefly the following concepts used in project management. Justify answer with help of diagrams : **(8)**
   1) Network diagram
   2) NODE Labelling
   3) Network with time duration.

   b) What is critical path ? How it is determined ? Explain in detail. **(8)**

OR

10. a) Draw the network corresponding to the following and determine : **(10)**
   1) The earliest and latest allowable start and completion time for each activity.
   2) Critical activities and the project duration.
   3) The total free and independent floats for each activities.

Activity	**Duration (Days)**	**Activity**	**Duration (Days)**
1 – 2	3	3 – 5	4
1 – 3	4	3 – 6	6
1 – 4	14	4 – 5	1
2 – 3	10		
2 – 6	5	5 – 6	1

   b) Explain applications of PERT in Engineering. **(6)**

11. a) Explain how Data and Information is processed to optimize production, in management Information system. Justify with suitable example. **(8)**

   b) Discuss how supply chain management helps in MIS. **(10)**

OR

12. Write short note on the following (**any three**) : **(18)**
   1) ERP.
   2) SAP.
   3) Time series analysis.
   4) Crushing of Network.
   5) Feed back system in MIS.

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T.E. (Mechanical) S/W (2003 Course) (Semester – I) Examination, 2009
Elective – I (3) : BEHAVIOURAL SCIENCE

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*3) Answers to the **two** Sections should be written in **separate books**.*
*4) **Black** figures to the **right** indicate **full** marks.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Define purpose of an Industrial Enterprise. Discuss in detail factors influencing the governing of enterprise ? **8**

   b) Discuss advantage and disadvantage of a public limited company. **8**

2. a) What do you mean by organisation structure ? Explain any two types of organisation based on its structure. **8**

   b) Elaborate the various functional areas of management. **8**

3. a) Differentiate between classical theory and Neo-classical theory of organisation. **8**

   b) Define the term Motivation. Explain the following in brief. **8**

4. Write a short note on (**any three**) : **18**

   a) Industrial Licensing

   b) Cognitive learning theory

   c) Trade Union

   d) New Industrial Policy in India.

SECTION – II

5. a) Differentiate between McGeror's theory X and theory Y which theory you suppose to be best in todays situation ? Why ? **8**

   b) Explain path goal model of leadership. State various leadership style under this model. **8**

6. a) State and explain in brief the stages of group information. **8**

   b) Explain Homan's model of small group behaviour. **8**

7. a) State different types of interviews. Explain any three in brief. **8**

   b) What do you mean by grapevine ? Explain its various types. **8**

8. Write a short note on (**any three**) : **18**

   a) Sources of conflicts

   b) Qualities of a good interviewer

   c) Indirect interview technique

   d) Quality award models.

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T.E. (Mech.) S/W (Semester – II) Examination, 2009
(2003 Course)
THERMAL ENGINEERING – II

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

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

*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Establish how an actual cycle differs from a theoretical vapor compression cycle ? **4**

b) State the properties of good refrigerant. What are the normal refrigerants used ? **4**

c) In a Bell-Coleman refrigeration plant, the air is drawn from cold chamber at 1 bar and 10°C and compressed to 5 bar. The same is cooled to 25°C in the cooler before expanding in the expansion cylinder to cold chamber pressure of 1 bar.

i) Determine the theoretical cup of the plant and theoretical net refrigeration effect/kg of air. The compression and expansion be assumed isentropic. Assume r = 1.41, C_p = 1.009 KJ/Kg°K.

ii) If the compression and expansion laws followed are $PV^{1.35}$ and $PV^{1.30} = C$ respectively, how will the result be modified ? **8**

OR

2. a) Describe briefly with the help of a diagram, the vapor absorption system of refrigeration. In what way this system is advantageous over the vapor compression system. **8**

b) The temperature limits of an ammonia refrigerating system are 25°C and –10°C. If the gas is dry at the end of compression. Calculate the coefficient of performance of the cycle. Assuming no undercooling of liquid ammonia. **8**
Use the following table for properties of ammonia.

Temp. (°C)	**Liquid heat (kJ/Kg)**	**Latent heat kJ/Kg**	**Liquid entropy kJ/Kg°K**
25	298.9	1166.94	1.1242
–10	135.37	1297.68	0.5443

3. a) Establish the following expression for air-vapour mixure.

Specific humidity

$$(w) = 0.622 \frac{Pv}{Pb - Pv}.$$

Where Pv = Partial pressure of water vapour

Pb = Barometric pressure. **4**

b) Define the following and explain. **4**

i) Sensible heat factor ii) Dew point temperature.

c) Atmospheric air at a dry bulb temperature of 16ºC and 25% relative humidity passes through a furnace and then through a humidifier, in such a way that the final dry bulb temperature is 30ºC and 50% relative humidity. Find the heat and moisture added to the air. Also determine sensible heat factor of the process. **8**

OR

4. a) Define comfort. What are the factors which affect comfort air conditioning ? **4**

b) Describe unitary and central air conditioning system. **4**

c) The atmospheric air has a DBT of 21ºC and WBT 18ºC. If the barometer reads 750 mm of Hg. Determine

i) Partial pressure of water vapour

ii) Relative humidity

iii) DPT.

Use psychrometric relations. **8**

5. a) Draw P-V and T-S diagram for a single stage receprocating air compressor without clearance. Derive the expression for the work done when compression is

i) Isothermal and ii) Isentropic. **6**

b) Establish that the workdone is minimum when the pressure ratio for each stage is the same and there is complete intercooling for multistage air compressor. **4**

c) A three stage compressor delivers air at 70 bar from an atmospheric pressure of 1 bar and 30°C. Assuming the intercooling complete, estimate the amount of minimum work required to deal with 1 kg of air. Also find the amount of heat rejected in each intercooler. The index of compression is 1.2 throughout. Take Cp for air = 1.005 kJ/Kg°K. **8**

OR

6. a) Explain, with a neat sketch, the working of an axial flow compressor. **6**

b) Derive an expression for efficiency of a roots blower compressor in terms of pressure ratio and ratio of specific heats. **4**

c) A centrifugal air compressor having a pressure compression ratio of 5, compresses air at the rate of 10 Kg/s. If the initial pressure and temperature of air is 1 bar and 20°C. Find

i) Final temperature of gas ii) Power required to drive the compressor.

Take r = 1.4 and Cp = 1 kJ/Kg°K.

Also calculate heat exchanged and work done by compressor if compression is polytropic, following reation $Pv^{1.6}$ = c. **8**

SECTION – II

7. a) What is detonation or knock in SI engine ? Why detonation is such harmful factor in engine operation ? **6**

b) Explain motor method and research method of octane rating of fuel. Compare these methods. **6**

c) What is importance of flame speed in SI engine combustion ? **4**

OR

8. a) Explain stages of combustion in diesel engine with the help of P-Q diagram. **6**

b) What is difference between DI and IDI combustion system ? Draw combustion chamber of each type. **6**

c) What is the effect of following variables on delay period in CI engine ?

i) Compression ratio. ii) Fuel-air ratio. **4**

9. a) What are various sources of emission in SI engine ? What are various emissions from these sources ? **6**

b) With the help of P-V diagram explain what is turbochanging ? What are the advantages of turbochanging ? **6**

c) What are the limitations of superchanging in SI engine ? **4**

OR

10. a) Explain three way catalytic converter in detail. **6**

b) What is need of superchanging ? Explain any one type of superchanger. **6**

c) Explain pulse turbochanging. **4**

11. a) Discuss the relative advantages and disadvantages of reciprocating I.C. engine and gas turbine. **5**

b) What are the applications of gas turbines ? **3**

c) In a simple gas turbine plant air enters compressor at 1 bar and 27ºC and leaves at 6 bar. It is then heated in combustion chamber to 700ºC and then enters turbine and expands to 1 bar. The isotropic efficiency of compressor and turbine are 0.80 and 0.85 respectively and combustion efficiency is 0.98. The fall in pressure through combustion chamber is 0.1 bar. Determine

i) Thermal efficiency ii) Work ratio

iii) Air rate in Kg/KW iv) Specific fuel consumption

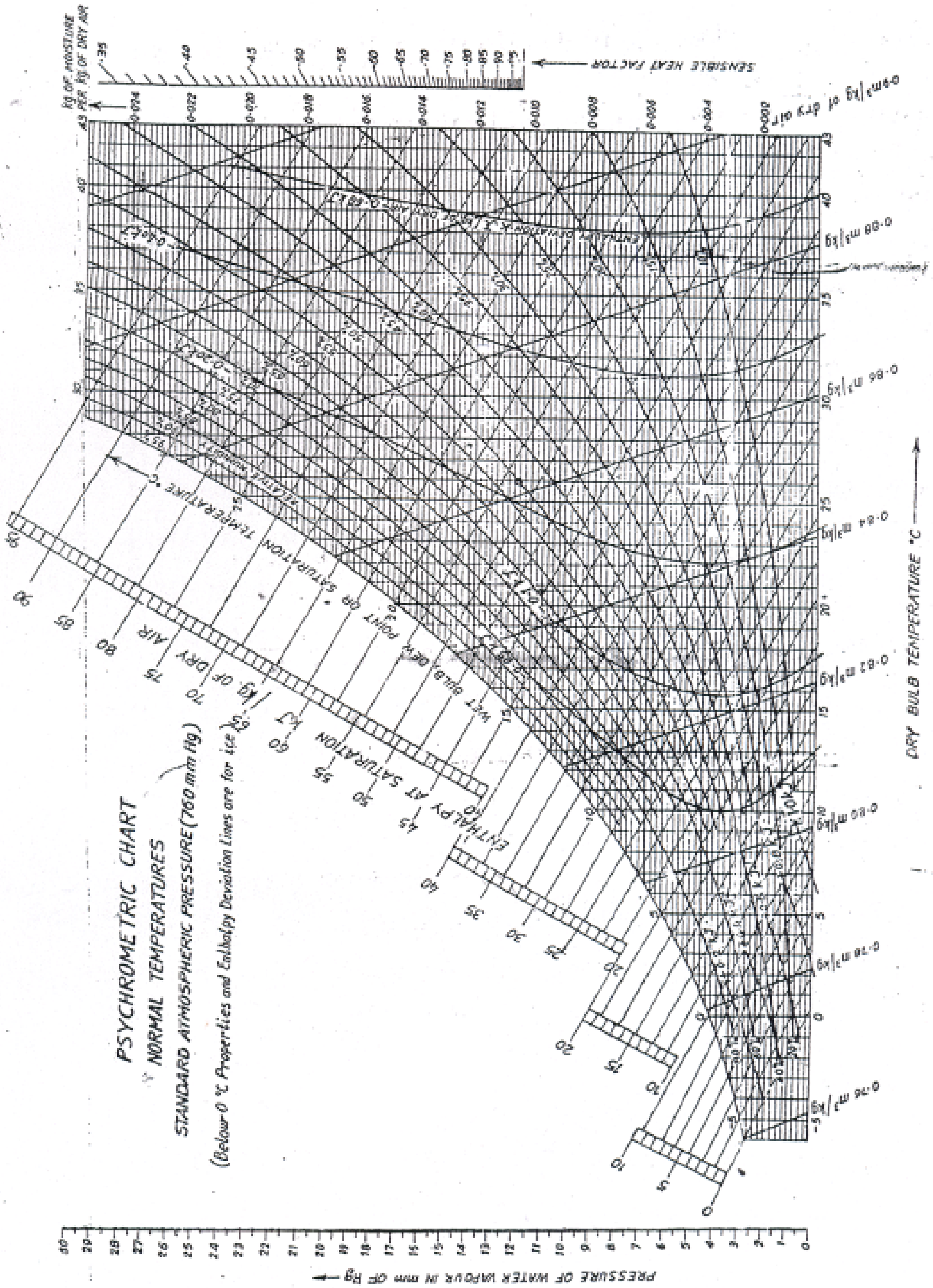
v) Air-fuel ratio. **10**

OR

12. a) What is thrust augmentation ? What are various methods of thrust augmentation ? **5**

b) What do you mean by propulsive power and propulsive efficiency ? **3**

c) A jet engine requires 1544 KW at 193 m/s. The fuel consumption is 0.316 Kg per propulsive KW per hr and the calorific value of fuel is 42676 KJ/Kg of fuel. The temperature rise in combustion chamber is limited to 510ºC. Calculate the air-fuel ratio, the velocity and reaction of jet and the propulsive and thermal efficiency of the plant. **10**


PSYCHROMETRIC CHART
NORMAL TEMPERATURES
STANDARD ATMOSPHERIC PRESSURE (760 mm Hg)
(Below 0 °C Properties and Enthalpy Deviation Lines are for ice)
SENSIBLE HEAT FACTOR
kg OF MOISTURE PER kg OF DRY AIR
DRY BULB TEMPERATURE °C
PRESSURE OF WATER VAPOUR IN mm OF Hg
ENTHALPY AT SATURATION kJ/kg. OF DRY AIR
WET BULB, DEW POINT OR SATURATION TEMPERATURE °C
RELATIVE HUMIDITY
m³/kg of dry air

T.E. (Mech.-S/W) (Semester – II) Examination, 2009
THEORY OF MACHINES AND MACHINES DESIGN – II
(2003 Course)

Time : 4 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

1. a) Explain function generation, path generation and body guidance. **6**

b) What is Chebychev spacing ? Synthesize a function generator to solve the equation $y = \frac{1}{x}; 1 \le x \le 2$ using three precision points with Chebychev's spacing. **10**

OR

2. The following data relates to a cam profile in which the follower moves with cycloidal motion during the lift and returning it with uniform acceleration and retardation, acceleration being $2/3^{rd}$ of retardation :

Minimum radius of cam	= 30 mm
Roller radius	= 10 mm
Lift	= 45 mm
Offset of follower axis	= 12 mm towards right

P.T.O.

Angle of ascent	= 70°
Angle of descent	= 120°
Angle of dwell between ascent & descent	= 45°
Speed of the cam	= 200 RPM

Draw the profile of the cam and determine the maximum velocity and the maximum acceleration of the follower during the outstroke and maximum velocity, the acceleration and retardation during return stroke. **16**

3. a) Two meshing gears have 20° involute teeth, the number of teeth on pinion is 24 and on gear wheel is 48. The speed of pinion is 300 rpm. The module is 6 mm. If the addendum on each gear is such that the path of approach and path of recess are half of their maximum possible value, find :

i) addendum on the gears

ii) the length of arc of contact and

iii) contact ratio. **8**

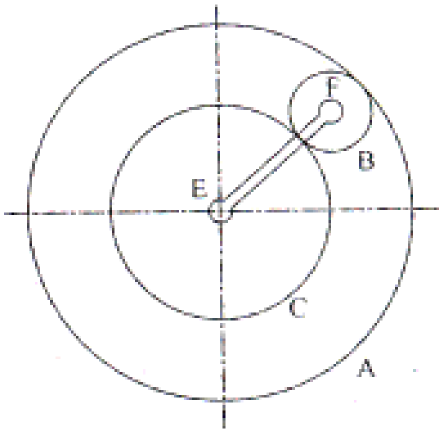
b) A pair of single helical gear is required to give a speed reduction of 4.2:1. The gears are to have a normal module of 3 mm, a pressure angle of 20° and a helix angle of 30°. If the shaft centre lines are to be approximated 400 mm apart, determine the number of teeth on each wheel and exact CD. **6**

c) What is conjugate action and conjugate gear tooth profile ? Give practical examples. **2**

OR

4. a) Derive the equation for maximum efficiency of spiral gears with neat sketch. **8**

b) An epicyclic gear consists of three gears A, B and C as shown in Fig. Internal Gear A has 72 teeth, Gear C has 32 teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 rpm. If gear A is fixed, determine the speed of gears B. **8**



5. a) A conical clutch has a cone angle of 30°. If the maximum intensity of pressure between the contact surfaces is limited to 70 KPa and the breadth of the conical surfaces is not to exceed $1/3^{rd}$ of the mean radius, find the dimensions of the contact surfaces to transmit 22 KW at 2000 RPM. Assume uniform wear condition and coefficient of friction as 0.15. **8**

b) Explain the principle and working of Bavis Gibson torsion dynamometer with neat sketch. **8**

c) Give classification of friction clutches. **2**

OR

6. a) Explain construction and working of internal expanding shoe brake. **5**

b) In case of band and block brake prove the following relationship : **5**

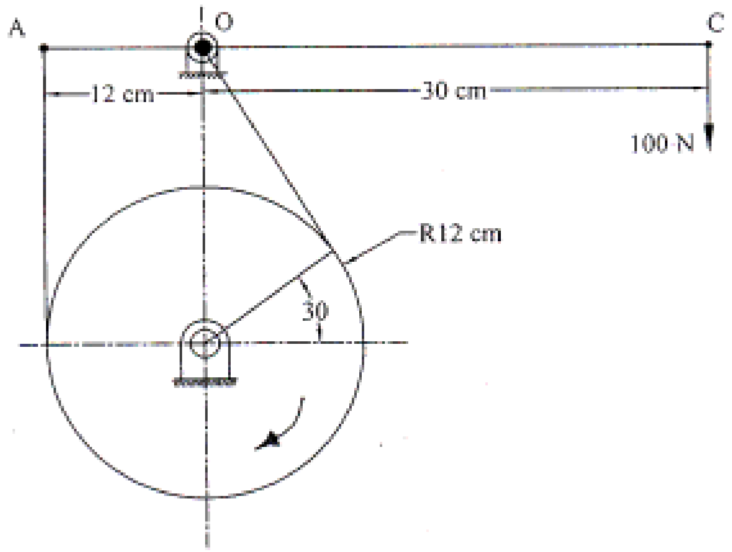
$$\frac{T_n}{T_0} = \left(\frac{1+\mu\tan\theta}{1-\tan\theta}\right)^n$$

c) The simple band brake as shown in fig. is applied to a shaft carrying a flywheel of mass 400 kg. The radius of gyration of the flywheel is 45 cm and runs at 300 rpm clockwise. It the coefficient of friction is 0.2 and the brake drum diameter is 24 cm, find :

i) the torque applied due to a hand load of 100 N

ii) the number if turns of the wheel before it is brought to the rest, and

iii) the time required to bring it to rest, from the moment of the application of the brake. **8**



SECTION – II

7. a) Explain nipping of leaf spring. **4**

b) A pair of spur gears with 20° full-depth involute teeth consists of a 20 teeth pinion meshing with a 41 teeth gear. The module is 3 mm while the face width is 40 mm. The material for the pinion as well as for the gear is steel with an ultimate tensile strength of 600 N/mm^2. The gears are heat treated to a surface hardness of 400 BHN. The pinion rotates at 1450 rpm and the service factor for the application is 1.75. Assume that velocity factor accounts for the dynamic load and the factor of safety is 1.5.

Determine the rated power that the gears can transmit.

Data :

i) Values of the Lewis form factor Y for 20° full depth involute system.

Z	Y
20	0.320
30	0.358
40	0.389
45	0.399

ii) Load stress factor $K = 0.16\left(\frac{BHN}{100}\right)^2$

iii) Velocity Factors C_V

a) For ordinary cut gears (v < 10 m/s) $C_v = \frac{3}{3+v}$

b) For accurately hobbed and generated gear (v < 20 m/s) $C_v = \frac{6}{6+v}$. **12**

OR

8. a) Explain various types of gear tooth wear. **4**

b) It is required to design a helical compression spring subjected to a maximum force of 1250 N. The deflection of the spring corresponding to the maximum force should be approximately 30 mm. The spring index can be taken as 6. The spring is made of patented and cold drawn steel wire. The ultimate tensile strength and modulus of rigidity of the spring material are 1090 and 81370 N/mm^2 respectively. The permissible shear stress for the spring wire should 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 coils

iv) total number of coils

v) free length of spring; and

vi) pitch of the coil.

Assume that the spring has square and ground ends. Also assume that there will be a gap of 1 mm between consecutive coils when the spring is subjected to the maximum force. **12**

9. a) A cone clutch with asbestos friction lining transmits 30 kW power at 500 rpm. The coefficient of friction is 0.2 and the permissible intensity of pressure is 0.35 N/mm^2. The semi-cone angle α is 12.5°. The outer diameter is fixed as 300 mm from space limitations. Assuming uniform wear theory, calculate :

i) the inner diameter,

ii) the face width of the friction lining; and

iii) the force required to engage the clutch. **10**

b) Explain fluctuation of energy and maximum fluctuation of energy in flywheel. **6**

OR

10. a) Write a short note on thermal consideration in the design of the clutch. **6**

b) The torque developed by an engine is given by following equation :

$T = 14250 + 2200 \sin 2\theta - 1800 \cos 2\theta$

Where, T is the torque in N-m and θ is the crank angle from inner dead centre position. The resisting torque of the machine is constant throughout the work cycle. The coefficient of speed fluctuations is 0.01. The engine speed is 150 rpm. A solid circular steel disk 50 mm thick, is used as a fly wheel. The mass density of steel is 7800 kg/m^3. Calculate the diameter of the flywheel disk. **10**

11. a) A ball bearing is operating on a work cycle consisting of three parts- a radial load of 300 N at 1440 rpm for one quarter cycle, a radial load of 5000 N at 720 rpm for one half cycle, and radial load of 2500 N at 1440 rpm for the remaining cycle. The expected life of the bearing is 10000 hr. Calculate the dynamic load carrying capacity of the bearing. **10**

b) Write a short note on sintered metal bearing. **4**

c) Compare hydrostatic bearing and hydrodynamic bearing. **4**

OR

12. a) Explain following terms related to rolling contact bearings

i) static load carrying capacity

ii) dynamic load carrying capacity

iii) equivalent dynamic load. **9**

b) Derive a expression for load carrying capacity of the hydrostatic step bearing. **9**

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T.E. (Mechanical S/W) (Semester – II) Examination, 2009
(2003 Course) MECHATRONICS

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Give any two definitions of Mechatronics. Explain the scope and importance of Mechatronics. **8**

b) What is a measurement system ? Explain with a neat sketch various components of a measurement system. **8**

OR

2. a) What do you understand from static characteristics of measuring instruments ? Explain the following terms:

i) Accuracy and precision

ii) Hysteresis and drift. **12**

b) Write a note on response of systems. **4**

3. a) What are strain gages ? Explain any two strain gage circuits. **8**

b) State the various sensors used for displacement and position measurement. Explain the construction and working of LVDT. **8**

OR

4. a) Write a short note on optical encoders. **8**

   b) Write short notes on the following :

      i) Thermocouple

      ii) Load cells. **8**

5. a) Explain transfer function with a simple example. **9**

   b) Differentiate between open and closed loop control system. **9**

OR

6. a) State the importance of mathematical modeling. Explain fluid and thermal systems building blocks with their mathematical models. **9**

   b) Differentiate between feedback and feedforward control system. **9**

SECTION – II

7. a) Write a short note on magnetic switches and proximity switches. **6**

   b) Explain P + I control action. **5**

   c) Explain dynamic response of first order system to a step input. **5**

OR

8. a) Explain limit switches and level switches. **6**

   b) Explain dynamic response of first order system to a ramp input. **5**

   c) Write a short note on bode plots. **5**

9. a) Write a short note on sample and hold circuit. **6**

   b) Discuss the characteristics of operational Amplifier. **5**

   c) Explain master slave Flip Flop. **5**

OR

10. a) Write a short note on
    i) Applications of Flip Flop. **10**
    ii) A/D converter

    b) Explain integrator and differentiator operational amplifier. **6**

11. a) Explain level control application using PLC with a Ladder diagram. **12**

    b) Write a short note on timers and counters used in PLC. **6**

OR

12. a) Write a ladder diagram for the following logic function :

    i) AND   ii) NOR   iii) OR **6**

    b) Explain the typical specifications of PLC. **6**

    c) Write a short note on micro controller. **6**

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[3663] – 132

T.E. (Electrical) (Sem. – I) Examination, 2009
ELECTRICAL MACHINES – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions*:** *1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4** and Q. **5** or Q. **6** from Section **I**.*
*4) Answer Q. **7** or Q. **8**, Q. **9** or Q. **10** and Q. **11** or Q. **12** from Section **II**.*
*5) **Neat** diagrams must be drawn **wherever** necessary.*
*6) Black figures to the **right** indicate **full** marks.*
*7) Use of logarithmic tables, slide rule and electronic pocket calculator is **allowed**.*
*8) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Prove that a rotating mmf is produced when 3 phase currents are fed to a symmetrical 3 phase distributed winding. Use analytical method for the answer. Also state the magnitude and frequency of such a field. **8**

b) A 1100 V, 50 Hz delta connected 3 phase induction motor has a star connected slip ring rotor with a phase transformation ratio of 3.8. The rotor resistance and standstill leakage reactance are 0.012 ohm and 0.25 ohm per phase respectively. Neglecting stator impedance and magnetising current determine :

i) the rotor current at start with slip rings shorted. **1**

ii) the rotor power factor at start with slip rings shorted. **1**

iii) the rotor current at 4% slip with slip rings shorted. **2**

iv) the rotor power factor at 4% slip with slip rings shorted. **2**

v) the external rotor resistance per phase required to obtain a starting current of 100 A in the stator supply lines. **2**

OR

2. a) Draw Torque-speed and Torque-slip characteristics of a 3 phase induction motor from basics. Explain breakdown Torque of the motor. At what slip does this torque occur ? **8**

b) A 746 kW, 3 phase, 50 Hz, 16 pole induction motor has a rotor impedance of (0.02 + j 0.15) ohm per phase at standstill. Full load torque is obtained at 360 r.p.m. Calculate

i) the speed at which maximum torque occurs

ii) the ratio of maximum to full load torque

iii) the external resistance per phase to be inserted in the rotor circuit to get maximum torque at starting. **8**

3. a) Compare a 3 phase induction motor with a 3 phase transformer. **6**

b) Establish a relationship between rotor input, rotor copper loss and shaft output of a 3 phase induction motor. **6**

c) A 4 kW, 6 pole, 3 phase, 50 Hz induction motor operates with a slip of 2.2 percent and requires 3500 watts when driving a load. When operating without load, the motor takes 300 watts. Determine the shaft torque when driving the above load. Neglect friction and windage losses. Also calculate efficiency at this load. **6**

OR

4. a) What is the circle diagram of a 3 phase induction motor ? Explain with the help of a connection diagram, a method to determine the following using the circle diagram :

i) Full load current ii) Full load torque

iii) Slip at full load iv) Best power factor. **10**

b) A 415 volt, 29.84 kW, 50 Hz delta connected 3 phase induction motor gave the following test data :

No load test : 415 V, 21 A, 1250 W

Locked rotor test : 100 V, 45 A, 2730 W

Draw the circle diagram and determine

i) Line current and power factor for rated output

ii) Maximum torque.

Assume stator and rotor Cu losses at standstill. Take current scale as 1 cm = 10 A. **8**

5. a) Explain why a starter is required for a 3 phase induction motor. **4**

b) Draw a circuit diagram for a auto transformer starter and explain its working. Derive a relation between starting torque and full load torque of a 3 phase induction motor as obtained by this starter. **8**

c) A cage induction motor has a short circuit current of four times the full load value and has a full load slip of 0.05. Determine a suitable auto transformer ratio if the supply current is not to exceed twice the full load current. Also determine starting torque in terms of full load torque. **4**

OR

6. a) Compare single cage and double cage 3 phase induction motors of same rating. **5**

   b) Describe the construction of a double cage induction motor. Explain its working. **5**

   c) The standstill impedances of outer and inner cages of a double cage induction motor are (2 + j 1.2) ohm and (0.5 + j 3.5) ohm respectively. Determine the slip at which the two cages develop equal torques. **6**

SECTION – II

7. a) List various methods of speed control of a 3 phase induction motor. **2**

   b) With the help of phasor diagrams explain how speed and power factor of a 3 phase slip ring induction motor are controlled by injecting emf in its rotor. What are the conditions for injection of emf in the rotor ? **8**

   c) Explain cogging and crawling in 3 phase induction motors. **6**

OR

8. a) Compare a 3 phase induction voltage regulator with auto transformer and tap changing transformer. **6**

   b) Explain why a 3 phase induction motor can not be inherently run as an induction generator ? With the help of suitable diagrams describe the working of an isolated induction generator. Explain clearly how voltage build up takes place in such generators. **10**

9. a) With the help of neat connection diagrams explain how you will determine the performance parameters of a capacitor start single phase induction motor. **8**

   b) A 250 W, 230 volt, 50 Hz capacitor start single phase induction motor has the following impedances at standstill.
   Main winding Z_m = (7 + j 5) ohm
   Auxiliary winding Z_a = (11.5 + j5) ohm.
   Find the value of capacitor to be connected in series with auxiliary winding to give maximum starting torque. **6**

   c) Draw the torque-speed characteristics of a two-value capacitor induction motor and label it. **2**

OR

10. a) State double revolving field theory with the help of this theory prove that a single phase induction motor is not inherently self starting. Hence draw the speed-torque characteristics of this motor showing the effects of forward and backward field on torque and speed. **8**

b) A 230 V, 50 Hz, 4 pole single phase induction motor has the following equivalent circuit impedances :

Stator impedance = (2.2 + j 3.1) ohm

Rotor parameters $\frac{R_2'}{2} = 2.25\,\text{ohm}$, $\frac{X_2'}{2} = 1.3\,\text{ohm}$.

Magnetising circuit parameters : $R_0 = 0\ \Omega$, $\frac{X_0}{2} = 40\ \Omega$

Friction, windage and core loss = 40 W

For a slip of 0.03 pu, calculate :

i) impedances due to forward and backward field

ii) input current

iii) power developed. **8**

11. a) Explain transformer and rotational e.m.fs and give their expressions for field and armature windings of a single phase series motor. **6**

b) A universal F.H.P. motor has total resistance and inductance as 40 ohm and 0.4 H respectively. When connected to 200 V d.c. supply, the motor draws 1 A and runs at a speed of 2000 r.p.m. Determine the speed and p.f. of the motor when it is connected to a single phase, 50 Hz, 200 V supply. Also find the speed and p.f with a.c. operation when the load is reduced so that the torque developed is 80% of that in the previous case. **10**

c) Draw the complete phasor diagram of an uncompensated single phase series motor. **2**

OR

12. a) Explain how you would determine output, torque and speed for a plain single phase series motor using circle diagram. Give proofs in support of your answer. **8**

b) A universal motor, 2 pole, 50 Hz, 230 volt has total resistance and reactance of 30 ohm and 150 ohm respectively. Rated output of the motor is 124.33 watt. It runs at 8000 rpm at full load. Using circle diagram find the following :

i) Full load current

ii) P.f. at full load

iii) Torque at full load and torque scale

iv) Speed scale.

Neglect no load losses. Assume voltage scale as 1 cm = 20 volt. **10**

T.E. (Electrical) (Semester – I) Examination, 2009
(2003 Course)
DESIGN OF ELECTRICAL MACHINES

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

SECTION – I

1. a) What is 'transformer grade steel' and 'dynamo grade steel' ? Discuss in detail properties of electrical sheet steels used in electrical machines. **10**

b) Draw heating curve and cooling curve and explain the following terms :
a) Heating time constant
b) Cooling time constant **8**

OR

2. a) Write a note on insulating materials used in the manufacture of electrical machines. **9**

b) Explain in detail various modes of heat generation. **9**

3. a) Derive output equation of three phase core type transformer. **8**

b) Calculate the KVA output of single phase transformer from following data :
i) Diameter of circumscribing circle/Distance between core centers = 0.56
ii) Core height/Distance between core centers = 2.8
iii) Net iron area/area of circumscribing circle = 0.7
iv) Current density = 2.3 A/mm^2
v) Window space factor = 0.27
vi) Flux density = 1.2 wb/m^2
vii) Distance between core centers = 0.4 m **8**

OR

4. a) Write a note on constructional features of power transformer. **8**

b) Explain the process of design of LV and HV winding of a distribution transformer. **8**

5. a) Explain the procedure to estimate the no load current of 3-phase transformer. **10**

b) A 500 KVA, 11000/440 Volts, Delta/Star transformer has the following data :

i) HV Turns = 1660

ii) Length of mean turn = 93 cm

iii) Length of coil = 52 cm

iv) Short circuit current = 20 × rated current

Find radial force in tones on the HV winding under short circuit conditions. **6**

OR

6. a) A 600 KVA, 6600/400 volt, 50 Hz, 3 Phase core type transformer has the following data

i) Width of LV winding = 3 cm

ii) Width of HV winding = 3 cm

iii) Height of LV and HV windings = 40 cm

iv) Length of mean turn = 1.5 m

v) HV winding turns = 220

vi) Width of duct between HV and LV winding = 2 cm

Estimate the leakage reactance of transformer referred to HV side. **6**

b) Explain the process of design of cooling tubes of a transformer. **10**

SECTION – II

7. a) With reference to constructional features of 3 phase induction motor discuss -

i) Stator laminations

ii) Stator frame

iii) Rotor laminations

iv) Rotor windings. **8**

b) Derive the output equation of 3-phase induction motor. **8**

OR

8. a) Discuss various factors which are considered for choice of specific electrical loading. **6**

   b) Find the main dimensions of a 15 kW, 3 phase, 400 V, 50 Hz, 2810 rpm, squirrel cage induction motor having an efficiency of 0.88 and a full load power factor of 0.9. Assume :
   Specific magnetic loading = 0.5 Wb/m^2 ;
   Specific electrical loading = 25000 A/m ;
   Take the rotor peripheral speed as approximately 20 m/s at synchronous speed. **10**

9. a) Discuss various factors affecting choice of length of air gap for 3-phase induction motor. **8**

   b) Discuss crawling, cogging and unbalanced magnetic pull for 3-phase induction motor. **8**

OR

10. a) A 90 (ninety) KW, 500 V, 3 phase, 8 pole induction motor has a star connected stator winding accommodated in 63 slots with 6 conductors per slot. If the slipring voltage on open circuit is to be about 400 V, find a suitable rotor winding, stating

    i) number of slots ii) number of conductors per slot iii) coil span iv) slipring voltage on open circuit v) approximate full load current per phase in rotor.
    Assume efficiency = 0.9 ; power factor = 0.86. **10**

    b) Write a short note on-design of squirrel cage rotor. **6**

11. Write short notes on :

    a) MMf calculations for air gap, stator teeth, stator core, rotor teeth and rotor core of 3 phase induction motor.

    b) Effect of saturation on calculation of mmf for 3 phase induction motor.

    c) Effects of ducts on calculation of magnetizing current. **18**

OR

12. a) A 75 KW, 3300 V, 50 Hz, 8 pole, 3-phase, star connected induction motor has a magnetizing current which is 35 percent of the full load current. Calculate the stator turns per phase if the mmf required for flux density at 30° from pole axis is 500 A. Assume winding factor = 0.95 ; Efficiency = 0.94, Power factor = 0.86. **10**

    b) Write short note on -
    Leakage fluxes and leakage reactances of 3-phase induction motor. **8**

T.E. (Electrical) (Sem. – I) Examination, 2009
CONTROL SYSTEM – I
(2003 Course)

Time : 4 Hours   Max. Marks : 100

SECTION – I

1. a) Discuss the merits and demerits of open loop and closed loop control system. **4**

b) Explain the terms with necessary sketches :

i) Open loop transfer function

ii) Closed loop transfer function

iii) Feed back

iv) Stochastic control system

v) Time invariant control system. **4**

c) Compute Z/Y of system shown in fig. 1 c. **8**

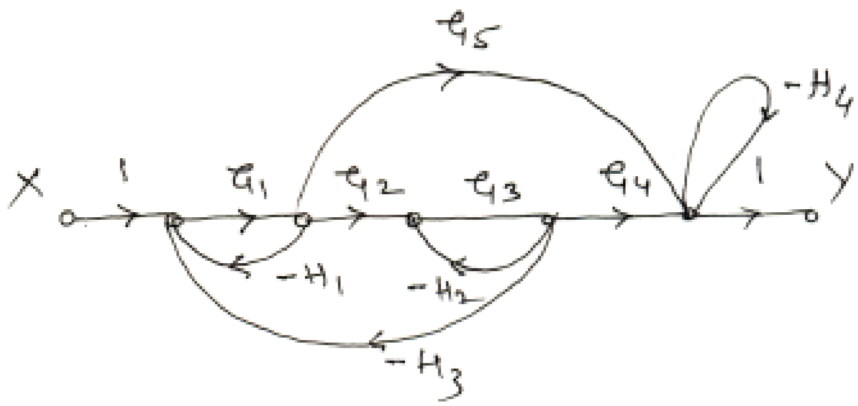


Fig. 1 c

OR

2. a) Write equilibrium Laplace transformed differential equations for mechanical system shown in fig. 2 a. **5**

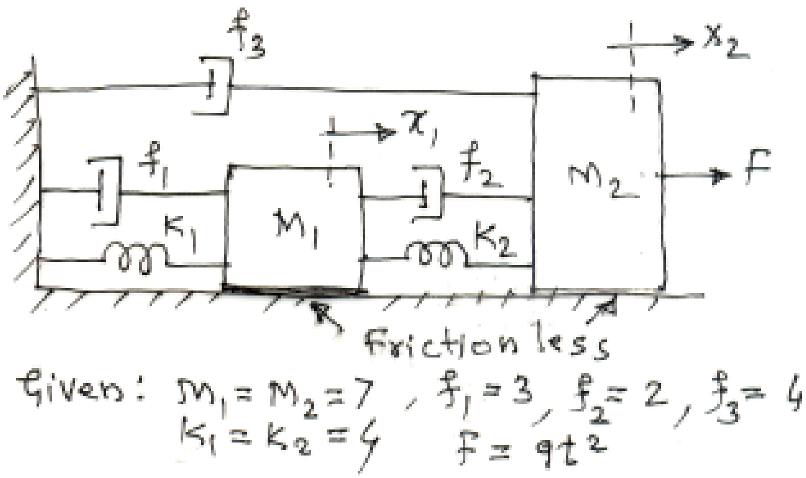


Fig. 2 a

b) State and explain Mason's Gain formula. **3**

c) Find Closed loop transfer function of system shown in fig. 2 c. **8**

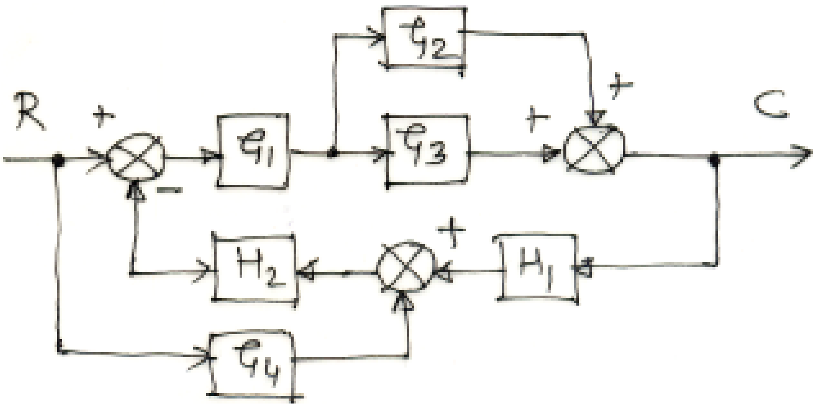


Fig. 2 c

3. a) Explain :

   i) Type of system

   ii) Order of system

   iii) Poles and zeros

   iv) Steady state error

   Give examples if necessary. **4**

   b) Discuss steady state error for type '0', type '1' and type '2' system. What are static error coefficients ? **4**

   c) The open loop transfer function of a unity feedback system is $G(s)=\frac{100}{S(S+10)}$.

   Find static error coefficients and the steady state error of the system when subjected to an input given by the polynomial $r(t) = 7 + 2t + 4t^2$. **8**

OR

4. a) Draw a neat sketch of an underdamped second order system time response and define all time response specifications. **4**

   b) Write short notes on :

   i) Effect of location of roots of characteristic equation on time response for a step input. Sketch the responses ? **4**

   c) For a unity feedback control system $G(s)=\frac{20}{S^2+5S+6}$, find out damping factor, damping constant, damping frequency, delay time, maximum over shoot and rise time. **8**

5\. a) State and discuss Routh-Hurwitz criterion of stability. What are its demerits ? **6**

b) Distinguish the following :

i) Stable system

ii) Unstable system.

iii) Marginally stable system.

iv) Conditionally stable system. **6**

c) The open loop transfer function of a unity feed back control system is given by

$$G(s)\,H(s) = \frac{K}{S(S+1)\,(1+2S)\,(1+3S)}$$

Determine value of K

i) For which system is stable

ii) Which will cause sustained oscillations in the closed loop system ? **6**

OR

6\. a) Explain how to find the following during sketching of Root-locus. **6**

i) Break away points

ii) Asymptotes and centroid

iii) Angle of departure.

b) Sketch the root locus for a unity feedback system with open loop transfer function $G(s) = \dfrac{K}{S(S^2+8S+32)}$. Determine stability and marginal K. **12**

SECTION – II

7. a) Give the comparison of time-domain and frequency domain analysis. Explain relation between time domain specifications and frequency domain specifications of a second order control system. **8**

b) Explain the technique to determine stability of a closed loop system from Bode plot. State also, i) Magnitude condition ii) Angle condition. **8**

OR

8. a) State and discuss :

i) Phase Margin

ii) Gain Margin

iii) Gain cross-over frequency

iv) Phase cross-over frequency with respect to Bode plot (Magnitude and Phase plot). **6**

b) The open loop transfer function of a unity feedback system is given by

$$G(s) = \frac{K(S+10)}{S(S+2)(S+5)}$$

construct Bode plot for K = 10. Determine PM, GM, Gain cross over frequency and phase cross over frequency. Determine whether the closed loop system is stable. **10**

9. a) Sketch Polar plots for type ‘0’ and type ‘1’ system. **6**

b) Explain how to determine stability, Gain margin from polar plot. **6**

c) Determine analytically phase cross-over frequency, GM and stability for

$$G(s)\,H(s) = \frac{100}{(S+1)^3}.$$ **6**

OR

10. a) Explain the terms with examples, related to Nyquist stability criterion.

1) Mapping function

2) Principle of argument. **4**

b) State and explain Nyquist criterion of stability. What are its merits over other stability criterions ? **6**

c) Using Nyquist criterion, find the stability, Gain Margin and Phase Margin for the open loop system :

$$G(s)\,H(s) = \frac{1}{S(1+2S)\,(1+S)}$$ **8**

11. a) What are compensating networks ? Discuss

i) Lag compensation

ii) Lead compensation. **6**

b) Explain complete design procedure for finding transfer function of the compensators.

i) Lead network

ii) Lag network using bode plot. **10**

OR

12. Design a phase lag compensator to a system whose open loop transfer function is

$G(s) = \dfrac{5}{S(1+0.1\,S)\,(1+0.3\,S)}$ so that its phase margin will be 50°. **16**

T.E. (Electrical) (Semester – I) Examination, 2009
(2003 Course)
MANAGEMENT TECHNIQUES

Time : 3 Hours | Max. Marks : 100

Instructions : *1) Answer* ***any one*** *question from* ***each*** *unit.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) Neat diagrams must be drawn ***wherever*** *necessary.*
4) ***Black*** *figures to the* ***right*** *indicate* ***full*** *marks.*
5) Assume suitable data, ***if necessary****.*

SECTION – I

Unit – I

1. a) 'All managers by whatever name called, manage'. Discuss, bringing out the universality of management functions. **10**

   b) State and explain the law of demand. **6**

OR

2. a) What are the different forms of business organizations ? Distinguish between cooperatives and joint stock enterprises, bringing out clearly the advantages and limitations of both the form of business organizations. **16**

Unit – II

3. a) As an industrial promoter where in India and why will you locate
   i) an iron and steel industry ii) an automobile factory
   iii) a cement factory iv) a cotton textile mill. **8**

   b) Distinguish between the following : **8**
   i) Invited bids and Speculative bids
   ii) Principal and Promoter.

OR

4. a) Describe the following principles of material handling : **8**

   i) Operating principles   ii) Equipment principles.

   b) Define inventory. How inventories are classified ? What is the need for inventory ? Explain. **8**

Unit – III

5. a) Define Motivation. Explain theory X and theory Y of motivation. **8**

   b) What are individual differences ? How are they important in industrial firm ? Explain with an example how they lead to industrial unrest ? **10**

OR

6. a) What is performance appraisal ? Explain its significance. **6**

   b) Explain the following industrial acts in brief : **12**

   i) Minimum wages act   ii) Workmen compensation act.

SECTION – II

Unit – IV

7. a) Define 'Marketing'. How is it different from selling ? Explain how marketing starts and ends with the customer ? **9**

   b) Distinguish the following : **9**

   i) Prime cost and Factory cost

   ii) Direct material and Indirect material cost

   iii) Direct overhead and Indirect overhead cost.

OR

8. a) Distinguish between shares and debentures. **6**

   b) What are the functions of finance ? Explain in brief any two financial institutions. **12**

Unit – V

9. a) Describe the seven sources of manufacturing wastes as identified in the JIT system. **8**

   b) Why is an ISO-9000 certification important to a firm ? Explain the methodology of ISO-9000 certification. **8**

OR

10. a) What are the principles and elements of TQM ? Explain. **8**

    b) Discuss the functions and qualities of an Entrepreneur. **8**

Unit – VI

11. a) Define 'communication'. Explain the process of communication with a neat diagram. **8**

    b) What are the techniques used for improving the following : **8**

    i) Writing skills ii) Presentation skills.

OR

12. Explain the following in brief : **16**

    i) Stress management

    ii) Time management

    iii) Business ethics

    iv) Professional ethics.

T.E. (Electrical) (Semester – II) Examination, 2009
POWER SYSTEM – II (2003 Course)

Time : 3 Hours Marks : 100

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

SECTION – I

1. a) Derive the expressions for A, B, C, D constant of long transmission line. **8**
   b) What is surge impedance loading ? What are the methods to improve it ? **8**

OR

2. a) Why it is essential to give the compensation to long transmission line ? **8**
   b) Explain the Ferranti effect taking place in long transmission line. **8**

3. a) What do you mean by complex power ? Explain why the complex conjugate of current is required to express the complex power. **8**
   b) What do you understand by per unit system ? How is it useful for representing single line diagram and network reduction ? **8**

OR

4. a) Explain the terms subtransient, transient and steady state impedance and current at an alternator when sudden three phase short circuit fault occurs. **8**
   b) What is the basis for selection of circuit breaker ? **8**

5. a) Why the analysis of unsymmetrical fault is difficult ? How is it done ? **9**
   b) Using the sequence components how the three phase power is measured ? **9**

OR

6. a) Draw and explain the sequence network for an alternator when DLG fault occurs on it. **9**
   b) Draw zero sequence network diagrams for various transformer connections. **9**

SECTION – II

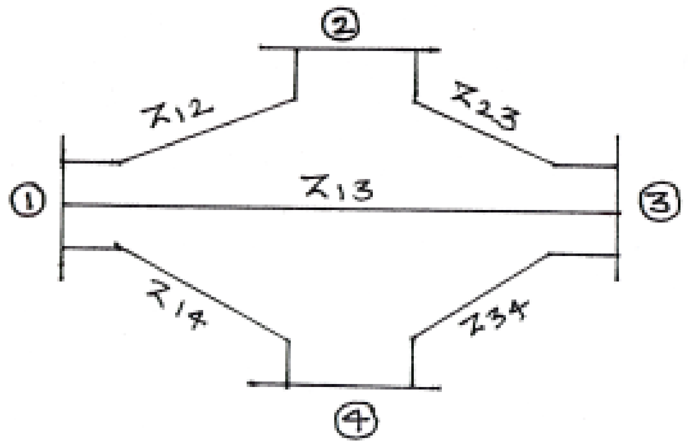
7. What is the importance of load flow study in power system engineering ? Explain Gauss-Seidal method for load flow analysis along with a flowchart. **16**

OR

8. a) Explain briefly the significance and nature of elements of a Y bus matrix along with an easy way to formulate Y bus matrix of power system. Also state advantages of Y bus formulation. **8**

   b) Determine Y bus for the four-bus system shown in Figure. The line series impedances are as follows : **8**

Line	**Impedance (p.u.)**
1 – 2	0.25 + j1
1 – 3	0.30 + j0.60
1 – 4	0.20 + j0.30
2 – 3	0.15 + j0.40
3 – 4	0.40 + j0.60



9. a) Define power system stability. Explain steady state, dynamic and transient stability of a power system. **8**

b) A 100 MVA, 11 KV, 50 Hz, four pole turbo generator has inertia constant of 5 MJ/MVA.

i) Find stored energy in rotor at synchronous speed.

ii) Machine is operating at a load of 60 MW when load suddenly increases to 80 MW. Find rotor retardation. Neglect losses.

iii) Retardation calculated above is maintained for 5 cycles. Find change in power angle and rotor speed in rpm at the end of this period.

iv) Another generator of 75 MVA, 3000 rpm having H = 4 MJ/MVA is put in parallel with above one. Find inertia constant for equivalent generator on a base of 100 MVA. **8**

OR

10. a) Derive power angle equation for one machine connected to an infinite bus and draw power angle curve. **8**

b) Explain different factors affecting power system stability and methods to improve it. **8**

11. a) Explain the technical and economic advantages of HVDC transmission systems over HVAC transmission systems. **10**

b) Explain constant ignition angle control method for HVDC transmission systems. **8**

OR

12. a) Write a note on each of the following :

i) Classification of HVDC systems

ii) Limitations and applications of HVDC transmission

iii) Multiterminal DC (MTDC) system. **18**

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T.E. (Electrical) (Semester – II) Examination, 2009
MICROCONTROLLER AND ITS APPLICATIONS
(2003 Course)

Time: 3 Hours | Max. Marks: 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Differentiate microprocessor and microcontroller. **4**
   b) Draw and explain the internal RAM organisation of 8051 microcontroller. **8**
   c) Explain various flags used in 8051 microcontroller. **4**

OR

2. a) Write short note on SFR's of 8051. **4**
   b) Draw functional block diagram of 8051 microcontroller and explain it in detail. **8**
   c) Explain classification of microcontroller based on various parameters. **4**

3. a) Explain the interrupt structure of microcontroller 8051 with vector addresses. **6**
   b) Explain in detail timer register of 8051 microcontroller. **6**
   c) Explain timer/counter control logic with difference between timing and counting operation. **4**

OR

4. a) Explain various modes of operation of timers in 8051. Explain in detail mode 3 operation. **8**

   b) Explain importance of RI and TI flag in serial communication of 8051. What are various serial data transmision modes ? **8**

5. a) Explain various addressing modes used in Instruction set of 8051 with example of each. **8**

   b) Write an assembly language program to multiply two 8 bit hexadecimal numbers stored in external data memory C000H and C001H. Result is 16 bit store the Lower byte result and Higher byte result at D000H and D001H of external data memory. **10**

OR

6. a) Explain different JUMP and CALL instructions of 8051 microcontroller. **8**

   b) Write an assembly language program to add 10 H hexadecimal numbers stored in internal RAM location 30 H onward result is 16 bit. Store lower byte of result at A000H and higher byte of result at A001H memory locations of external data memory. **10**

SECTION – II

7. a) Write a short notes on simulator, emulator, assembler and compiler used for 8051 microcontroller. **8**

   b) Explain salient features of members of MCS-51 family. **8**

OR

8. a) Explain the format and function of each bit of IP and IE SFR's. **8**

   b) Explain 8051 communication with computer through RS 232 link. **8**

9. Write a short notes on (Assembly programmes are not expected)

   i) DC motor control using 8051.

   ii) Temperature measurement using 8051.

   iii) Level measurement using 8051. **18**

OR

10. a) Draw and explain stepper motor control using 8051. **18**

b) Flow measurement using 8051 microcontroller.

c) Write assembly language program to control stepper motor.

11. a) Write a short note on internal memory structure in 8096 family. **8**

b) Draw block diagram of 8096. **8**

OR

12. a) Explain the PWM output generation using 8096. **8**

b) Explain features of MCS 96 family microcontrollers. **8**

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T.E. (Electrical) (Semester – II) Examination, 2009
POWER ELECTRONICS
(2003 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) What are the characteristics of an ideal switch ? Compare with a practical switch. **8**

b) What is the switching loss in a power electronic switch ? How is it affected by switching frequency ? **8**

OR

2. a) How power semiconductor devices are classified ? Give examples of each type. Explain types of triggering methods used for SCR. **8**

b) Draw and explain VI characteristics of triac, with different operating modes. Give applications of triac. **8**

3. a) Explain construction, characteristics and switching action in MOSFET in comparison with IGBT. **8**

b) Explain : i) Why MOSFETs and IGBTs are preferred for high frequency applications ? ii) Turn on and turn off process for MCT. **8**

OR

4. a) Explain important specifications of IGBT and explain "Latch up" in IGBT. **8**

   b) Draw output and transfer characteristics of MOSFET and explain its advantages and disadvantages. **8**

5. a) Draw a neat circuit diagram for a single phase semibridge rectifier feeding RL load at firing angle α. Derive output voltage expression. Draw output voltage, current and input current waveforms. **9**

   b) What is a dual converter ? Explain its modes of operation with help of a neat circuit diagram. Where is the dual converter used ? **9**

OR

6. a) Explain working of a three phase fully controlled bridge rectifier feeding highly inductive load with help of neat circuit diagram. What is the boundry of discontinuous conduction ? Write expression of average output voltage. **9**

   b) Explain inversion mode of operation of a single phase full converter. What is the range of control available ? Draw control characteristics and explain. **9**

SECTION – II

7. a) Explain with neat diagram type c chopper operation. Sketch output voltage, output current of chopper wave foms for first quadrant operation. **8**

   b) Explain different control strategies of DC chopper. **8**

OR

8. a) A step up chopper has input voltage of 200 V and output voltage of 400 V. If the conducting time of thyristor-chopper is 60 μs. Compute the pulse width of output voltage.
   In case output voltage pulse width is halved and frequency is constant. Find the average value of new output voltage. **8**

   b) Explain "Type E" chopper with relevant w/fs. **8**

9. a) Explain with neat diagram single phase current source inverter. Sketch and explain o/p waveforms. **8**

   b) Explain the operation of 1 ϕ transisterised bridge inverter having inductive load, operate in quasi square wave mode. Draw the necessary w/fs. **10**

OR

10. a) Explain 3ϕ VSI in 120° mode with neat circuit and waveforms. **12**

b) Explain 1ϕ series SCR inverter with neat circuit diagram and voltage waveforms. **6**

11. a) Explain various methods for control of output voltage in inverters. **8**

b) Explain selection criteria of following devices in connection with 1ϕ converter. **8**

i) Step up transformer

ii) Transformer with centre tap

iii) No. of SCR'S

iv) No. of power diodes.

OR

12. a) What is Snubber circuit ? Give step by step procedure to design a Snubber circuit. Explain working of Snubber circuit. **8**

b) Explain multiple pulse modulation used in inverters. Draw necessary w/fs to obtain four pulses per half cycle of output voltage w/fs. State the advantage of multiple pulse modulation over single pulse modulation. **8**

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T.E. (Electrical) (Semester – II) Examination, 2009
ELECTRICAL MACHINES – III
(2003 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 electronic pocket calculator is ***allowed****.*
5) Assume suitable data, ***if necessary****.*
6) Answer Q. ***1*** *or Q.* ***2****, Q.* ***3*** *or Q. 4, Q.* ***5*** *or Q.* ***6*** *from Section –* ***I****.*
7) Answer Q. ***7*** *or Q.* ***8****, Q.* ***9*** *or Q.* ***10****, Q.* ***11*** *or Q.* ***12*** *from Section –* ***II****.*

SECTION – I

1. a) Explain construction of a three phase alternator with a neat diagram. **6**

b) Derive expression of induced emf of a three phase alternator. **6**

c) The stator of a three phase, 20 pole alternator has 120 slots and there are four conductors per slot. If the speed of alternator is 300 rpm, calculate emf induced per phase. Resultant air gap flux is 0.05 wb per pole. Assume coil span as 160° electrical. **6**

OR

2. a) Explain synchronous impedance method to find regulation of a three phase alternator. **6**

b) Draw and explain phasor diagram of a cylindrical rotor 3 phase alternator. Also calculate the induced emf from it. Consider lagging p.f. load. **6**

c) A 3 phase, 11 KV star connected alternator delivers a current of 80 A on full load. On short circuit, a field excitation of 2.8 A produces the full load current. An emf of 400 V per phase is produced on open circuit by the same excitation. The armature resistance is 0.7 ohms per phase. Determine the regulation at full load.

I) 0.8 p.f leading II) Unity p.f. **6**

3. a) Explain slip test on a three phase alternator to determine d-axis and q-axis reactances. **8**

b) Draw phasor diagram at lagging p.f. load for a salient pole three phase alternator and find induced emf equation from it. **8**

OR

4. a) Explain following terms :

I) Infinite bus bas II) Synchronizing power

III) Synchronizing torque IV) Power-power angle relation. **8**

b) Explain the process of load sharing between two alternators in parallel (by controlling the steam supply of the prime movers). **8**

5. a) Why is a three phase synchronous motor not self-starting ? Explain the method of making it self-starting by using damper winding. Also explain 'hunting'. **8**

b) A three phase 400 V, star connected synchronous motor draws 26.67 A at 0.9 p.f. leading. What will be the back emf generated ? The impedance per phase is 0.2 + j 2 ohms. Also find the power angle. **8**

OR

6. a) Compare three phase induction motor to three phase synchronous motor w.r.t.

I) Construction II) Working p.f.

III) Starting IV) Cost

V) Applications **8**

b) Name and explain tests conducted on three phase synchronous motor during manufacturing. **8**

SECTION – II

7. a) Explain edge and end effects of a linear induction motor. List some applications of this motor. **8**

b) Describe the construction and working of a variable reluctance motor. **8**

OR

8. a) Describe the construction of single phase Hysteresis motor and explain how the torque is produced by the motor. Draw the speed-torque characteristics of the motor from no load to full load. **10**

b) Compare the printed circuit motor with a d.c. shunt motor. **6**

9. a) What are harmonic induction torques ? Explain their effect on the working of a 3 phase induction motor. **8**

b) Explain how tooth ripples are generated in a 3 phase synchronous generator. How are they suppressed ? **8**

OR

10. a) Explain the sources which generate harmonics in a 3 phase synchronous machine. What are their effects on its working ? How these effects are reduced ? **10**

b) A 3 phase alternator has generated emf per phase of 230 V with 10% third harmonic and 6% fifth harmonic content. Calculate the r.m.s line voltage for

i) star connection ii) delta connection.

Find also the circulating current in delta connection if the reactance per phase of the alternator of 50 Hz is 10 ohm. **6**

11. a) Obtain identical transformations for currents and voltages from a rotating balanced 3 phase (a, b, c) winding to a rotating balanced 2 phase (α, β) winding. **10**

b) A 3 phase, 4 pole, 50 Hz squirrel cage induction motor develops a torque of 300 Nm at rated phase voltage of 240 V. The three phase stator winding is now replaced by 2 phase stator winding for which the number of poles, effective number of turns per phase and conductor size are not changed. Determine :

i) The rated phase voltage of two phase induction motor.

ii) The torque developed by the two phase induction motor if it is energised at rated phase voltage from a 2 phase, 50 Hz supply system. Neglect losses.

iii) The rating in KW of 2 phase induction motor. **8**

OR

12. a) Using the concept of generalized machine theory obtain the parameters of the equivalent circuit of a 3 phase induction motor. Hence draw the equivalent circuit of the motor. **10**

b) When running on full load at 400 V, a 3 phase delta connected induction motor takes an input current of 60 A at 0.85 p.f. when running light at 400 V, the motor input current and power are 16 A and 2200 watts respectively. Its friction and windage losses are 800 watts. If stator resistance per phase is 0.6 ohm, calculate the shaft power and its efficiency at a full load slip of 0.04. **8**

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T.E. (Electrical) (Semester – II) Examination, 2009
ELECTRICAL INSTALLATION, MAINTENANCE AND TESTING
(2003 Course)

Time: 3 Hours Total Marks: 100

Instructions : *1) Answer **any 1** question from **each** Unit.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) Neat diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) Assume suitable data, **if necessary**.*

SECTION – I

Unit – I

1. a) Compare AC and DC systems of power transmission. **8**

   b) State and prove Kelvin's law for feeder design with reference to supply system. **6**

   c) Draw single line diagram of typical AC supply distribution system. **4**

OR

2. a) Distinguish between a distributor and feeder. **4**

   b) Compare 1 phase, 2 wire overhead system with 3 phase, 3 wire overhead system on the basis of volume of conductor material required. **6**

   c) A single phase cable has R = 0.4 Ω /km, X = 0.3 Ω /km. The length of cable is 1 km and load points A, B, C, and D are loaded as 20A at 0.8 p.f. lag, 15 A at 0.8 p.f. lag, 60 A at unity p.f. and 50 A at 0.9 p.f. lag respectively. The distance of load points from sending end is 200 m, 400 m, 800 m and 1000 m respectively. The voltage at sending end is maintained at 240 V. The load power factors are referred to sending end. Find the voltages at respective loading points. **8**

Unit – II

3. a) Explain in detail classification of substation. **8**

   b) Explain the terms : **8**

      i) Touch potential ii) Step potential

      iii) Transfer potential

OR

4. a) Explain in detail design of earthing grid od substation. **8**

   b) Explain in detail function of the equipments used in the substation. **8**

Unit – III

5. a) Explain in detail the process of deterioration of insulation. **8**

   b) What is condition based maintenance ? State its advantages over other types of maintenance. **8**

OR

6. a) Define and explain :

      i) Polarization index

      ii) Dielectric absorption ratio. **8**

   b) Explain the concept of condition monitoring and state its advantages. **8**

SECTION – II

Unit – IV

7. a) Write a note on dissolved gas analysis in context with condition monitoring of transformers. **8**

   b) Explain in detail different failure modes of transformer. **10**

OR

8. a) How transformer oil gets contaminated ? Explain the reconditioning of transformer oil with block diagram. **10**

   b) How degree of polymerization and partial discharge measurement is used for condition monitoring of transformer ? **8**

Unit – V

9. a) Explain various tests carried out on induction motor. **8**

   b) What is signature analysis ? How it is useful in condition monitoring of electrical equipments ? **8**

OR

10. a) Explain the condition monitoring of power cables. **8**

    b) Write detail note on thermography. **8**

Unit – VI

11. a) What are different failure modes of bearings ? **8**

    b) Explain vibration signature analysis used for failure analysis of rotating machines. **8**

OR

12. a) Explain the nomenclature of the bearings. Draw the relevant figure. **8**

    b) Condition monitoring of motors using spark pulse measurements method. **8**

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T.E. (E & TC/Electronics, Indl. Elex.) (Semester – I) Examination, 2009
DIGITAL DESIGN AND COMPUTER ORGANISATION
(2003 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) Assume ***suitable*** *data, if necessary.*
5) In Section ***I*** *: Attempt Q.* ***1*** *ro Q.* ***2****, Q.* ***3*** *or Q.* ***4****, Q.* ***5*** *or Q.* ***6****.*
In Section ***II*** *: Attempt Q.* ***7*** *or Q.* ***8****, Q.* ***9*** *or Q.* ***10****, Q.* ***11*** *or Q.* ***12****.*

SECTION – I

1. a) Design a sequential circuit using Mealy machine for detecting an overlapping sequence 1101. Use JK flip flops. **8**

   b) What does word 'finite' signify in the term finite state machine ? State advantages and disadvantages of a finite state machine. **4**

   c) Compare ASM chart and state diagrams. **4**

OR

2. a) What are the static and dynamic hazards ? Explain how static hazards are eliminated. **8**

   b) Explain the fundamental and pulse mode asynchronous sequential circuits. **4**

   c) Draw the ASM chart for MOD-4 up counter with the condition that there exist an input signal W, and if W = 1 the count is incremented by 1 otherwise it remains same. **4**

3. a) What is the difference between sequential execution and concurrent execution of VHDL statements ? Explain with the help of suitable example. **8**

   b) Write a VHDL code to design a BCD to seven segment decoder for a single digit LED display. **8**

OR

4. a) Explain different classes of data objects in VHDL with example for each. **8**

   b) Write a VHDL code for synchronous and asynchronous reset D flip flop. **8**

5. a) Using Booth's algorithm multiply the following :

Multiplicand = +15

Multiplier = –6 **6**

b) Explain the concept of look ahead carry generator. Explain its advantages. **6**

c) List the rules for floating point multiplication and division. **6**

OR

6. a) Perform the following division using restoring and non-restoring division algorithm

Dividend = 1100

Divisor = 0011. **12**

b) Explain IEEE single precision and double precision floating point number format. **6**

SECTION – II

7. a) Describe the following addressing modes along with suitable examples :

i) Immediate mode

ii) Autoincrement mode

iii) Autodecrement mode. **6**

b) What are condition codes ? Explain the use of them. **6**

c) What is the difference between subroutine and interrupt service routine ? **4**

OR

8. a) Draw and explain the single bus organisation of the CPU. **6**

b) Write the control sequence for an unconditional branch instructions. **6**

c) Give difference between Stacks and Queues. **4**

9. a) What are the different methods of handling multiple I/O devices by CPU ? **8**

b) Explain synchronous and asynchronous bus in an Input operation with timing diagram. **8**

OR

10. a) Compare programmed I/O and interrupt driven I/O techniques of data transfer. **6**

b) Explain serial port interface circuit for the processor. **6**

c) Explain exceptions used for debugging the program. **4**

11. a) What is virtual memory concept ? Explain the role of TLB in virtual memory organisation. **8**

b) What are the differences between SRAM and DRAM ? **6**

Explain need of refreshing in case of DRAM.

c) Write a short note on memory management requirements. **4**

OR

12. a) Write short notes on : **12**

i) DVD

ii) RAID

iii) Magnetic disk

b) Compare associative and set-associative mapped cache. **6**

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T.E. (E & TC/Electronics, Indl. Elex.) (Semester – I) Examination, 2009
(2003 Course)
ANALOG INTEGRATED CIRCUITS – DESIGN & APPLICATIONS

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

*4) In Section **I** : Attempt Q. No. **1** or **2**, Q. No. **3** or **4**, Q. No. **5** or **6**. In Section **II** : Attempt Q. No. **7** or **8**, Q. No. **9** or **10**, Q. No. **11** or **12**.*

SECTION – I

1. A) What is the use of swamping resistors in differential amplifier ?

The following specifications are given for the dual-input, balanced output differential amplifier $R_C = 2.2k\Omega$, $R_E = 4.7k\Omega$, $R_S = 50\Omega$, $+V_{CC} = 10V$, $-V_{EE} = -10V$, $h_{fe} = \beta_{dc} = 100$, $V_{BE} = 0.715$.

i) Determine operating point values.

ii) Determine A_d, i/p and o/p resistance.

iii) If swamping resistance each of 100Ω is connected in the above circuit calculate I_{CQ}, V_{CEQ}, A_d, i/p and o/p resistance. **12**

B) Define 1) CMRR 2) Slew Rate 3) PSRR 4) Input offset current. **4**

OR

2. A) Explain virtual ground and virtual short concept. **4**

B) Explain the current mirror circuit with necessary derivation. **8**

C) A square wave of peak to peak of 750 mV has to be amplified to a peak to peak amplitude of 3.8 V, with a rise time of 4.5 μsec or less. Can IC 741 Op-Amp be used ? **4**

3. A) Explain the operation of voltage to current converter with grounded load, also derive expression for load current I_L in terms of V_{in} and R. **6**

B) a) Design a differentiator to differentiate an i/p signal that varies in frequency from 10 Hz to about 1 KHz.

b) If a sine wave of 1V peak at 1 KHz is applied to the differentiator of part (a), draw its output wave form. Assume G = 0.1 μ F. **10**

OR

4. A) Derive an expression for output voltage of practical integrator. Draw output wave form if i/p is square wave. **6**

B) Draw and explain 3 Op-Amp Instrumentation amplifier which provides current output. Also derive expression for output current. **10**

5. A) Explain how comparator can be used as pulse width modulator ? **4**

B) With neat circuit diagram explain operation of absolute - value output circuit. **8**

C) Using IC 741 Op-Amp with a supply of $\pm$12V design an inverting Schmitt trigger circuit to have trigger points of $\pm$2V. **6**

OR

6. A) Write short note on peak detector circuit. **6**

B) Design a window detector, whose output voltage is high, when i/p voltage is between +4 V and +1 Volt. Use IC LM 339. **8**

C) Explain the important characteristics of comparator. **4**

SECTION – II

7. A) Explain operation of missing pulse detector using IC 555. Draw necessary waveforms. **8**

B) Derive expression for pulse width 'T' of a monostable multivibrator using Op-Amp. **8**

OR

8. A) Draw the neat diagram of triangular waveform generator and explain its operation. **8**

B) Draw and design RC phase-shift oscillator. So that its oscillating frequency = 200 Hz. **8**

9. A) Find transfer function of fourth order Butter worth low pass filter ? **6**

B) Design a wide band pass filter having f_L = 200 Hz and f_H = 1 KHz and pass band gain of 4. Draw the freq. response of the filter and calculate Q of the filter. **10**

OR

10. A) Derive the expression for voltage gain of a general Sallen-Key structure used for second order active filters. **8**

B) Write short note on :

1) Frequency normalization
2) Low pass filter to Band pass filter transformation. **8**

11. A) State applications of analog multiplier and explain square rooting circuit using multiplier. **6**

B) Explain with neat diagram operation of temperature compensated log amplifier. **8**

C) Explain phase detector using X-OR gate. **4**

OR

12. A) Write short notes on : **12**

1) Frequency synthesizer using PLL
2) Voltage controlled oscillator
3) Frequency translator using PLL.

B) Define **6**

1) Capture range
2) Lock range
3) Pull-in time

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11. a) Draw a neat circuit diagram to generate maximum length sequence using linear feedback shift register of length m = 5 with feedback taps [5, 2]. Find generated output sequences if initial contents of SR are [10000].

If chip rate is 10^7 chips/sec, calculate chip and PN sequence duration and period of output sequence. **8**

b) With neat block schematic, explain working of FHSS transmitter and receiver. Comment on the commercial applications of FHSS. **8**

OR

12. a) In DS/BPSK system, the feedback shift register used to generate PN sequence, has length m = 19. The system required to have an average probability of symbol error due to externally generated interference signal that does not exceed minimum requirement. Calculate

1) Processing gain

2) Anti-jam margin. **8**

b) Explain in detail operation of CDMA technique and compare performance parameters of FDMA, TDMA and CDMA. **8**

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SECTION – II

7. a) With block diagram and mathematical expression, explain operation of offset QPSK. Compare its performance parameters with MSK. **9**

b) In digital CW communication bit rate of NRZ data is ‘2’ MbPS and carrier frequency is 100 MHz. Compute , for BPSK and QPSK system.

1) Symbol rate of transmission

2) Required channel bandwidth

3) Comment on the results. **9**

OR

8. a) With the help of neat block schematic, explain M-ary FSK system with spectral characteristics and signal space representation. **9**

b) Sketch the waveforms of minimum shift keying for a bit sequence of 1100101011. Compare MSK and GMSK. **9**

9. a) Show that performance of matched filter and correlator are identical. **8**

b) A received signal have amplitude of $\pm 2V$ for a time ‘T’ signal is corrupted by white gaunian noise, having psd 10^{-4} V^2/Hz. If signal is processed by MF reciever, what should be minimum time ‘T’ during which signal must be sustained so that probability of error is not exceeding 1.1×10^{-5}.

Given erfc (x) $= \frac{2}{\sqrt{\pi}} \int_x^{\infty} e^{-u^2} du$

x	**erFc x**
2.6	2.4×10^{-4}
2.8	7.5×10^{-5}
3	2.2×10^{-5}
3.3	3.06×10^{-6}
3.7	1.67×10^{-7}

8

OR

10. a) State the various properties of matched filter. Explain the impulse response in detail. **8**

b) Binary data is transmitted at rate of 10 mbps over a channel whose bandwidth is 6 MHz. Final signal energy per bit at receiver input for coherent BPSK and DPSK to achieve probability error, Pe $\leq 10^{-4}$. Assume $\frac{N_0}{2} = 10^{-10}$ Watts/Hz. **8**

4. a) A binary channel with bit-rate of 56 kbps is available for uniform PCM voice transmission having signal bandwidth of 3.4 kHz.

Calculate :

1) Sampling frequency
2) Number of bits per sample
3) Quantization levels with step size
4) Transmission bandwidth for two channels
5) Signal to noise ratio. **8**

b) What is predictive coding ? Explain LPC transmitter and receiver for speech synthesis in detail. **8**

5. a) State properties of line codes and draw waveforms for the bit sequence 1101010011 to

1) RZ unipolar 2) NRZ polar 3) AMI
4) Manchester 5) RZ polar 6) Polar Quaternary (NRZ). **8**

b) State different types of synchronizers with principle of operation, explain in detail early late bit synchronizer with closed loop voltage controlled clock. **8**

OR

6. a) What is scrambler ? For a scrambler shown in figure (1), if data stream I = 1010001101 is given. Find the output sequence of data stream and verify using unscrambler. Assume initial content of register as zero. **8**

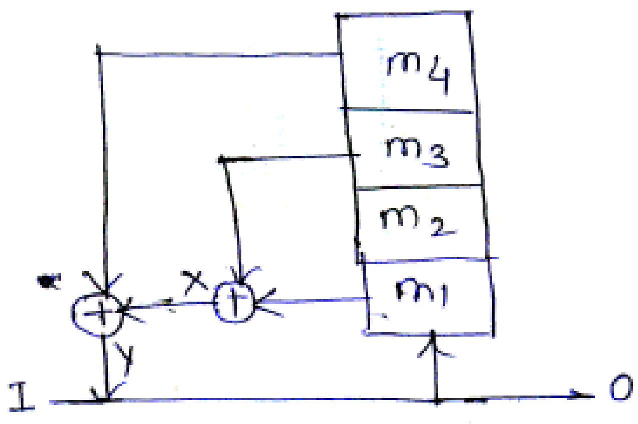

Fig. 1

b) State different functions of multiplexers. Give comparative statements for hierarchies used by AT and T and CCIT. **8**

T.E. (E&TC/Electronics, Indl. Elex.) (Semester – I) Examination, 2009
(2003 Course)
DIGITAL COMMUNICATION

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **3** questions from Section **I** and **3** questions from Section – **II**. Q. **1** or **2**, Q. **3** or **4**, Q. **5** or **6**, Q. **7** or **8**, Q. **9** or **10**, Q. **11** or **12**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) State properties of auto-correlation function. Show that when wide sense stationary process passed through a LTI filter with impulse response h(t) produces constant mean-square value. **9**

b) State the properties of in-phase and quadrature phase components of narrow band noise and explain the process of generation with PSD. **9**

OR

2. a) A random process $X(t) = A \cos (\omega_c t + \theta)$, where 'A' and '$\omega_c$' are constants while '$\theta$' is a random variable with uniform pdF.

$$f_\theta(\theta) = \frac{1}{2\pi}, \quad -\pi < \theta < \pi$$

i) Find mean, auto correlation function and psd of X(t). (Show that X(t) is Wss before finding psd.)

ii) Find auto-correlation function by time averaging and show that $<R_{xx}(\tau)> = R_{xx}(\tau)$. **9**

b) Explain the practical aspects of natural and flat-top sampling with waveforms. Comment on recovery of baseband signal. **9**

3. a) Explain in detail principle of Delta Modulation system with block schematic and supporting waveforms. Derive expression for quantization noise in the same. **8**

b) A 1 kHz signal of voice channel is sampled at 4 kHz using 12-bit PCM and a DM system. If 25 cycles of voice signal are digitized, find in each case

1) Signalling rate
2) Bandwidth required
3) Number of bits required to be transmitted
4) Comment on results. **8**

OR

T.E. E. & TC./Electronics, Indl. Elex. (Semester – I) Examination, 2009
MICROPROCESSOR, MICRO CONTROLLERS AND APPLICATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume **suitable** data, if necessary.*

SECTION – I

1. a) Interface 8K EPROM and 16 K RAM to 8 bit $\mu p/\mu c$ using suitable 3 : 8 decoder. Such that following addresses are generated.
   1) EPROM start from 0000H
   2) RAM start from 8000H

   Show all control lines and address map. **10**

   b) Explain following hardware troubleshooting tools in brief
   1) Logic Analyser
   2) In-Circuit Emulator **8**

OR

2. a) Draw and explain the internal block diagram of 8255. Draw the control word format and explain I/O modes of 8255 in detail. **10**

   b) Give the difference between **8**
   i) Von Neuman and Harward architecture of Microprocessor.
   ii) Microprocessor and Microcontroller.

3. a) Explain various modes of serial communication in 8051. **8**

   b) Explain interrupt structure of 8051. **8**

OR

4. a) Explain in detail special function register (SFR). Give its bit address. **8**

   b) Explain in detail timer/counter modes of 8051. **8**

5. a) Explain the following instruction in detail : **8**
   i) XCH A, byte
   ii) DIV AB
   iii) CJNE Dest, source, target
   iv) LCALL addr.

   b) Write an assembly language program to transfer the message "HELLO" serially at 9600 baud rate, 9 bit data and one stop bit for 8051. **8**

OR

6. a) Write an assembly language program to convert a given 8 bit binary number into its gray code equivalent. **8**

   b) Write a program in assembly language of 8051 to design a BCD down counter. The contents of the counter are to be displayed on LED's connected to the port 1. Counter starts from 99. **8**

SECTION – II

7. a) Interface 0808/0809 ADC to 8051. Write assembly language program to convert CH3 and store the result in internal memory at 50H. **8**

   b) Interface 4×8 matrix keyboard to 8051. Using P0 and P1 port. Also write a assembly language program to read key. **8**

OR

8. a) Interface 2 line, 20 character LCD display to 89C51 using four data pins only. Write program to display "Ohmic Memory Avail" on line 2 of LCD using busy flag cheek. **8**

   b) Interface stepper motor to 8051. Draw interfacing diagram with driver circuit. Write assembly language program to rotate a motor 45° forward and 30° reverse. **8**

9. a) State advantages of RS 485 over RS 232 and explain SPI bus protocol. **8**

   b) Compare I^2C bus and MOD bus protocol. **8**

OR

10. a) Explain I^2C bus protocol in detail with timing diagram for
   i) STAR and ii) STOP. **8**

   b) Explain ASCII and RTU modes of MODBUS. **8**

11. a) Explain the architecture of PIC 16cx/17x with suitable block diagram. **6**

   b) State features of AVR microcontroller series. **6**

   c) Explain PIC 16x/17x memory organization. **6**

OR

12. a) Explain different addressing modes of PIC microcontroller. **6**

   b) Explain I/O port structure of PIC 16cx/17x microcontrollers. **6**

   c) What are features of RS 232 ? How serial interface of microcontroller is converted into RS 232 ? **6**

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T.E. (Electronics/E & TC, Indl.Elex) (Semester – I) (2003 Course) Examination, 2009

MECHATRONICS

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 non programmable electronic pocket calculator is **allowed**.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Explain the following terms with reference to a measuring system :
Accuracy, Precision, Drift, Sensitivity, Hysteresis, Linearity. **12**

b) A wheatstone bridge has all arms of 300Ω each. One arm has a variable element which produces an output voltage across the diagonal arms. Excitation voltage is 12 V. Find out change in resistance in one arm to produce 1 mV output. **4**

OR

2. a) Define robotics, what are different types of robots ? Explain any two types in details. **8**

b) Discuss role of electronics in mechatronics system. **8**

3. a) List any four sensors used for pressure measurement. Compare their characteristics. **8**

b) A cylindrical strain gauge load cell use four identical strain gauges each of resistance 100Ω and G.F. = 2. The bridge supply is 12 V. The load cell diameter is 4 cm and its elastic modulus is $E = 2 \times 10^5$ MN/m^2 and Poisson's ratio is 0.3. What is the output voltage of the bridge per Newton force applied ? **8**

OR

4. a) What is fibre optic temperature sensor ? Explain set up for temperature measurement. **8**

b) Explain Proximity sensors with specific applications. **8**

5. a) Explain how to interface sensors to PLC. Write important specifications of PLC. **10**

   b) Compare feature of AD 522 and AD 524. **8**

OR

6. a) What are the important selection factors for ADCs and DACs ? Explain them. **8**

   b) Discuss data acquisition system for interfacing following sensors in a process : **10**

   i) Load cell

   ii) Pressure cell

   iii) Flow measuring device

   iv) Thermistor

   v) Thermocouple

SECTION – II

7. a) Write a short note on multi channel data logger system. **8**

   b) Describe IEEE 488 standand bus. Give its important specifications. **8**

OR

8. a) With necessary timing diagram, explain the communication procedure in I^2C bus. **8**

   b) Explain strip-chart recorder. **8**

9. a) What are actuators ? Explain pneumatic actuators. **8**

   b) Explain specifications and selection criterion for stepper motor. **8**

OR

10. a) Compare hydraulic system with pneumatic system. **8**

   b) Write a short note on servo motors. **8**

11. a) Explain the mechanical and electronic design of a coin counter. **10**

   b) Discuss the mechatronics aspects of rotary optical encoder. **8**

OR

12. a) As a mechatronics case study, discuss ‘Skip control of a CD player’. **8**

   b) Explain in detail, how strain gauge is used for weight measurement. **10**

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T.E. (E & TC / Electronics, Indl. Elex) (Sem. – II) Examination, 2009
(2003 Course)
ADVANCED MICROPROCESSORS

Time : 3 Hours   Max. Marks : 100

***Instructions**: 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Explain the following instructions of 8086 with suitable example :
   i) LOCK
   ii) TEST
   iii) WAIT
   iv) CLD **8**

   b) Write an 8086 assembly language program for BCD to seven segment code conversion. Use XLAT instruction and common cathode display. **10**

OR

2. a) What is segmentation ? Explain the advantages and disadvantages of segmentation. **4**

   b) Explain the following addressing modes of 8086 with suitable example :
   i) Register indirect
   ii) Indirect relative
   iii) Based indexed. **6**

   c) Explain the interrupt structure of 8086 microprocessor. **8**

3. a) Draw and explain the register set of 80386 and explain a typical function of each of the register in brief. **8**

   b) Explain real mode of 80386. **8**

OR

4. a) Explain multitasking. How is it achieved in 80386 ? **8**

   b) Explain the following features of Pentium microprocessor :

      i) Superscalar architecture

      ii) Branch prediction. **8**

5. a) Explain block diagram of mother board used in personal computer. **8**

   b) Explain the features of following adapters :

      i) CGA

      ii) SVGA

      iii) VGA

      iv) MDA. **8**

OR

6. a) Explain the interface of PS/2 mouse with personal computer. **8**

   b) Explain how the characters are displayed in CRT. **8**

SECTION – II

7. a) List the features of PCI bus and explain how the addresses can be captured from the PCI bus. **8**

   b) Explain the following terms with respect to USB :

      i) Data encoding

      ii) Device address

      iii) Data rate

      iv) Different types of data transfer. **10**

OR

8. a) With reference to parallel port explain the following :

      i) Increase in data transfer speed in EPP and ECP modes over SPP mode

      ii) Advantages of ECP mode over EPP mode. **10**

   b) Write an ALP/C program to implement PC to PC communication using serial port. **8**

9. a) With the help of diagram explain the following scheduling algorithm :
   i) Pre emptive
   ii) Non pre emptive. **8**

   b) What is a process ? Explain any two ways of implementing interprocess communication. **8**

OR

10. a) Compare the following :
   i) Process
   ii) Thread. **4**

   b) Explain with respect to file system :
   i) File structure
   ii) File attribute. **4**

   c) Explain the memory management in operating system. **8**

11. a) List and explain all the operating modes of ARM processor. **8**

   b) Compare the features and application areas of RISC and CISC processor. **8**

OR

12. a) Explain the dataflow model of ARM core. **8**

   b) Explain the following instructions of ARM processor :
   i) LDR R2, [R0], # 6
   ii) Mov R1, R2, LSL # 3
   iii) OR R0, R2, R1
   iv) Mov PC, LR. **8**

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T.E. (E&TC/ Electronics, Indl. Elex.) (Semester – II) Examination, 2009
POWER ELECTRONICS
(2003 Course)

Time: 3 Hours Total Marks : 100

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

SECTION – I

1. a) Draw the vertical cross section and VI characteristics of SCR. Also explain the two transistor analogy for an SCR. **10**

b) Why resistance trigger circuit has the maximum firing angle of 90° ? Suggest the modification in the circuit so that firing angle can be extended beyond 90° and explain its working. **6**

OR

2. a) Draw the vertical cross section and input and output characteristics of a power MOSFET. **10**

b) What do you understand by safe operating area (SOA) of a power semiconductor device ? Draw the forward biased SOA of the IGBT and explain how it is superior to that of power BJT. **6**

3. a) A single phase HCB operated from the 230 V, 50 Hz mains feeds a resistive load of 100 Ω. If the firing angle is 60°, calculate, **10**

i) Average output voltage.

ii) RMS output voltage.

iii) Total output power.

iv) DC output power.

v) Load current at instant of turn on i.e. wt = α.

P.T.O.

b) Draw the circuit diagrams of symmetrical and asymmetrical single phase half controlled bridge rectifiers and sketch the SCR and diode current wave forms for each circuit for level loads. **6**

OR

4. a) Draw the circuit diagram and wave forms, explain the operation of the three phase full converter for 'R' load for α =0°, 30°, 60° and 90°. **10**

b) Give the values of ripple frequency for 1ϕ supply and 3ϕ supply. What are the advantage of 3ϕ supply over 1ϕ supply ? **6**

5. a) Derive the following for the single phase bridge inverter having square wave output. **9**

i) RMS value of output.

ii) Fourier series for output voltage.

iii) RMS value of fundamental component of voltage.

b) Draw typical circuit of power MOSFET based full bridge inverter system which can be operated from DC battery or AC i/p. **9**

Output should be variable frequency from 10 KHz to 50KHz and variable voltage from 100V to 200V/230V. Output power rating should be 1KW for 230 V output voltage. System should consists of over current protection.

OR

6. a) Explain 180° conduction scheme for 3ϕ VSI bridge inverter having balanced star 'R' load. **12**

Draw the wave form for base drives and phase voltages for V_R, V_Y and V_B.

b) Give the comparison between Square Wave and Quasi-Square Wave Inverter. **6**

SECTION – II

7. a) For step down type A chopper, input voltage is 600V DC. It supplies a load of 10Ω at 25% duty cycle. Find average output voltage, average output cycle. Find average output voltage, average output current, RMS value of output voltage and ripple factor. **8**

b) Explain operation of a step-up chopper. Derive for output voltage and show that output voltage can be equal to twice input voltage. State assumptions made. **8**

OR

8. a) What are the advantages of resonant convertors over switched mode converters ? Give classification of resonant converters. **8**

   b) With the help of a circuit diagram and wave forms, explain the operation of 'type C' two quadrant chopper feeding a D-C. Motor load. **8**

9. a) Draw the circuit diagram of 1ϕ AC phase control using triac with diac as a triggering device. Sketch the output voltage waveforms. Derive the equation for RMS output voltage. **8**

   b) A single phase AC regulator, using two inverse parallel SCR's operates from the 230V, 50Hz mains and is used to control a room heater (resistive load).

      i) Calculate the resistance of the heater so that the maximum power dissipation is 5 KW.

      ii) If the regulator is operated in the ON-OFF control mode, calculate the heater power dissipation and input power factor if ON period is 10 cycles and OFF period is 15 cycles. **8**

OR

10. a) With the help of circuit diagram and waveforms explain the operation of three phase full wave AC/AC controller with balanced 'R' load. **10**

    b) What are the various methods of AC voltage regulation ? Explain any one of them in brief. **6**

11. a) Draw the block diagram of electronic ballast for fluorescent lighting and explain its advantages and disadvantages. **9**

    b) Explain HVDC transmission with 12 pulse converter diagram and advantages over HVAC transmission. **9**

OR

12. a) With the help of respective block diagrams, explain the difference between online and offline UPS. What are the advantages of online UPS over offline UPS ? **9**

    b) Write short note on speed control of separately excited DC motor using controlled rectifier. **9**

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T.E. (E & TC/Electronics, Indl.Elex) (Semester – II) Examination, 2009
(2003 Course)
DIGITAL SIGNAL PROCESSING

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) Your answers will be ***valued*** *as a whole.*
5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is ***allowed****.*
6) Assume suitable data, if ***necessary****.*

SECTION – A

1. a) Discrete time systems $h_1(n)$ and $h_2(n)$ are connected in cascade

$$h_1(n) = \left\{\frac{1}{2}, \frac{1}{4}, \frac{1}{2}\right\}$$

$$h_2(n) = \delta(n-2)$$

Determine the response of the overall system to the input

$x(n) = \delta(n+2) + 3\delta(n-1) - 4\delta(n-3)$ **8**

b) Compute the inverse Z-transform of the following

i) $X(z) = \dfrac{z^2}{(z-1)(z-0.2)}$

ii) $X(z) = \dfrac{z^{-1}}{1-3z^{-1}}$ ROC: $|z| < 3$. **8**

OR

2. a) A system has unit sample response h(n) given by

$$h(n) = -\frac{1}{4}\delta(n+1) + \frac{1}{2}\delta(n) - \frac{1}{4}\delta(n-1)$$

i) Is the system BIBO stable ?

ii) Is the filter causal ?

iii) Compute the frequency response. **8**

b) State and prove the convolution property of z-transform. **8**

Compute the convolution x(n) of the signals using Z-transform

$x_1(n) = \{4 \ \ -2 \ \ 1\}$

$$x_2(n) = \begin{cases} 1 & 0 \le n \le 5 \\ 0 & \text{otherwise} \end{cases}$$

3. a) Perform circular convolution of following two sequences

$x_1(n) = \{2\ 1\ 2\ 1\}$

$x_2(n) = \{4\ 3\ 2\ 1\}$ **4**

b) Compute 8-point DFT of the sequence

$x(n) = 1 \qquad 0 \le n \le 7$

$\quad = 0 \qquad$ otherwise

by using decimation in frequency FFT algorithm. **8**

c) Explain, with suitable example, the phenomenon of spectral leakage in the computation of Discrete Fourier Transform. **4**

OR

4. a) Compute the eight point DFT of the sequence

$x(n) = \{1\ 2\ 3\ 4\}$ **8**

b) Explain radix 2 DIT FFT algorithm. **8**

5. a) Design a bandpass FIR filter which approximates the ideal filter with cut-off frequencies at 0.2 rad/sec and 0.3 rad/sec. The filter order is M = 7. Use Hanning window function. **8**

b) What is Gibb's phenomenon ? Explain the need of window functions in design of FIR filter. **4**

c) An FIR filter is to be designed to meet the following specifications.

passband	150 – 250 Hz
transition width	50 Hz
passband ripple	0.1 dB
stopband attenuation	60 dB
sampling frequency	1 KHz

6

i) Determine the order of the filter.

ii) Select the appropriate window function.

OR

6. a) Determine the unit sample response of linear phase FIR filter of length M = 4 for which the frequency response at w = 0 and $w = \pi/2$ is specified as

$H_r(0) = 1 \quad H_r(\pi/2) = 1/2$ **8**

b) Using frequency sampling method, design a LP FIR filter to meet the following specifications :

passband	0 –5 KHz
sampling frequency	18 KHz
filter length	9

10

SECTION – B

7. a) Design a digital butterworth filter that satisfies the following constraint using bilinear transformation. Assume T = 1 sec

$$0.9 \le |H(e^{j\omega})| \le 1 \qquad 0 \le \omega \le \pi/2$$

$$|H(e^{j\omega})| \le 0.2 \qquad 3\pi/4 \le \omega \le \pi$$ **8**

b) Compare impulse invariant method and Bilinear transformation method of IIR filters. **4**

c) Differentiate between FIR and IIR filters. **4**

OR

8. a) Design high pass digital filter to meet the following specifications

passband	:	2– 4 KHz
stopband	:	0 – 500 Hz
δp	:	3dB
δs	:	20 dB

Assume butterworth approximation. **8**

b) Obtain the cascade structure for the following system

$$y(n) = \frac{3}{4} y(n-1) - \frac{1}{8} y(n-2) + x(n) + \frac{1}{3} x(n-1).$$ **8**

9. a) Explain the sampling rate conversion by non-integer factors. **6**

b) Design a 3-stage decimator for reducing the sampling rate from 96KHz to 1 KHz. The highest frequency of interest is 450 Hz $\delta_p = 0.001$ $\delta_s = 0.0001$ $M_1 = 8$, $M_2 = 4$, $M_3 = 3$. **10**

OR

10. a) Explain the principles of decimation and interpolation in multirate signal processing. **8**

b) Design a suitable interpolator for the following system

base band	0 – 20 KHz
I/P sampling frequency	44.1 KHz
O/P sampling frequency	176.4 KHz
stopband attenuation	50 dB
passband ripple	0.5 dB
transition width	2 KHz
Stopband edge frequency	22.05 KHz

8

11. a) Explain, how finite word length affects the performance of digital filters. **8**

b) Output signal of A/D converter is allowed to pass through a first order LPF with a transfer function which is expressed as under

$$H(z) = \frac{(1-a)\,z}{z-a} \qquad 0 < a < 1$$

Compute steady state output noise power because of quantization of input signal. **10**

OR

12. a) What are the desirable features of digital signal processor ? **8**

b) Compute the output noise power of

$$H(z) = \frac{1}{1-\alpha\, z^{-1}}$$ **5**

c) Explain the role of MAC unit and Barrel Shifter in digital signal processor. **5**

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T.E. (E & TC/ Electronics) (Indl. Elex.) (Semester – II) Examination, 2009
(2003 Course)
ELECTROMAGNETIC WAVES AND RADIATING SYSTEMS

Time: 3 Hours Total Marks: 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagram must be drawn **wherever** necessary.*
*3) Figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Attempt Q.**1** or Q.**2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section **I**, Q.**7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section **II**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Define electric field intensity $\overline{E}$. Derive the expression for the same using Coulomb's law of force. **8**

b) Derive the boundary conditions for electric field at an interface between conductor and free space. Also derive magnetic boundary conditions. **10**

OR

2. a) State and explain Gauss's law. Also explain application of Gauss's law. **8**

b) Derive Poisson's equation for magnetostatic field. Use the equation to derive Ampere's circuital law in differential and integral form. **10**

3. a) What is Poynting vector ? What is its significance ? Derive the expression for Poynting vector. **8**

b) A lossy dielectric has $\mu = 4\times\pi\times10^{-9}$ H/m and $\varepsilon = \dfrac{10^{-8}}{36\pi}\text{F/m}$, $\sigma = 2\times10^{-8}\text{S/m}$ the electric field $\overline{E} = 200\sin\omega t\,\hat{a}_z$ V/m exists at a certain point in the dielectric.

i) At what frequency will the conduction current density and displacement current densities have equal magnitudes ?

ii) At this frequency calculate the Instantaneous displacement current density.

iii) What is the phase angle between the conduction current and the displacement current ? **8**

OR

4. a) State Maxwell's equations for static fields. Explain how they are modified for time varying electric and magnetic field. **8**

   b) Given $\overline{H} = H_m e^{j(\omega t+\beta z)} \hat{a}_x \text{ A/m}$ in free space find $\overline{E}$. **8**

5. a) What is uniform plane wave ? What is meant by transverse electromagnetic wave ? **8**

   b) A metal sheet of Aluminium has σ =38.2 M℧/m and μ r = 1. Calculate the skin depth δ, the propagation constant γ and velocity of propagation v at the frequency of 1.6 MHz. **8**

OR

6. a) What is Maxwell's IVth equation ? Explain the term conduction current density and displacement current density associated with it. **8**

   b) When the wave is propagating in a good conductor obtain the expression for α, β and what do you understand from skin depth, write the expression and physical significance for skin depth ? **8**

SECTION – II

7. a) What is reflection on transmission line ? What are disadvantages of the same ? Explain in brief the terms : reflection coefficient and SWR. **8**

   b) The characteristic impedance for a certain line in 710< – 16° when the frequency in 1 KHz. At this frequency the attenuation 0.01 neper per km and the phase function is 0.035 radians per km. Calculate the resistance, the leakage, the inductance and the capacitance per km and velocity of propagation. **8**

OR

8. a) Derive the expression for characteristic impedance (Z_0) and propagation constant (γ) in terms of primary constants of a transmission line. **8**

   b) The characteristic impedance of a uniform transmission line is 2040Ω at a frequency of 800 Hz. At this frequency the propagation constant is 0.054 < 87.9°. Determine the values of R, L, G and C. **8**

9. a) Calculate the dimensions of a half wave dipole antenna operating at 100 MHz in the free space what is its radiation resistance ? Give the total power radiated if it is fed with a current of amplitude 25 A. **6**

b) Explain the following terms related to antenna :

1) Radiation resistance

2) Directivity

3) Field radiation pattern

4) Power radiation pattern

5) Directive gain. **10**

OR

10. a) Draw the equivalent circuit of transmitting and receiving antenna. Explain the concept of reciprocity of antenna. **6**

b) An antenna of jam aircraft is being used to jam enemy radar. If the antenna has a gain of 12 dB in the direction of transmission and the radiated power in 5 kW. Calculate the electric field intensity in the vicinity of enemy radar which is 3 km away. The frequency of transmission is 4 GHz. **10**

11. a) Write short note on (**any 2**)

i) Antenna feeding techniques

ii) Microstrip antenna

iii) Antenna towers. **10**

b) Explain the working of Yagi-Uda antenna with a neat sketch. **8**

OR

12. a) What is antenna array ? What is an array factor ? Also explain principle of patterns multiplication. **10**

b) Explain in detail 'broadband antenna'. **8**

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T.E. (E&T.C./Electronics, Indl. Elex) (Sem. – II) Examination, 2009
(2003 Course)
INFORMATION THEORY AND CODING TECHNIQUES

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Assume suitable data, **if necessary**.*

SECTION – I

1. a) What is entropy ? Show that the entropy is maximum, when all the messaging are equiprobable. Assume m = 3. **6**

b) Explain in detail the Rate Distortion Function. **5**

c) Explain the properties of mutual information. **5**

OR

2. a) A channel has following channel matrix $\left[P\left(\frac{y}{x}\right)\right] = \begin{bmatrix} 1-P & P & 0 \\ 0 & P & 1-P \end{bmatrix}$

1) Draw the channel diagram.

2) If the source has equally likely outputs, compute the probabilities associated with the channel outputs for P = 0.2. **6**

b) Define the following with their significance an application in Digital Communication System. **5**

1) Noiseless channel

2) Kraft inequality.

c) Write a short note on : **5**

1) Data Compaction

2) Shannon Source Coding Theorem.

3. a) Prove that the maximum channel capacity $C_\infty = 1.44\ {}^{P}\!/_{No}$. **6**

b) For M-ary PCM prove that $C = B \log_2 \left(1 + \frac{12\ P}{\lambda\ 2N}\right)$ **5**

c) Explain the water filling interpretation of the information capacity theorem. **5**

OR

4. a) Explain the rate distortion theory and sphere packing problem. **6**

b) Show that the Shannon limit for an AWGN channel is equal to -1.6 dB in the information capacity theorem. **5**

c) An ideal communication system with average power limitation and WGN has the bandwidth of 1 MHz and S/N ratio of 10. **5**

1) Determine the channel capacity

2) If S/N ratio dropped to 5 what bandwidth is required for the same capacity.

5. a) Explain in detail the circuit implementation of cyclic codes. **6**

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

1) Maximum Distance separable codes

2) Perfect code.

c) Explain VRC and LRC techniques and its use in error detection. **6**

OR

6. a) Draw the encoder and syndrome calculator for the generator polynomial $g(x) = 1 + x^2 + x^3$ and obtain the syndrome for the required codeword 1001011. **6**

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

1) Golay code

2) CRC code

c) Design a LBC with a minimum distance of three and a message block size of eight bit. **6**

SECTION – II

7. a) Explain the time domain and transform domain approach with suitable example. **6**

b) Explain in detail mapping by set partitioning is used to design TCM. **5**

c) What are Turbo Codes and explain the coding and decoding procedure of Turbo Codes. **5**

OR

8. a) Explain Virterbi's algorithm with the suitable example. **6**

b) Comment on :

1) Distance bound

2) Performance bound

related to the convolutional codes. **5**

c) Explain and evaluate the performance of stop and wait ARQ and selective repeat ARQ (assume the suitable data). **5**

9. a) Explain primitive polynomial and minimum polynomial with suitable example. **6**

b) Explain decoding procedure of BCH codes with suitable example. **5**

c) Explain in detail implementation of R-S Encoder. **5**

OR

10. a) A (15, 5) BCH tripple error correcting code has the following generator matrix.

$g(x) = x^{10} + x^8 + x^5 + x^4 + x^2 + x + 1$ find corrected code word if transmitted code word is $x^5 + x^3$ take primitive polynomial $x^4 + x + 1$. **8**

b) What is JPEG ? What are its standards ? Explain the DCT image compression scheme. **8**

11. a) Explain the following related to mobile communication. **8**
    1) Hand off process
    2) Cell splitting.

    b) Explain in detail with analysis Satellite system power budget. **10**

OR

12. a) Draw and explain the block diagram of space diversity technique. **6**

    b) Compare GSM with IS-95 standards for mobile communication system. **6**

    c) Define E.I.R.P., antenna bandwidth and aparture efficiency of antenna. **6**

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T.E. (Instru. & Control) (Sem. – I) Examination, 2009
(2003 Course)
MICROCONTROLLER TECHNIQUES

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) **All** questions are **compulsory**.*

SECTION – I

1. a) Enlist the salient features of 8051 microcontroller. **8**

   b) A sensor is connected to microcomputing system. Write a program to find the highest value in an array of stored data. **8**

OR

2. a) Write a program to toggle all the bits of P_3 port at every 250 ms. Assume the crystal frequency is 11.0592 MHz. **8**

   b) Differentiate between LJMP, AJMP and SJMP with suitable example. **8**

3. a) Assuming that clock pulses are fed into pin To, write a program for "Counter O" in mode 2 to count the pulses and display the state of the TLO count on P_2. **8**

   b) Explain Interrupt structure of 8051. Enlist steps in execution in an Interrupt. **8**

OR

4. a) Indicate which mode and which timer are selected for each of the following ?

   a) MOV TMOD, # 01 H, b) MOV TMOD, # 12 H,

   c) MOV TMOD, # 20 H, d) MOV TMOD, # 10 H **8**

   b) Write a program to transfer the message "Embedded System Design" serially at 9600 baud rate, 8 bit data, 1 stop bit. **8**

5. a) Draw the interfacing scheme of DAC (0808) and write a program for generation of cosine wave. **10**

   b) Draw and explain interfacing of Thumbwheel. **8**

OR

6. a) Draw the interfacing scheme of stepper motor and write a program to rotate it clockwise continuously. **10**

   b) Write a program to display word "LCD" on the LCD module interfaced with 8051. **8**

SECTION – II

7. a) Draw the typical scheme of connections between RS 232 C and 89 C51. Compare RS-232 C and RS 485 standards. **10**

   b) Show the interface of an relay. Write a program for its safe ON-OFF operation. **8**

OR

8. a) Design a digital level meter for a sensor outputs 10 mV/ft for the range of 0 to 10 ft.

      i) Draw the interfacing scheme. **6**

      ii) Write a program for level indication. **6**

   b) Draw and explain interfacing of RTC to 89C51. **6**

9. a) Write a program to multiply two 8 bit numbers for PIC 16C6 X/7X. **8**

   b) Explain I/O ports structure of PIC 16F8XX. **8**

OR

10. a) Explain following instructions with examples :

      i) btfsc f, b   ii) decf f, F(w)

      iii) sublw k   iv) bsf f, b. **8**

    b) Discuss architectural features of PIC 16F8XX. **8**

11. a) What are the functions of PIE 1, PIE 2, PIR 1 and PIR 2 SFRs in 16F877 ? **8**

    b) Explain use of AD module of PIC 16C7X. **8**

OR

12. a) Explain interrupt structure of PIC 16C6X/7X. **8**

    b) Explain use of Master Synchronous Serial port module of 16F877 for Serial Peripheral Interface. **8**

T.E. (Instrumentation and Control) (Semester – I) Examination, 2009
SIGNALS AND SYSTEMS
(2003 Course)

Time: 3 Hours Total Marks: 100

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

SECTION – I

1. a) Determine and sketch the convolution y(t) = x(t)*h(t) of

$$x(t) = e^{-at}u(t), a > 0$$

and h(t) = u(t). **8**

b) Determine whether the following signals are periodic. If the signal is periodic determine its fundamental period.

i) $x_1(t) = je^{j10t}$

ii) $x_2(n) = e^{j7\pi n}$

iii) $x_3(n) = 3e^{j3/5(n+1/2)}$. **9**

OR

2. a) Determine the values of P_∞ and E_∞ for each of the following signals

i) $x_1(t) = e^{-2t}u(t)$

ii) $x_2(n) = \cos\left(\frac{\pi}{4}n\right)$

iii) $x_3(t) = e^{j(2t+\pi/4)}$. **9**

b) Which of the following impulse responses corresponds to stable LTI systems ?

i) $h_1(t) = e^{-t}\cos(2t)u(t)$ ii) $h_2(n) = n\cos\left(\frac{\pi}{4}n\right)u(n)$

iii) $h_3(t) = e^{-(1-2j)t}u(t)$ iv) $h_4(n) = 3^n u(-n+10)$. **8**

3. a) Find the bilateral Laplace transform and associated ROC for **9**

$$x(t) = e^{-t}\frac{d}{dt}(e^{-(t-1)}u(t+1).$$

b) Identify the ROCs associated with z-transforms of the following :

i) $x(n) = \left(-\frac{1}{2}\right)^n u(-n) + 3\left(\frac{1}{5}\right)^n u(n)$

ii) $y(n) = \left(-\frac{1}{2}\right)^n u(n) + 7\left(\frac{1}{5}\right)^n u(n)$

Find the z-transforms and plot signals as well as ROCs. **8**

OR

4. a) Determine the inverse Laplace transform of

$$X(s) = \frac{2(s+2)}{s^2+7s+12} \quad \mathcal{R}e\ \{s\} > -3$$

Given that

$$e^{-at}u(t) \overset{L}{\longleftrightarrow} \frac{1}{s+a} \quad \mathcal{R}e\ (s) > \mathcal{R}e\ \{-a\}.$$ **8**

b) Determine for each of the following z-transform whether the corresponding signal has an approximately low pass, band pass or high pass characteristic. Also sketch the pole-zero plots.

i) $X(z) = \frac{z^{-1}}{1+\frac{8}{9}z^{-1}}, |z| > \frac{8}{9}$

ii) $X(z) = \frac{1}{1+\frac{64}{81}z^{-1}}, |z| > \frac{8}{9}$. **9**

5. a) Find the Fourier transform of the system output, if the input and system impulse responses are

i) $x(t) = 4e^{-1}u(t), \quad h(t) = 3e^{-2t}u(t)$

ii) $x(t) = \delta(t), \quad h(t) = \frac{1}{2}e^{-t/2}u(t).$ **8**

b) Determine the Fourier series representation of a square wave of unit amplitude and period T. (Assume even symmetry of square wave) **8**

OR

6. a) Prove the following properties of DTFT if

$$x(n) = \xleftrightarrow{\text{DTFT}} X(e^{j\omega})$$

i) $-jnx(n) \xleftrightarrow{\text{DTFT}} \frac{d}{d\omega}X(e^{j\omega})$

ii) $\sum_{k=-\infty}^{\infty} x(k)y(n-k) \xleftrightarrow{\text{DTFT}} X(e^{j\omega})$ **8**

b) State any eight properties of DTFT. **8**

SECTION – II

7. a) Define and explain

i) Power spectral density

ii) Auto correlation function. **8**

b) Determine the autocorrelation of the sequence x(n) = {1, 2, 3, 4, 7}. Use the graphical method. **9**

OR

8. a) Determine the autocorrelation function of
$x(t) = e^{-5t}u(t)$. Also find its energy spectral density. **9**

b) Determine the cross-correlation of
i) x(n) = {1, 2, 1, 1}, y(n) = {3, 2, 1, 1}
ii) x(n) = {1, 1, 3, 2}, y(n) = {4, 2, 1, 1} **8**

9. a) Define
i) Random variables ii) Distribution function
iii) Probability density function **9**

b) What are the properties of following ?
i) Distribution function ii) Probability density function **8**

OR

10. a) Define :
i) Mean ii) Moment
iii) Variance iv) Standard deviation **8**

b) Let X be a continuous random variable with pdf.

$$f_X(x) = \begin{cases} kx, & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$$

where k is constant.
i) Determine the value of k and sketch $f_x(x)$
ii) Find and sketch the corresponding cdf $F_x(x)$
iii) Find $P\left(\frac{1}{4} < X \le 2\right)$. **9**

11. a) Compare FDM and TDM. **8**

b) Explain the Sinusoidal Amplitude in detail with the help of neat diagram. **8**

OR

12. a) Compare narrow band frequency modulation and wide band frequency modulation. **8**

b) Explain PAM in detail. **8**

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T.E. (Instrumentation and Control) (Sem. – I) Examination, 2009
(2003 Course)
CONTROL SYSTEM COMPONENTS

Time : 3 Hours | Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Explain in detail various applications of D.C. series and shunt motors with justification. **8**

   b) Compare synchronous and induction motors. Also state applications of synchronous motor and induction motors. **6**

   c) Explain the characteristics of D.C. series motor. **4**

OR

2. a) A 230 V, 4 pole d.c. motor has armature circuit resistance of 0.5Ω. Find the back emf in the motor when armature current is 25 Amp. If armature winding is lap connected with 320 conductors and the useful flux per pole is 50 mwb, calculate speed. Assume suitable data if required. **8**

   b) Draw the neat schematic with proper labelling of : **8**

      i) D.C. series motors

      ii) D.C. shunt motors

      iii) D.C. compound motors.

   c) What is the significance of Back EMF ? **2**

3. a) Explain the construction and working of one type of stepper motor. Give its applications. **8**

   b) List different types of generator. Explain with neat sketch any one type of D.C. generator. **8**

OR

P.T.O.

4. a) Explain with neat sketch working principle of D.C. servomotor. State the features of servomotors. **8**

b) A shunt generator has field winding and armature winding resistance as 220Ω and 0.1Ω. The generator delivers a load of 5 kW at 220 V. Total iron losses and mechanical losses in generator are 250 W. Determine generator efficiency. **8**

5. a) Explain following with respect to relay :

i) Construction and working

ii) Various types

iii) Applications

iv) Selection criteria. **8**

b) Explain pressure switch in detail. Give its applications. **8**

OR

6. a) State any two practical industrial applications for each of the following : **8**

i) Selector switch

ii) Rotary switch

iii) Temperature switch

iv) DIP switch.

b) Explain following switches with diagram : **8**

i) Single Pole Single Throw (SPST)

ii) Double Pole Single Throw (DPST)

iii) SPDT – Single Pole Double Throw

iv) DPDT.

SECTION – II

7. a) What are different methods of breaking ? Explain forward and reverse rotation of motor and how it is achieved. **8**

b) Draw and explain an electrical wiring diagram for overload and short circuit protection. **8**

OR

8. a) What are interlocks ? Explain various interlocks in the lift application with wiring diagram. **8**

b) Explain Star-Delta starter. Give application of starter. **8**

9. a) Explain any four components of pneumatic system. **8**

b) List various types of cylinder. What is cushioning of air cylinder ? State its effects on the cylinder performance. **8**

OR

10. a) Explain with neat sketch working of time delay valve. Draw the pneumatic circuit using standard symbol. Give application of the same. **8**

b) Explain 3/2 way valve and 4/3 way valve with diagram. How it is interfaced with double acting cylinder ? **8**

11. a) Explain in brief meter in and meter out circuit with respect to Hydraulic System. **8**

b) It is required to have continuous reciprocation of double acting cylinder once start signal is applied. Design circuit diagram for the same. **10**

12. a) Explain various properties of oil to be used in hydraulic system. **6**

b) Compare pneumatic and hydraulic system. **4**

c) Explain hydraulic power supply in detail. **8**

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T.E. (Instrumentation and Control) (Semester – I) Examination, 2009
ANALYTICAL INSTRUMENTATION
(2003 Course)

Time : 3 Hours | Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate full marks.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) State the advantages and disadvantages of instrumental methods of analysis over classical method. **6**

   b) What is the principle of coulometry ? With neat diagram, explain the construction and working of instrumentation for constant current coulometry. **10**

OR

2. a) What is quantitative and qualitative analysis ? Explain it with reference to polarogram. **8**

   b) Give detailed classification of instrumental techniques of analysis. **8**

3. a) Calculate the thickness of the first order interference filter which uses a transparent film that has refractive index of 1.512 and that allows radiation of 528 nm to pass. **6**

   b) Explain the working of double beam optical null spectrophotometer with neat diagram. **10**

OR

4. a) What is the spectral bandwidth of exist slit of monochromator ? An optical system consist of slit 0.1 mm wide in a monochromator whose linear reciprocal dispersion is 1.6 nm/mm. Calculate the spectral bandwidth of exist slit. **6**

   b) List the detectors used in UV-VIS range. Explain working of high vacuum photoemissive cell with neat diagram. **10**

5. a) State the principle of bolometer. Draw the block diagram of the measurement system for bolometer and explain its working. **10**

   b) Explain inductively coupled plasma source with neat diagram. State its advantages. **8**

OR

6. a) Draw and explain the working of optical ray diagram of single beam littrow mounted IR spectrophotometer. Compare dispersive and non-dispersive IR spectrophotometer. **12**

   b) Explain discharge type automizer with condensing chamber and burner with neat diagram. **6**

SECTION – II

7. a) Draw the block diagram and explain the working of single beam spectrofluorometer. **6**

   b) Explain the functioning of pulsed Fourier transform NMR spectrometer with neat block diagram. **10**

OR

8. a) List out the detectors used in Raman spectrometer. Explain the detector used in single channel Raman spectrometer with neat diagram. **10**

   b) Explain the instrumentation for O_2 measurement with neat diagram. **6**

9. a) List out different ionization methods in mass spectrometry. Explain electron impact ion source along with ion accelerating system. **12**

   b) With neat diagram, explain electron capture detector. **6**

OR

10. a) What is the significance of mass spectrometer in gas chromatography ? Which mass analyzers are ideally used in coupled with gas chromatograph ? Explain any one with neat diagram. **12**

    b) Draw the block diagram of HPLC. List the detectors used in HPLC. **6**

11. a) Draw the schematic diagram for measuring ionising chamber. **8**

    b) Draw the functional diagram of X-ray generation tube and explain its working. **8**

OR

12. Write short notes on : **16**

    i) Abbe's Refractometer. **(8+8)**

    ii) Instrumentation for ESCA.

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T.E. (Instrumentation and Control) (Semester – I) Examination, 2009
ELECTRONIC INSTRUMENTATION
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section – **I** and **3** questions from Section – **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain working of RMS detector in digital multimeter with neat diagram. **8**

b) Short note on peak reading voltmeter. **6**

c) Explain parallel connection of Q. meter. **4**

OR

2. a) With the help of neat block diagram explain working of Automatic Test equipment. **8**

b) Determine crest factor for sine, square and triangular waveform when peak to peak voltage is 4 volts. **6**

c) Explain following terms with respect to RMS meter :

i) RMS value

ii) Average value. **4**

3. a) Explain sampled sine wave synthesizer with neat block diagram. **8**

b) Explain following pulse characteristics with neat diagram. **8**

i) Pulse rise time

ii) Pulse droop

iii) Duty cycle

iv) Pulse repetition rate

OR

4. a) Explain triangular to sine wave converter using biased diode network. **8**

b) Explain pulse generator using active circuits with neat diagram. **8**

5. a) Explain practical set up for measuring contact change over time of relay using digital storage oscilloscope with waveform. **8**

b) Explain following terms in oscilloscope

i) Vertical sensitivity

ii) Post deflection Acceleration. **4**

c) Explain following modes in DSO

i) Pre trigger Mode

ii) Roll Mode. **4**

OR

6. a) Explain sampling oscilloscope with neat block diagram. **8**

b) Explain following probes in C.R.O.

i) High resistance passive divider probe

ii) Active voltage probe. **8**

SECTION – II

7. a) Determine conversion time for 16 bit ADC if clock frequency is 10 KHz. **2**

b) Explain successive approximation type ADC with timing diagram. **12**

c) An 8 bit DAC has V_{ref} = 5 volts. Calculate output voltage when B_{in} = 10110100. Find also V_{LSB}. **4**

OR

8. a) Explain flash type of ADC with its advantages and disadvantages. **10**

b) Short note on data loggers. **4**

c) Explain following terms w.r. to ADC

i) Series Mode rejection

ii) Accuracy. **4**

9. a) Explain digital capacitance meter with neat block or circuit diagram. **8**

b) Explain significance of $3\frac{3}{4}$ digit, $4\frac{1}{2}$ digit and $4\frac{4}{5}$ digits in digital instrument. **6**

c) Explain totalizing mode of universal counter. **2**

OR

10. a) Explain following sources of errors in universal counter.

i) Trigger error

ii) Time base error. **4**

b) Explain working principle of Temperature Compensated Crystal Oscillator (TCXO) with block schematic. **8**

c) Short note on automatic ranging in digital instrument. **4**

11. Write short note on (**any 2**) : **16**

 1) Logic Analyzer.

 2) Distortion meter.

 3) Frequency division multiplexing.

OR

12. a) What is telemetry ? Explain

 i) Land line telemetry

 ii) Radio frequency telemetry. **6**

 b) Short note on virtual instrumentation. **4**

 c) What is modulation ? Explain amplitude shift keying in brief. **6**

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T.E. (Instrumentation & Control) (Semester – II) Examination, 2009
DIGITAL SIGNAL PROCESSING
(2003 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Consider the FIR filter $y[n]=x[n]-x[n-4]$.

i) Compute and sketch its magnitude and phase response.

ii) Compute its response to the input

$$x[n]=\cos\frac{\pi}{2}n+\cos\frac{\pi}{4}n \qquad -\infty<n<\infty$$

iii) Explain the results obtained in part (ii) in terms of the magnitude and phase responses obtained in part (i). **8**

b) Derive an expression for the steady state and transient response to sinusoidal input signal. **4**

c) Explain the effect of finite word length in digital filter. **4**

OR

2. a) Explain the pole-zero patterns for several low-pass and high-pass filters. **4**

b) Determine the direct form-II realization for each of the following LTl systems. **4**

i) $2y[n]+y[n-1]-4y[n-3]=x[n]+3x[n-5]$

ii) $y[n]=x[n]-x[n-1]+2x[n-2]-3x[n-4]$

P.T.O.

c) Determine the frequency response $H(\omega)$ of the following moving average filters. **8**

i) $y[n] = \frac{1}{2M+1} \sum_{K=-M}^{M} x[n-k]$

ii) $y[n] = \frac{1}{4M} x[n+M] + \frac{1}{2M} \sum_{K=-M+1}^{M+1} x[n-K] + \frac{1}{4M} x[n-M]$

3. a) State and prove following properties for DFT **8**
   i) Circular frequency shift
   ii) Circular convolution.

   b) The first five points of the eight-point DFT of a real-valued sequences are $\{0.25, 0.125 - j0.3018, 0, 0.125 - j0.0518, 0\}$. Determine the remaining three points. **6**

   c) Let X(k), $0 \le k \le N-1$, be the N-point DFT of the sequence x[n], $0 \le n \le N-1$. We define

$$\hat{X}(k) = X(k) \qquad 0 \le k \le k_c, \; N - k_c \le k \le N-1$$
$$= 0 \qquad k_c < k < N - k_c$$

   and we compute the inverse N-point DFT of $\hat{X}(k)$, $0 \le k \le N-1$. What is the effect of this process on the sequence $x[n]$? Explain. **4**

OR

4. a) Let $x_p[n]$ be a periodic sequence with the fundamental period N. Consider the following DFTs. **6**

$$x_p[n] \xleftrightarrow[N]{DFT} X_1(k)$$

$$x_p[n] \xleftrightarrow[3N]{DFT} X_3(k)$$

   i) What is the relationship between $x_1(k)$ and $x_3(k)$?
   ii) Verify the results in part (i) using the sequence

$$x_p[n] = \{\ldots, 1, 2, 1, \underset{\uparrow}{2}, 1, 2, \ldots\}$$

   b) Create a DFT coefficient table that uses only $N/4$ memory locations to store the first guadrant of the sine sequence (assume N even). **2**

c) Compute 8-point DFT of the sequence

$$x[n] = 1 \qquad 0 \le n \le 7$$
$$= 0 \qquad \text{elsewhere}$$

by using decimation-in-frequency FFT algorithm. **10**

5. a) Design a FIR linear phase digital filter approximating the ideal frequency response **10**

$$Hd(\omega) = 1 \qquad |\omega| \le \pi/6$$
$$= 0 \qquad \pi/6 < |\omega| \le \pi$$

i) Determine the coefficients of a 25-tap filter based on the window method with rectangular window.

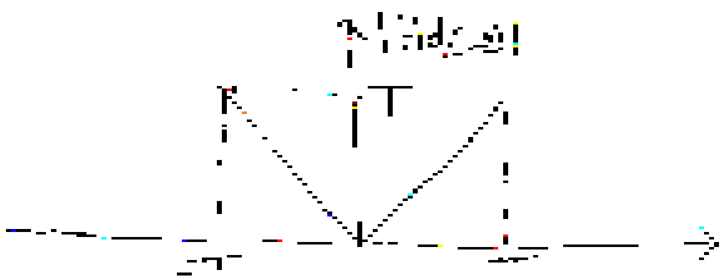
ii) Determine and plot magnitude and phase response of the filter.

b) Show that for a linear phase FIR filter $\sum_{n=0}^{m-1} h[n]\sin(\omega_\tau - \omega_n) = 0,$ assume filter length 'g'. **6**

OR

6. a) Explain the design of FIR differentiator. **4**

b) Use the window method with a Hamming window to design 21-tap differentiatorr as shown in Fig. Compute and plot the magnitude and phase response of the resulting filter. **12**



SECTION – II

7. a) Compare FIR and IIR filters. **4**

b) Determine the order of filter for following specifications :

$\alpha_p = 1$ dB, $\Omega_p = 400$ rad/sec

$\alpha_s = 25$ dB, $\Omega_s = 500$ rad/sec **6**

c) An analog filter has a transfer function, $H(s) = \dfrac{10}{s^2 + 7s + 10}$

Design a digital filter using impulse invariant method ($T_s = 1$ sec). **8**

OR

8. a) Design a Chebyshev filter with a maximum passband attenuation of 3.5 dB at passband Frequency = 30 rad/sec and stopband frequency = 50 rad/sec for stopband attenuation of 25 dB. **12**

b) Compare different types of IIR filters. **6**

9. a) List out the salient features of TMS320C67XX processor (any eight). **8**

b) Draw the main block diagram of TMS320C67XX processor architecture. **8**

OR

10. a) List out the salient features of TMS320C67XX processor (any eight). **8**

b) Draw the schematic/block diagram of TMS320C67XX processor. **8**

11. a) Explain any one application of digital signal processor in detail. **8**

b) Explain the various datatypes of TMS320C67XX processor. **8**

OR

12. a) List out the Four features of Instruction set of TMS320C67XX. **8**

b) Write an ASM program to generate square wave using TMS320C67XX. **8**

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T.E. (Instrumentation and Control) (Semester II)Examination, 2009
PROCESS PLANT OPERATION
(2003 Course)

Time : 3 Hours | Max. Marks : 100

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

SECTION – I

1. a) Explain importance of pumps and compressors in process industries. **8**

   b) Explain the concept of unit operations and unit processes with examples. **8**

OR

2. a) Explain distillation and drying in detail. **8**

   b) Explain extraction and absorption in detail. **8**

3. What is kinetics, explain it in detail ? Also explain the rate of reaction and different factors affecting it. **16**

OR

4. Explain different types of reactors in detail. Derive the performance equation of CSTR. **16**

5. Explain the concept of Heat transfer and Mass transfer with examples in detail. **18**

OR

6. Write short notes on : **18**
   i) Condensers and evaporators
   ii) Types of Dryers
   iii) Heat Exchangers.

P.T.O.

SECTION – II

7. Explain different types of settling in detail. **16**

OR

8. Explain different types of size reduction in detail. Also explain different types of separators. **16**

9. Explain the concept of corrosion and protection from corrosion in detail. **16**

OR

10. Explain different types of testing machine in detail. **16**

11. Explain with flow sheet about manufacturing of cement. **18**

OR

12. Draw flow sheet of sugar manufacturing and explain it in detail. **18**

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T.E. (Instrumentation and Control) (Semester – II) Examination, 2009
PROCESS LOOP COMPONENTS (2003 Course)

Time: 3 Hours Total Marks: 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Design signal conditioning circuit for Pt – 100 for a temperature range of 0-150°C to provide 4.20 mA output signal. **12**

b) Draw typical process loop system and explain following terms : **6**

i) Set point ii) Process variable

OR

2. a) Explain various standard signals used in process industries. Explain the concept of field area and control room area. **6**

b) Design a signal conditioning circuit for a sensor whose output range is 0 to 250 mV with linear variation in temperature. The circuit must provide very high input impedance with 0.5 V dc output. **12**

3. a) Explain the difference between transmitter and converter. Give the application of I-P converter. **8**

b) Draw and explain block diagram of SMART transmitter. Write specification of SMART transmitter. **8**

OR

4. a) Explain difference between two wire and four wire transmitters. Also draw suitable diagram for each type. **8**

b) Explain the use of DPT for level measurement. Explain zero elevation and zero supression. **8**

P.T.O.

5. a) What is meant by tunning of controller ? What are different methods of tunning ? Explain any one method in detail. **8**

   b) Explain block diagram of digital controller. Explain front facia of digital controller. **8**

OR

6. a) Explain ON-OFF control action in detail. Give its suitable application. **8**

   b) What is reset windup ? How to overcome reset windup ? **8**

SECTION – II

7. a) How PLC can be interfaced to pneumatic systems. Develop ladder diagram for forward and reverse motion of double acting cylinder using two limit switches. **12**

   b) Explain following terms with respect to PLC :
   i) Scan time ii) Programming techniques iii) I/P module. **6**

OR

8. a) Develop ladder diagram for the following application : **12**
   On activation of START push button, a motor and lubricating pump turns ON at the same time. When the operators STOP push button the motor must turn OFF immediately. The lubricating pump will turn OFF only affer a delay of 10 sec. Explain timing diagram.

   b) Give examples of Analog input, Analog output for PLC. Explain various timers used in PLC. **6**

9. a) Explain following terms with respect to control valve :
   i) Valve coefficient ii) Turndown
   iii) Guiding iv) Valve trim. **8**

   b) Compare the following :
   i) Single seated and double seated. **8**
   ii) Air to open and Air to closed valve.

OR

10. a) Explain with neat sketch the working of globe valve. State its advantages and disadvantages and its application. **8**

b) Explain different control valve characteristic. Why installed characteristics are different from inherent characteristics ? **8**

11. a) Explain various types of feeders used in process control with their necessity. **8**

b) Explain various ways to make an instrument suitable for operation in hazardous area. **8**

OR

12. a) Write note on (**any two**): **16**

i) Computing Relays

ii) Intrinsic Safety

iii) Flow Totalizer.

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T.E. (Instrumentation & Control) (Semester – II) Examination, 2009
INSTRUMENT SYSTEM DESIGN
(2003 COURSE)

Time : 3 Hours Max. Marks :100

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

SECTION – I

1. A) Explain procedures to test prototype board also explain “pliot Run”. **10**
B) Explain Consumer products with Industrial products development stages. **6**

OR

2. A) What is the need for standards ? Explain ANSI standards. **6**
B) What is ‘Ergonomics’, explain physical cognitive ergonomics ? **10**

3. A) What is “Tribo-electric” effect and explain ESD protection in equipments like keyboards and control panels design ? **8**
B) Explain contact noise in details. **4**
C) Explain effect of shield on capacitor coupling. **4**

OR

4. A) Explain advantages, disadvantages and applications of “Hybrid” ground. **8**
B) Compare ESD versus EMC. **4**
C) Explain why secondary shields may be needed between sensitive circuits and the chussis to prevent capacitive coupling from upsetting the circuit. **4**

P.T.O.

5. A) With the help of basic circuit connection explain working of precision voltage-to-current converter XTR-110, explain external transistor use for the same with an example. **18**

OR

6. A) Explain IL 300 as a photoconductive isolation amplifier. **10**

B) Draw the circuit of AD 595 to drive LED for alarm directly. **8**

SECTION – II

7. A) Draw and explain CMOS Micro power "phase-locked loop" IC CD 4046 B as a frequency synthesis. **18**

OR

8. A) With the help of any one example explain the use of darlington transistor array IC ULN 2803. **18**

9. A) Why PCB should have the proper value of wave impedance "ZW", explain "Reflection" problem if digital PCBs are not properly designed ? **8**

B) What are the advantages and disadvantages of "Solder Mask" ? **6**

C) What is the composition of "Tin-Lead-Silver" solder alloys ? **2**

OR

10. A) Why to use flux at the time of soldering, explain "Non-Corrosive" fluxes ? **6**

B) What is the principle of soldering explain wetting and dihedral angle of Molten solder ? **6**

C) What is flexible printed circuit boards ? **4**

11. A) What is a definition of reliability, explain degree of failure ? **8**

B) Explain failure rate verses time (Bathtab-Curve) under failure modes. **8**

OR

12. A) Explain methods used for calibration and its need for consumer products. **8**

B) Explain virtual instrumentation and its used in industrial products development, testing etc. **8**

———————

T.E. (E & TC./Electronics, Indl. Elex.) (Sem. – II) Examination, 2009
LINEAR INTEGRATED CIRCUITS (Old)
(1997 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Explain with internal circuit diagram working of Norton Amplifier in inverting mode. **6**

   b) Design an inverting Norton Amplifier for a gain of 12 using LM 3900. Use 9 V single power supply. Input impedance be 100KΩs, lower cut off frequency 100 Hz and load impedance of 20 KΩs. Assume source impedance zero ohms. **10**

2. a) Discuss with the help of block schematic the principle of operation of PLL.

   b) Explain the terms "Lock range" and "Capture range". State the factors governing these ranges.

   c) Draw a circuit of typical "Voltage Controlled Oscillator" and explain it's operation. **16**

3. (Ref. fig.01)
   A_1 and A_2 are the gains of OP-AMP 1 and 2 respectively, at the operating frequency. Assuming initially, that the OP-AMP 1 and 2 are ideal,

   1) Describe the function of the given circuit .

2) Draw the wave forms at indicated points 1,2,3, for sinusoidal signal at during the positive and negative half cycles.

3) Derive the expression for gain,

$$A_p = \frac{V_o}{V_{in}} \text{ When } V_{in} > 0$$

4) Derive the expression for gain,

$$A_n = \frac{V_o}{V_{in}} \text{ When } V_{in} < 0$$

5) Derive the condition, to be satisfied by RK's (K=1,2,3,4,5) so that $|A_p| = |A_n| = A_o$

6) If the resistors R_K (K=1,2,3,4,5) Vary by $\pm$ P %, then show that the maximum percentage difference in gain

$$\frac{A_p - A_n}{A_o} \times 100 \text{ is } 800p$$

7) Hence find out the tolerance of the resistors R_K, to be specified for 1% overall error in the output amplitudes during positive and negative half cycles of input signal. You may make suitable approximations, if needed. **16**

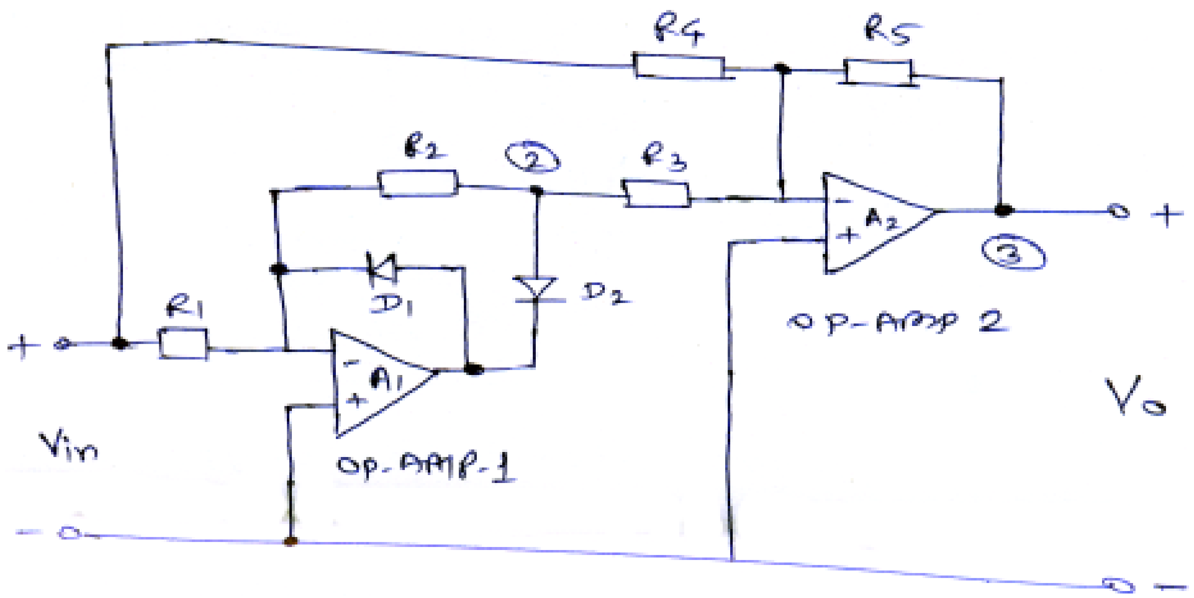

Fig. 01

4. a) Define a power factor of a load in utility. **2**

b) Explain with the help of neat diagram, how a multiplier with the transfer function $V_o = \frac{V_x . V_y}{V_{ref}}$. can be used to measure the power factor of a load. Explain how calibration can be done. Derive the expressions you may use. **10**

c) For an OP-AMP, the values of R_1 and R_f are 1KΩ and looK Ω respectively. It is an inverting amplifier. Its output offset drift is $\frac{dV_{os}}{dT} = 10\mu v / °_C$

Its input offset current drift is $\frac{dI_{io}}{dT} = 0.5\ nA / °_C$

The amplifier was nulled at 25° **C**

Calculate the error voltage E_r at 45° **C** Refer Fig.2

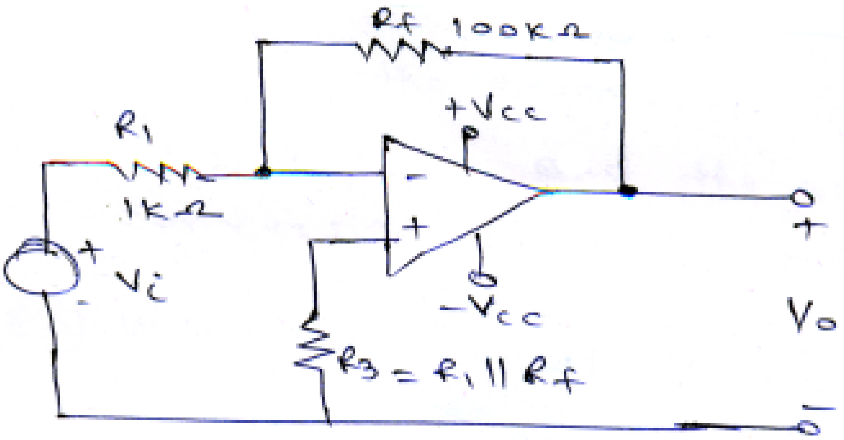

Fig. 2 **4**

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

i) Wilson current mirror

ii) Precision rectifier

iii) Programmable gain amplifier

iv) Sample and Hold circuit

v) PID controller.

SECTION – II

6. a) Explain I to V converter with the help of an application for D to A converter. **8**

b) Derive an expression for output voltage of a Log-ratio amplifier and explain its working with the help of circuit diagram. **8**

7. a) Draw a neat block diagram of the internal circuitary of VCO IC566. **4**

b) Explain the operation of VCO IC566. **4**

c) Derive the expression for the centre frequency f_o and the voltage to frequency conversion ratio $K_v = \dfrac{\Delta f_o}{\Delta V_c}$ **8**

8. a) With neat circuit diagram, explain the operation of "Dual slope" analog to digital converter. **8**

b) Op-amp 741 is to be used as free running oscillator with a square wave output of 2KHz frequency. The duty cycle of the waveforms should vary 10% to 90% and amplitude of square wave should be 10V peak to peak. Draw the circuit diagram and calculate the values of components if capacitor used is of 0.1 μ fd. **8**

9. a) Describe an FSK generator using IC 555. **6**

b) Design FSK circuit employing IC 555 and a transistor for switching between two frequencies f_1 = 1070Hz, f_2= 1270 Hz use a timing capacitor C_T=0.01 μf. **4**

c) A photodiode, when illuminated at zero LUX produces 0.1 μ Amp. and 50 LUX, it produces 5 μ Amp. current through the photodiode. Design a circuit for producing 1 Volt output change from zero LUX intensity to 50 LUX intensity. **6**

10. Write short note on (**any three**) : **18**

1) Trans conductance Amplifier
2) Wein bridge oscillator
3) LM 380 audio power amplifier with A_{CL} = 70
4) IC 555 as a PWM modulator
5) Equalizer circuits.

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T.E. (Printing) (Semester – I) Examination, 2009
(2003 Course)
PRINTING PROCESS INSTRUMENTATION

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****.*
*6) Solve Q.****1*** *or Q.****2****, Q.****3*** *or Q.****4****, Q.****5*** *or Q.****6*** *from Section* ***I****, and solve Q.****7*** *or Q.****8****, Q.****9*** *or Q.****10****, Q.****11*** *or Q.****12*** *from Section* ***II***

SECTION – I

1. a) Define the term automatic control system. With neat diagram and suitable example explain closed loop control system. **10**

b) Give comparison between pneumatic, hydraulic and electronic systems. **8**

OR

2. a) Explain the following terms

i) Accuracy

ii) Reproducibility

iii) Threshold

iv) Dead zone

v) Resolution. **10**

b) Define the term servomechanism. Explain it with suitable example. **8**

3. a) An RTD has α_0 = 0.005/°C, R = 500Ω and dissipation constant of 30 mw/ °C at 20°C. The RTD is used in bridge circuit such as $R_1 = R_2$ = 500 Ω and R_3 a variable resistance used to null the bridge. If the supply voltage is 10 volts and RTD is placed in ice bath at 0°C find the value of R_3 to null the bridge. **8**

b) Explain in detail construction and working of rotameter. **8**

OR

4. a) With suitable diagram explain LVDT type accelerometer. **8**

   b) List the different methods for humidity measurement. Explain any one in detail. What is the significance of humidity in printing applications ? **8**

5. a) Explain in detail working of LDR. Which materials are used for construction of LDR ? **8**

   b) With neat diagram explain optocoupler. Explain its role in printing applications. **8**

OR

6. a) What do you mean by signal conditioning ? Explain in detail inverting amplifier configuration. **8**

   b) Explain first order high pass filter in detail. Explain the term cut off frequency. **8**

SECTION – II

7. a) Define the following terms :

      i) Process Equation

      ii) Process Load

      iii) Process Lag

      iv) Control Lag

      v) Degree of freedom. **10**

   b) With suitable example explain final control operation. **8**

OR

8. a) With suitable example explain on-off controller. What are the limitations of on-off controller ? **10**

   b) Why integral controller is called reset controller ? How integral controller will eliminate offset ? **8**

9. a) With suitable equation and diagram explain electronic proportional plus derivative controller. **8**

   b) Explain pneumatic PID controller. **8**

OR

10. a) With neat diagram explain microprocessor based flow control system. **8**

    b) Explain electronic proportional controller in detail. **8**

11. a) Define the term PLC. List the specifications of PLC. Explain the architecture of PLC. **8**

    b) Explain advantages of PLC over relay logic controller. **8**

OR

12. a) With suitable assumptions draw the Ladder diagram for washing machine system. **8**

    b) Explain in detail the term SCADA. **8**

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T.E. (Printing) (Semester – I) Examination, 2009
REPROTECHNIQUES
(2003 Course)

Time : 3 Hours   Max. Marks : 100

SECTION – I

1. State the basic elements of an artwork essential for good reproduction. **16**

OR

1. Classify originals and explain their characteristics in detail. **16**

2. Discuss Halftone concept in detail. **16**

OR

2. Discuss the following :

   1) Screen ruling   2) Screen angle

   3) Moire   4) Conventional dot formation theory. **16**

3. Evaluate amplitude modulation and state the advantages/disadvantages. **18**

OR

Explain the relationship of screen factor with substrate properties. **18**

SECTION – II

4. Explain the structure of lith film emulsion and manufacturing process. **18**

OR

4. Describe in detail autoprocessor structure and working. **18**

P.T.O.

5. Discuss frequency modulation dots in detail. **16**

OR

5. Compare frequency modulation with amplitude modulation in detail. **16**

6. Explain importance of control strip and discuss elements in detail. **16**

OR

6. Describe structure and working of densitometer. **16**

T.E. (Printing) (Semester – I) Examination, 2009
(2003 Course)
DESIGN OF PRINTING MACHINE COMPONENTS

Time : 3 Hours Max. Marks : 100

*N.B. :1) **All** questions are **compulsory**.*
*2) Assume suitable data if **necessary**.*

SECTION – I

1. a) What are the important considerations in selection of material in design ? **8**

b) Write a note on : **8**

i) Creativity in design ii) Tolerance.

OR

1. a) What are the differences between the properties of brittle and ductile materials ? **8**

b) Write a note on : **8**

i) Types of fits

ii) Limits system and bases.

2. a) Explain the term factor of safety and factors to be considered while selecting a factor of safety. **8**

b) A knuckle joint is subjected to an axial load of 100 KN. Determine the diameter of knuckle pin consideration the load to be uniformly distributed over the pin in the eye and uniformly varying over the portion of pin in forks. Use the following data :

i) Allowable tensile and compressive stress for pin = 600 N/mm^2.

ii) Allowable shear stress for pin = 300 N/m^2.

iii) Allowable bearing pressure for pin = 200 N/mm^2.

iv) Thickness of eye = 1.5 × pin diameter.

v) Total fork thickness = eye thickness. **8**

OR

2. Design a cotter joint to transmit a load of 100 KN in tension or compression. Assume following stresses for socket, spigot and cotter.
   i) Allowable tensile stress = 90 N/mm^2
   ii) Allowable crushing stress = 170 N/mm^2
   iii) Allowable shear stress = 60 N/mm^2. **16**

3. a) Explain ASME code for design. **8**

   b) A 45 mm diameter shaft is made of steel with a yield strength of 400 MPa. A parallel key of size 14 mm wide and 9 mm thick made of steel with a yield strength of 340 MPa is to be used. Find the required length of key, if the shaft is loaded to transmit the maximum permissible torque. Use maximum shear stress theory and assume a factor of safety of 2. **10**

OR

3. Two 35 mm shafts of printing machine are connected by a flanged coupling. The flanges are fitted with 6 bolts on 125 mm bolt circle. The shaft transmit a torque of 800 N-m at 350 rpm. For the safe stresses mentioned below, calculate
   1) Diameter of bolts
   2) Thickness of flanges
   3) Key dimensions
   4) Hub length
   5) Power transmitted. **18**

SECTION – II

4. a) Derive a relation for torque required to raise the load and lowering the load against thread friction. **8**

   b) The lead screw of a lathe has ACME threads of 60 mm outside diameter and 8 mm pitch. It supplies drives to a tool carriage which needs an axial force of 2000N. A collar bearing with inner and outer radii as 30 mm and 60 mm respectively is provided. The coefficient of friction for screw threads is 0.12 and for collar it is 0.1. Find the torque required to drive the screw and the efficiency of the screw. If the lead screw rotates at 30 rpm, find the power required to drive the screw. **8**

OR

4. a) A power screw having double start having square threads 25mm nominal diameter and 5 mm pitch is acted upon by axial load of 10 KN. The outer and inner diameter of screw collar are 50 mm and 20 mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.2 and 0.15 respectively. The screw rotates at 12 r.p.m. Assuming uniform wear condition at the collar and allowable thread bearing pressure of 5.8 N/mm^2, find :

   1) The torque required to rotate the screw

   2) The stress in the screw

   3) The no. of threads of nut in engagement with screw. **16**

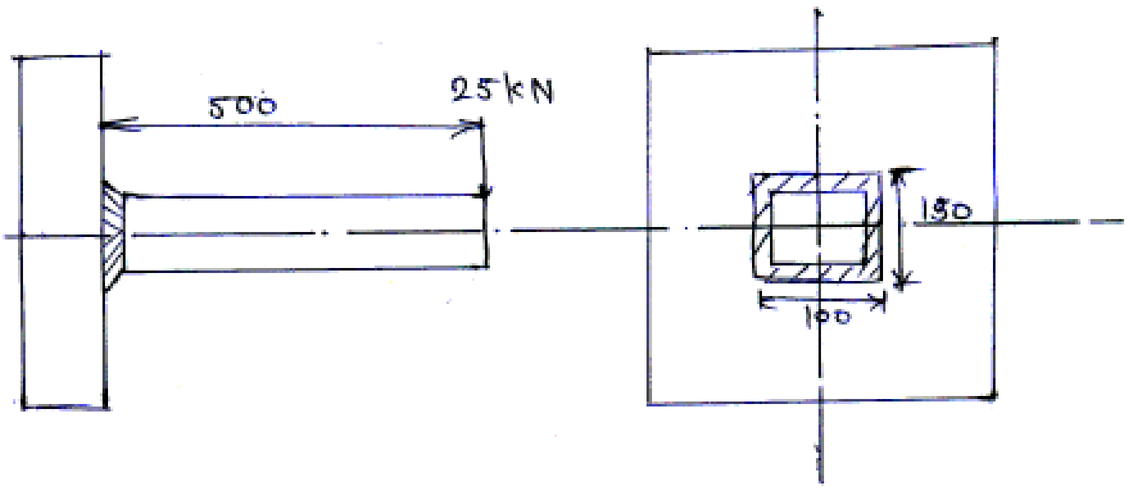
5. a) Explain advantages and limitations of welded joint. **8**

   b) A 50 mm diameter solid shaft is welded to a flat plate by 10 mm fillet weld. Find maximum torque that the welded joint can sustain if the maximum shear stress intensity in the weld material is not to exceed 80 MPa. **8**

OR

5. a) What are the different types of stresses included in screw thread ? **8**

   b) A rectangular cross section bar is welded to a support by means of fillet welds as shown in fig.



Determine the size of the welds is limited to 75 MPa. **8**

6. a) Derive the relation for deflection of Helical torsion spring. **8**

b) Design a spring for balance to measure 0 to 1000 N over a scale of length 80 mm. The spring is to be enclosed in a casing of 25 mm diameter. The approximate number of turns is 30. The modulus of rigidity 85 KN/mm^2. Also calculate the maximum shear stress induced. **10**

OR

6. a) Derive load stress equation for Helical spring. **8**

b) A mechanism used in printing machinery consists of a tension spring assembled with a preload of 30 N. The wire diameter of spring is 2 mm with a spring index of 6. The spring has 18 active coils. The spring wire is not drawn and oil tempered having following material properties.

1) Design shear stress = 680 N/mm^2
2) Modulus of rigidity = 8×10^4 N/mm^2

Determine

1) The initial shear stress in the wire
2) The spring rate and
3) The maximum force the spring can take. **10**

T.E. Printing (2003 Course) (Semester – I) Examination, 2009
TECHNOLOGY OF PRINT FINISHING AND PACKAGING

Time : 3 Hours Total Marks : 100

Instructions : ***All*** *questions are* ***compulsory****. Answer* ***A*** *or* ***B*** *from* ***each*** *question. Illustrations should be drawn* ***wherever*** *necessary.* ***Use*** *of colours permitted* ***wherever*** *necessary.*
Start ***each*** *question on a* ***fresh*** *page.*

SECTION – I

1. A) Explain the following terms in brief (**3-4** lines only) **any 9** : **18**

a) folder
b) limp binding
c) hard case
d) edge decoration
e) sewing over gauze
f) collating marks
g) foil stamping
h) library binding
i) nipping press
j) pulpboard
k) shrink wrapping
l) marbling
m) perforation
n) creasing

OR

1. B) A brochure as under is to be printed and bound **18**

Brochure of 64 pages Copies 60000

Size 7” × 9” inches

To be printed in 4 Colours

Paper to be used 30” × 40” 51.0 kg Art Paper. Rate Rs. 72.6 per kg

Printed on 30 × 40 machine

Wire stitched with 2 pins

Find the following :

Total cost of

1) Total quantity of Paper required including 6% wastage and
2) Cost for the same
3) Folding @ Rs. 60 per 1000
4) Collating/Gathering @ Rs. 50 per 1000 forms/signatures
5) Wire Stitching @ Rs. 55 per 1000 staples
6) Cutting @ Rs. 175 per 1000 copies
7) Packing @ Rs. 8 per 25 copies

2. A) What processes are covered under "Print Finishing" ? **16**

OR

2. B) Explain the working of a Programmed Paper cutting machine. **16**

3. A) What are the various methods of fastening pages together ? **16**
Explain the production of a Centre Stitched Booklet.

OR

3. B) What is imposition in relation to folding ? **16**
Explain with a diagram - 16 page Landscape imposition of work and turn.

SECTION – II

4. A) What are the various types of packaging used ?
Explain any one in detail. **18**

OR

4. B) What are the substrates and materials used in manufacture of Printed Cartons ? **18**

5. A) Prepare a Layout for a folding box having the final dimensions as under
6.5 inches × 3.4 inches × 2.3 inches height
box should be two piece i.e bottom and top cover
show both cutting and creasing **16**

OR

5. B) In a punching die used for a carton what are the various types of materials used ? How is such a die produced ? **16**

6. A) Give reasons for the following **any 4** : **16**

1) Use of Multi layer Corrugated Boxes, advantages thereof
2) Use of Thermocole
3) Brand Security with relation to packaging, the role of a printer in this
4) Disposal of packaging at the Printers. Security aspect.
5) Other types of packaging other than paper/boxboard
6) Various types of closures used
7) Considerations when designing a box

OR

6. B) When you prepare a die for punching ? What are the considerations needed to be taken care of in respect of ? **16**

Total Pressure required for punching considering the following

1) Cutting pressure required is 40 Kg per running centimetre
2) Creasing pressure required is 30 kg per centrimetre

How will you determine the machine on which this die can be used ?

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B/II/09/200

T.E. Printing (2003 Course) (Sem. – II) Examination, 2009
SURFACE PREPARATION – I

Time : 3 Hours Total Marks : 100

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*

SECTION – I

1. Define Imposition. Explain Imposition scheme for 16 pages Portrait printed Work and Turn. **18**

OR

State and explain various methods of Film Planning. **18**

2. A) Explain Deep Etch plate making in detail and state its advantages. **8**

B) Comment on "Lacquor Application". **8**

OR

A) State and explain various illuminants used in plate making. **8**

B) Write notes on : **8**
i) Dark Reaction
ii) Desensitization.

3. Explain Toray Waterless plate in detail. **16**

OR

Explain Diffusion Transfer plate in detail. **16**

P.T.O.

SECTION – II

4. Explain laser plate making in detail. **18**

OR

What is Ctp ? State and explain any two types of plates used in Ctp. **18**

5. Comment on Mesh selection for screen printing. **16**

OR

State and explain various methods of screen preparation. **16**

6. State and explain various Quality Control aids used in conventional plate making. **16**

OR

Discuss Quality Control in Ctp. **16**

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T.E. (Printing) (Semester – II) Examination, November 2009
OFFSET MACHINES – I
(2003 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.*

SECTION – I

1. a) Describe functions of plate clamp. **8**
   b) Draw the figure of automatic plate changing and describe the process. **10**

OR

   a) State function of Impression cylinder. **8**
   b) Explain pressure setting between blanket and impression and state its importance. **10**

2. a) State different roller materials found on offset machine inking system. **4**
   b) Describe their functions. **4**
   c) Describe ink metering. **8**

OR

2. Write short notes on : **16**
   a) Roller diameters.
   b) Forme rollers
   c) Ink path
   d) Ceramic coated duct roller.

3. a) State any 3 types of modern dampening systems. **12**
   b) State different roller materials used in dampening system. **4**

OR

3. a) State importance of fountain solution and addition of alcohol. **8**
   b) State and explain properties of fountain solution affecting print quality. **8**

P.T.O.

SECTION – II

4. a) Explain stream feeder with neat diagram. **10**

   b) What are functions of conveyor tapes and side lay ? **8**

OR

4. a) Describe delivery section of single sheet feeding offset machine. **10**

   b) Describe infeed section. **8**

5. What is premakeready and makeready operations in offset printing ? **16**

OR

Describe latest developments in offset press. **16**

6. Explain press room maintenance. **16**

OR

State and describe waste generated from platemaking and press room. **16**

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T.E. (Printing) (Sem. – II) Examination, 2009
DIGITAL COLOUR IMAGING & COLOUR MANAGEMENT
(2003 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.*

SECTION – I

1. Solve **any two** :

1) What is the difference between illuminent and source ?
Explain D50 and D 65 with spectral power distribution graph. **9**

2) Explain human vision mechanism with neat diagram. **9**

3) Explain Additive and substractive colour synthesis with their application. **9**

2. Solve **any four** : **16**

1) Trapping.
2) Reflection densitometer.
3) Gray balance.
4) Transmission densitometer.
5) Hue error and greyness.
6) Dot area and dot gain.

3. Solve **any two** :

1) What is colour management ? Why it is required ? **8**
2) Explain the function and structure of spectrophotometer. **8**
3) Explain close loop and open loop system with neat dig. **8**

P.T.O.

SECTION – II

4 a) What is Profile ?

Write down the different factors considered for monitor profile. **10**

OR

a) Explain Input and Output profile. **10**

b) Solve **any two** : **8**

1) Gamut mapping.
2) ICC.
3) CMM.
4) Device link.

5. Answer **any two** :

1) Explain perceptual and absolute rendering Intents. **8**
2) Explain the different stages for press standardization. **8**
3) Explain relative and saturation rendering Intent with neat dig. **8**

6. Explain **any two** : **16**

1) Different types of Image setter.
2) Digital printing.
3) Soft proofing and hard proofing.
4) Digital photography.

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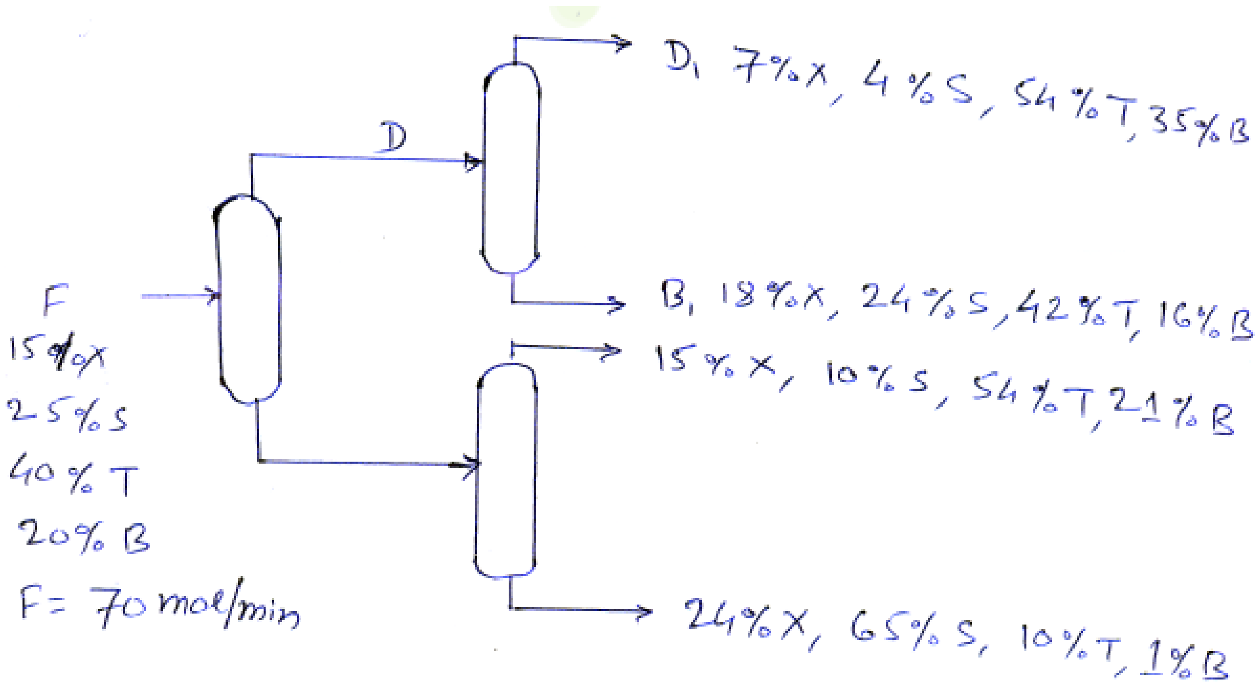
T.E. (Chemical) (Semester – I) Examination, 2009
CHEMICAL ENGINEERING MATHEMATICS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, **if necessary**.*

SECTION – I

1. Xylene, Styrene, Toulene, Butane are to be separated with array of distillation column that is shown below where F, B, D, B_1, B_2 and D_2 are molar flowrates in moles/min.



P.T.O.

a) Calculate molar flowrates of streams B_1, D_1, B_2 and D_2.

b) Calculate molar flowrates and composition of B, D. **18**

OR

2. a) State the convergence criteria for the Gauss Seidal method. **9**

b) Find eigen values and eigen vectors of the matrix

$$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$$ **9**

3. a) Give the graphical interpretation of Newton-Raphson method and obtain

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$ **8**

b) Solve $x^3 - 2.5x^2 + 3x - 1.8 = 0$ by Newton-Raphson method. **8**

OR

4. a) The table below shows temperature as a function of time **8**

t	1	2	3	4	5	6	7
T	81	75	80	83	78	70	60

where t denotes time and T denotes Temperature. Use Simpsons $\frac{3}{8}$ rule to estimate $\int_1^7 f(t)dt$.

b) Explain three error sources in computations. **8**

5. Solve $\frac{d^2y}{dx^2} + y = 0$ with boundry conditions

$y = 0$ when $x = 0$
$y = 0$ when $x = 1$
Find y at $x = 0.5$. **16**

OR

6. Solve the boundry value problem $\frac{d^2y}{dx^2} - 64y + 10 = 0$ with y(0) = y(1) = 0.
Using finite difference method and calculate y (0.5), taking step size n = 0.25. **16**

SECTION – II

7. a) If the relation between x and y is of the type $y = a.b^x$ using following values of x and y . Find the values of constants a and b for the best curve fit. **8**

x	2.1	2.5	3.1	3.5	4.1
y	5.14	6.788	10.29	13.58	20.578

b) Explain various methods of least square criteria. **8**

OR

8. a) Fit a parabola to the following data using the method of least squares **10**

x	1.0	1.2	1.4	1.6	1.8	2.0
y	0.98	1.40	1.86	2.55	2.28	3.20

b) What are the quantification of error in linear regression ? **6**

9. a) Explain the fundamental operations with tensors. **8**

b) Show that $\frac{\partial A_p}{\partial x^q}$ is not a tensor even though A_p is a covarient tensor of rank one. **8**

OR

10. a) Explain vector and tensor components in curvilinear co-ordinates. **8**

b) Derive the expression for $(\nabla.v)$ and ∇v in cylindrical co-ordinates. 8

11. a) What is optimization and what are the six steps of optimization. **6**

b) Maximise $Z = 500X_1 + 600X_2$
Subject to conditions

$X_1 + 2X_2 \leq 15$

$3X_1 + 2X_2 \leq 18$

$X_1, X_2 \geq 0$

Find the optimal solution and maximize Z. **12**

OR

12. A small manufacturing firm produces two types of gadgets A and B which are first processed in the foundry and then send to the machine shop for finishing. The number of man hrs. require in each shop for the production of each unit of A and of B and number of man hours the firm available per week are tabulated. The profit on sale of A is Rs. 30/- per unit as compared with Rs. 20/- per unit of B. How many each of A and of B should be produced per week in order to maximize the profit. **18**

	Foundry	**Machine shop**
A	10	5
B	6	4
Firm capacity	1000	600

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T.E. (Chemical) (Semester – I) Examination, 2009

MASS TRANSFER – I

(Common to Bio-Technology)(2003 Course)

Time : 3 Hours | Max. Marks : 100

Instructions : *1) Answer **3** questions from Section – **I** and **3** questions from Section – **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

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

*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Derive Maxwell's law. **6**

b) Explain Kundsen's diffusion. **6**

c) Calculate the rate of diffusion of NaCl across a film of non - diffusing water film 1.5 mm thick, at 18°C, when concentrations on opposite sides of the film are 24 and 4% by wt. NaCl respectively. Density of 24 and 4% NaCl at 18°C are 1081 and 1027 kg/m^3. **6**

OR

2. a) Derive Stefan's law. **6**

b) What is eddy diffusion ? **6**

c) An open square tank of length 6 m contains benzene at 25°C, which is exposed to atmosphere in such a way that the liquid is covered with a stagnant air film 5 mm thick concentration of benzene beyond the air film is zero. Vapour pressure of benzene at 25°C is 100 mm Hg . What is the rate of loss of benzene in kg/h ? Diffusivity of benzene = 277.7 cm^2/h at 25°C. **6**

3. a) Explain what is absorption factor and its importance. **6**

   b) An ammonia - air mixture is to be washed with water at 25°C to recover ammonia. Gas inlet flowrate is 25 m^3/s containing 2% ammonia by volume at 1 atm pressure. 95% of NH_3 is to be recovered. The inlet water contains 0.005 mole fraction of NH_3. The equilibrium relation is $y = 0.125\ x$, where x and y are mole fractions of NH_3 in water and air respectively. Determine the minimum water flowrate, number of theoretical stages when water flow rate is 1.5 times the minimum. **10**

OR

4. a) What is (L/G) min and its importance ? **6**

   b) It is desired to absorb 90% of acetone from a gas containing 1 mole % acetone in air; in a continuous counter current tower. The total inlet gas flow rate is 30 kg mole/hr. and the total pure water flow rate is 90 kmol/h. The process is isothermally carried out at 300 K and 101.3 KPa. The equilibrium relation is $y = 2.53\ x$ where x and y are mole fractions of acetone in water and gas. Find the no. of theoretical stages. **10**

5. a) What are film and overall mass transfer coefficients ? Give the relation between them and derive it. **6**

   b) What is Reynold's analogy ? **6**

   c) What are point and tray efficiencies ? **4**

OR

6. a) Explain two film theory giving all its assumptions. **6**

   b) What are the different types of mass transfer coefficients ? Define each. **6**

   c) What are cascades ? Explain their working graphically. **4**

SECTION – II

7. a) Derive an equation for height of packing required in forced draft counter current cooling tower in terms of

$Z = HTU \times NTU$

where $NTU = \int_{HG_1}^{HG_2} \frac{dH_G}{H_f - H_G}$.

Use basic equation for heat and mass transfer in counter current cooling tower. State the assumptions used **10**

b) Explain the "Humidity Chart". **6**

OR

8. a) The dry bulb temperature and dew point of ambient air were found to be 303K (30°C) and 289 K (16°C) respectively. Calculate

i) The absolute molal humidity

ii) The absolute humidity

iii) The % RH

iv) The % saturation

v) The Humid heat

Data : Vapour pressure of water at 298 K = 1.818 KPa

Vapour pressure of water at 303K = 4.243 KPa.

Barometric pressure = 100 KPa. **10**

b) Write short note on the following

i) Adiabatic saturation temperature

ii) Theory of wet bulb temperature. **6**

9\. a) Explain with neat sketch drying rate curve. **8**

b) A granular solid is dried under constant drying conditions. 7 hrs are required to reduce the moisture content from 35% to 10%. The critical moisture content was 45% and equilibrium moisture content is 1%. All moisture contents are expressed on dry basis. Assuming that the rate of drying during the falling rate period is proportional to free moisture content how long should it take to dry 10 kg of dry sample of the same material from 40% to 5% under the same drying conditions. **10**

OR

10\. a) Derive the equation for calculating constant rate of drying period and falling rate of drying period. **10**

b) The following data are obtained in the Laboratory. Total drying time 7 hrs. Initial moisture content 80%, 10% final moisture content (wet basis). Calculate the time required to dry to a moisture of 5% wet basis. The equilibrium moisture content is zero and the critical moisture content is 15% of the initial moisture. **8**

11\. Write short note on :

i) Pressure drop in packed beds

ii) Absorption with Chemical reaction

iii) Choice of solvent in absorption

iv) Materials of packing and their characteristics. **16**

OR

12\. a) Differentiate between Tray tower Vs Packed tower. **6**

b) Explain type of packing. **5**

c) Write a note on "Venturi Scrubber". **5**

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T.E. (Chemical) (Semester – I) Examination, 2009
(2003 Course)
PROCESS INSTRUMENTATION AND INSTRUMENTAL ANALYSIS

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Define an instrument. Classify the instrument based on function. **8**

b) Convert the following °R values to °K values. **8**

i) 75°R' ii) –212°R'

OR

2. a) What is the first order system ? Derive its transfer function. **8**

b) Explain static and dynamic characteristics of measuring instruments. **8**

3. a) Classify the temperature measuring instruments and indicate approximate temperature range of each category. **8**

b) Explain 'Quartz crystal' thermometer in detail. **8**

OR

4. a) Describe the operating principle, construction and working of optical pyrometer. **8**

b) Explain seebeck effect and its application in working of a temperature measuring instrument. Name the instrument with its working diagram. **8**

P.T.O.

5. a) Explain the use of a piezometer tube to measure the intensity of pressure in a liquid. **10**

   b) Explain the use of LVDT as a pressure measuring device. **6**

   c) Enlist various manometric liquids. **2**

OR

6. a) Explain the working principle and construction of a inclined tube manometer. **8**

   b) Explain construction and working of pirani vacuum guage. **6**

   c) Enlist sources of errors in manometer. **4**

SECTION – II

7. a) Explain the principle, construction and working of orificemeter. **10**

   b) Describe Coriolis Mass flow meter. **6**

OR

8. a) Describe the principle, construction and working of electromagnetic flow meter. **10**

   b) Discuss pitot tube in detail. **6**

9. a) Explain the radiation level detector. **8**

   b) Explain construction and working of Bubbler method and its application. **8**

OR

10. a) Describe the method for electrical measurement of level of conducting liquid contained in a metal vessel. **10**

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

    i) Diaphragm method

    ii) Air purge method.

11. a) Enumerate the applications of chemical composition measurements in chemical process industries. **10**

b) Write short notes on : **8**

i) Mass spectroscopy

ii) Rotational viscometer.

OR

12. a) Discuss ‘chromatography’ in detail. **8**

b) Write short notes on : **10**

i) X-ray diffraction method.

ii) IR absorption spectroscopy.

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T.E. (Chemical) (Sem. – I) Examination, 2009
PROCESS EQUIPMENT DESIGN – I
(2003 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) ***Use*** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
4) Assume ***suitable*** *data, if* ***necessary****.*
5) ***All*** *questions are* ***compulsory****.*

SECTION – I

1. a) Define pressure vessel and explain general design considerations for the design of unfired pressure vessel. **8**

b) A cylindrical pressure vessel with 2 m ID is to be operated at a pressure of 4 kgf/cm^2. The permissible stress of the material is 960 kgf/cm^2. Welded joint efficiency is 85%. Calculate the thickness required.

If this vessel is fabricated in the spherical form, what maximum pressure will it be able to withstand ? **10**

OR

2. a) A vessel is to have one end closed by a blind flange. Calculate the minimum thickness of blind flange.

Design data as below :

– Design pressure = 170 kgf/cm^2

– Design temperature = 120°C

– Allowable bolt stress at gasket seating and operating conditions = 1300 kgf/cm^2

– Allowable flange stress at gasket seating and operating conditions = 1190 kgf/cm^2

– Inside diameter of gasket = 34.4 cm

– Width of gasket = 2.5 cm

– Gasket factor, m = 3.00

– Gasket seating stress, Y_a = 680 kgf/cm^2

– Bolt circle diameter = 56.2 cm

– 50 mm diameter, 16 bolts are used. **10**

b) With neat sketch explain the Reinforcement of nozzles. **8**

3. a) Explain the constructional features of high pressure vessels. **8**

b) A high pressure vessel is to be operated at 150 N/mm^2. The inside diameter of the vessel is 30 cm. Vessel is fabricated from high tensile steel having permissible tensile stress 500 N/mm^2. Determine the wall thickness on the basis of the maximum tangential stress at inner surface. **8**

OR

4. a) What are the various stresses in the cylindrical shell of the skirt support for tall vessel. **8**

b) Explain detailed design procedure of saddle supports. **8**

5. a) A storage vessel is required to store 45000 kg of oil, whose density is 910 kg/m^3. The diameter of the vessel can be taken as 2.5 m. If the plates in the size of 1.2 m $\times$ 2.5 m in different thicknesses are available for fabrication, estimate the total number of plates required for fabrication of storage tank. Welded joint efficiency is 85%. Permissible stress of the material = 1020 kgf/m^3. **10**

b) What are the various causes for loss of volatile liquid during storage ? **6**

OR

6. a) What type of vessels are used for storage of gases ? Why ? **6**

b) Explain the various types of roofs used for variable volume storage tanks. **10**

SECTION – II

7. 5.52 kg/sec kerosene at 199°C is cooled to 93°C using crude oil which is heated from 38° C to 77° C. A pressure drop of 67 kN/m^2 is permissible in both streams. A combined dirt factor of 0.00053 $[w/m^2k]^{-1}$ should be provided.

Available for this service is 54 cm ID heat exchanger having 154 tubes, 25.4 mm outer diameter, 2.4 mm thick, 4.88 m long and laid on 32 mm square pitch. The tube bundle is arranged for four passes and baffles are spaced 125 mm apart. Will the heat exchanger suitable ?

Given data

Properties of kerosene and crude oil.

Property	**Kerosene**	**Crude oil**
Viscosity	0.4	3.6 cP
Sp. heat	2570	2050 J/kgK
Density	800	975 Kg/m^3
Thermal conductivity	0.1325	0.133 w/m K

* Thermal conductivity of tube wall = 45 w/m K

* Temperature correction factor = 0.89

Use following correlations :

$j_h = 0.027 /(N_{Re})^{0.2}$ for tube side fluid

$j_h = 0.351/(N_{Re})^{0.45}$ for shell side fluid

$j_h = (N_S +) (N_{Pr})^{2/3} \left(\frac{\mu w}{\mu}\right)^{0.14}$. **16**

OR

8. Ammonia vapors are to be condensed at 1500 kN/m^2. Saturation temperature of ammonia vapors is 42°C, flow rate of vapors = 0.3 kg/sec. Water is available at 28°C.

   25 mm od tubes are arranged on triangular pitch of 31 mm and 5 m in length are available. Overall heat transfer coefficient for condensing ammonia vapors = 1000 to 2500 w/m^2 K. Properties of liquid ammonia: Density = 600 kg/m^3, viscosity = 0.085×10^{-3} N.sec/m^2, Thermal conductivity = 0.502 w/m K.

   Fouling factor on ammonia side = 0.0002 [w/m^{2}K]$^{-1}$

   Fouling factor on water side = 0.0004 [w/m^{2}K]$^{-1}$

   Latent heat of ammonia vapors = 1092 kJ/kg.

   Properties of water : Density 1000 Kg/m^3.

   Viscosity = 0.7×10^{-3} N. sec/m^2,

   Thermal conductivity = 0.63 w/m K

   Design 1 : 4 type shell and tube heat exchanger. **16**

9. It is desired to concentrate 22680 Kg/hr of chemical solution at 37.7°C and 10% solids to a product which contains 50% solids, by using triple effect forward feed evaporator. Steam available at 185 kN/m^2 and steam temperature is 118°C. The third effect is operated at 13.4 kN/m^2 and the temperature in the last effect is 51.7°C.

   Determine the steam consumption, steam economy and heating surface of each effect.

   The specific heat of all solutions = 4.18 kJ/kg K

   The overall heat transfer coefficients are 3.4, 1.42 and 0.71 kw/m^2 K in the first, second and third effect respectively. **18**

OR

10. A looped flow arrangement plate heat exchanger is to be used for cooling viscous liquid from 368 K to 333 K.

   The mass flow rate of viscous hot liquid is 10,000 Kg/hr. Water available at 18 °C is to be used as a coding medium.

   Maximum water outlet temperature is 44°C.

   Plates are made up of stainless steel.

   Thickness of plate is 1.0 mm and projected heat transfer area of plate is 0.2 m^2.

   The effective width between the plates is 0.4 m and distance between the centres of inlet and outlet parts is 0.8 m. Gasket thickness is 3 mm.

Properties of viscous liquid and water

Property	**Viscous liquid**	**Water**
Viscosity	0.1230	0.78×10^{-3} N.Sec/m^2
Sp. heat	2510	4180 J/Kg K
Thermal conductivity	0.1730	0.6200 w/m K

Design the heat exchanger.

Assume U = 270 w/m^2 K

– Assume fouling factor 0.0002 [w/m^{2}K]$^{-1}$ for each fluid.

– Use following heat transfer correlations.

– $j_h = 1.416 (N_{Re})^{-0.77}$ for $N_{Re} \le 70$

– $j_h = 0.178 (N_{Re})^{-0.24}$ for $N_{Re} > 70$

– $j_h = (N_{ST}) (N_{Pr})^{0.667} \left(\frac{\mu}{\mu w}\right)^{0.14}$. **18**

11. a) How are filters classified ? **6**

b) What are the main factors to be considered while selecting the filtration equipment ? **4**

c) With neat sketch, explain rotary drum filter. **6**

OR

12. a) With neat sketch, explain plate and frame filter press. **6**

b) A rotary filter operating at 0.03 Hz, filters 0.0075 m^3/sec.

Operating under the same vacuum and neglecting the resistance of the filter cloth, at what speed must the filter be operated to give a filtration rate of 0.016 m^3/sec. **10**

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T.E. (Chemical) (Semester – I) Examination, 2009
CHEMICAL ENGINEERING THERMODYNAMICS – II
(2003 Course)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) State and explain the fundamental property relation. **6**

b) From the following data, calculate the fugacity of Nitrogen at 1000 bar and 273 K. **10**

P bar	50	100	200	400	800	1000
$\mathbf{\frac{PV}{RT}}$	0.9846	0.99	1.0365	1.2557	1.7959	2.0641

OR

2. a) The solute in a dilute solution obeys Henry's law and the solvent obeys Raoult's law. Explain this statement in details. **8**

b) Will it be possible to prepare $0.1 m^3$ of alcohol-water solution by mixing $0.03 m^3$ alcohol with $0.07 m^3$ pure water ? If not possible, what volume should be mixed in order to prepare a mixture of same strength ?

$\rho_E = 781\ kg/m^3$, $\rho_W = 997\ kg/m^3$, partial molar volumes of ethanol and water are $53.6\times10^{-6}\ m^3/mol$ and $18\times10^{-6}\ m^3/mol$ respectively. **8**

P.T.O.

3. a) Explain property changes of mixing and derive the expressions for ΔG, ΔS, ΔV, and ΔH. **8**

b) The azeotrope of the ethanol-benzene system has a composition of 44.8% mol ethanol with boiling point of 341.4 K at 101.3 kPa. At this temperature, the vapor pressure of benzene is 68.9 kPa and vapor pressure of ethanol is 67.4 kPa. In a solution containing 10% mol alcohol, what are the activity coefficients ? **8**

OR

4. a) Describe activity and activity coefficients. Give the effect of temperature and pressure on activity coefficients. **8**

b) The excess Gibb's energy of a binary liquid mixture at T and P is given by

$$G^E/RT = (-2.6\,x_1 - 1.8x_2)\,x_1x_2$$

Find expressions for r_1 and r_2 at same T and P. **8**

5. a) For each of the following non-reactive equilibrium systems, determine the degree of freedom.

i) Two miscible materials in vapor-liquid equilibrium with vapor composition specified at a given temperature.

ii) A mixture of methane and air in contact with a solid adsorbent at atmospheric pressure.

iii) Liquid water in equilibrium with water vapor and nitrogen

iv) A vapor phase containing ammonia and air and a liquid phase containing of ammonia and water. **12**

b) State the Duhem's theorem. What is its significance in establishing the state of the system ? **6**

OR

6. Assuming the validity of Raoult's law, do the following calculations for the Benzene (1)/Toluene(2) system.

a) Given x_1 = 0.33 and T = 100°C, find y_1 and P

b) Given y_1 = 0.33 and T = 100°C, find x_1 and P

c) Given x_1 = 0.33 and P = 120 kPa, find y_1 and T

$$\ln P^{sat}/kPa = A - \frac{B}{t/°C + C}$$

Compound	A	B	C
Benzene	13.8594	2773.78	220.07
Toluene	14.0098	3103.01	219.79

18

SECTION – II

7. a) Explain in brief the different criteria of phase equilibrium. **8**

b) Write short notes on :

i) Liquid-liquid equilibria

ii) Solid-liquid equilibria. **8**

OR

8. a) Explain in details any two thermodynamic consistency tests. **8**

b) Derive the Clausius-Clapeyron equation using the criteria of phase equilibria. **8**

9. a) Derive an expression showing the effect of temperature on equilibrium constant. **8**

b) Deduce the relationship between mole fraction of species in multiple reactions and the extent of reaction. **8**

OR

10. a) Derive the expression :

$\Delta G^{\circ} = -RT\, l nK \cdot$ **8**

b) Estimate the standard free energy change and the equilibrium constant at 700 K for the reaction :

$N_{2(g)} + 3H_{2(g)} \longrightarrow 2NH_{3(g)}$

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. The specific heat (J/mol.K) data are given below :

For N_2 $C_p = 27.27 + 4.93\times10^{-3}$ T

For H_2 $C_p = 27.01 + 3.51\times10^{-3}$ T

For NH_3 $C_p = 29.75 + 25.11\times10^{-3}$ T **8**

11. a) Write short note on phase rule and Duhems theorem for reacting system. **6**

b) Explain in details :

i) Relation of equilibrium constant to composition

ii) Multireaction equilibria. **12**

OR

12. a) A gas mixture consisting of 60% H_2, 20% N_2 and rest inert gas is passed over a suitable catalyst for the production of ammonia at 50 bar.

$$\frac{1}{2}N_2 + \frac{3}{2}H_2 \longrightarrow NH_3 \quad K_p = 1.25 \times 10^{-2}$$

Assuming ideal gas behaviour, determine the composition of the gases leaving the reactor. **8**

b) A feed stock of pure n-butane is cracked at 750 K and 1.2 bar to produce olefins. Only two reactions have favourable equilibrium conversions at these conditions :

$$C_4H_{10} \longrightarrow C_2H_4 + C_2H_6 \ldots\ldots \text{I} \quad K_1 = 3.856$$

$$C_4H_{10} \longrightarrow C_3H_6 + CH_4 \ldots\ldots \text{II} \quad K_2 = 268.4$$

If these reactions reach equilibrium, what is the product composition ? **10**

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T.E. (Chemical) (Semester – II) Examination, 2009
CHEMICAL REACTION ENGINEERING – I
(2003 Course) (Common to Biotechnology)

Time : 3 Hours Marks : 100

Instructions : *1) Answer* ***three*** *questions from Section* ***I*** *and* ***three*** *questions from Section –* ***II****.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) Neat diagrams must be drawn ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) Use of logarithmic tables, electronic pocket calculator and steam tables is ***allowed****.*
6) Assume suitable data, ***if necessary****.*

SECTION – I

1. The irreversible reaction $A + 2B \rightarrow 2D$ is exothermic at low temperatures and the rate law is $-r_A = K_A C_A^{1/2} C_B$

Suggest a rate law that is valid at high temperatures, where the reaction is reversible :

$A + 2\,B \rightleftharpoons 2\,D.$ **16**

OR

2. a) Differentiate between elementary and non-elementary reactions. **4**

b) Show that the following scheme :

$$N_2O_5 \underset{K_2}{\overset{K_1}{\rightleftharpoons}} NO_2 + NO_3^*$$

$$NO_3^* \xrightarrow{K_3} NO^* + O_2$$

$$NO^* + NO_3^* \xrightarrow{K_4} 2NO_2$$

is consistent and can explain the observed first order decomposition of N_2O_5. **12**

3. a) The aqueous reaction $A \rightarrow R + S$ proceeds as follows :

Time, min	0	36	65	100	160	∞
C_A, mol/lit	0.1823	0.1453	0.1216	0.1025	0.0795	0.0494

Given : C_{AO} = 0.1823 mol/lit, C_{RO}=0, C_{SO}=55 mol/lit. Find the rate equation for this reaction. **12**

b) Differentiate between Integral and differential method of analysis. **4**

OR

4. a) Find the over-all order of the irreversible reaction

$2H_2 + 2NO \rightarrow N_2 + 2H_2O$

from the following constant volume data using equimolar amounts of hydrogen and nitric oxide : **12**

Total pressure, mmHg	200	240	280	320	360
Half life, sec	265	186	115	104	67

b) Write equation and explain the test for second order reversible bimolecular reactions. **4**

5. a) The homogeneous gas decomposition of phosphine $4PH_{3(g)} \rightarrow P_{4(g)} + 6H_2$ proceeds at 650°C with first order rate $-r_{PH_3}$ = (10/hr) C_{PH_3}. What size of plug flow reactor operating at 650°C and 606.5 KPa can produce 93% conversion of a feed consisting of 4 Kmol of pure phosphine per hour ? **12**

b) Derive performance equation for PFR. **6**

OR

6. a) Deduce the performance equation for recycle reactor. **12**

b) Derive the tanks in series model equation for equal sized first order reaction. **6**

SECTION – II

7. Reactions are generally accompanied by a variety of undesired side reactions, some of higher order, some of lower order. To see which type of operation gives the best product distribution, consider the simplest typical case, the parallel decompositions of A, $C_{AO} = 2$,

$$A \rightarrow \begin{cases} R & r_R = 1 \\ S & r_S = 2\,C_A \\ T & r_T = C_A^2 \end{cases}$$

Find the maximum expected C_S for isothermal operations.

i) in a mixed reactor

ii) in a plug flow reactor. **16**

OR

8. a) Deduce the equation for $\tau_{P,Opt}$ in a PFR for reactions in series. **8**

b) Explain the product distribution in PFR in series parallel reactions. **8**

9. Calculate the heat of reaction for the synthesis of ammonia from hydrogen and nitrogen at 150°C in kcal/mol of N_2 reacted and in kJ/mol of H_2 reacted.

Given : $\Delta H^0_{fNH_3} = -11{,}020$ cal/mol N_2

$\hat{C}_{PH_2} = 6.992$ cal/mol $H_2 \cdot K$

$\hat{C}_{PN_2} = 6.984$ cal/mol $N_2 \cdot K$

$\hat{C}_{PNH_3} = 8.92$ cal/mol $NH_3 \cdot K$ **16**

OR

10. a) Describe the optimum temperature progression in MFR. **8**

b) With sketch, discuss in details the non-adiabatic operations. **8**

11. The concentration readings in the table given below represent a continuous response to a delta function input into a closed vessel which is to be used as a chemical reactor. Tabulate and plot the exit age distribution E. Assuming fit by dispersion model, calculate the vessel dispersion number D/uL. Comment on the result. **18**

Time t, min	0	5	10	15	20	25	30	35
Tracer O/P Conc. g/lit fluid	0	3	5	5	4	2	1	0

OR

12. A sample of the tracer hytane at 320 K was injected as a pulse to a reactor and the effluent concentration measured as a function of time, resulting in the following data :

t (min)	0	1	2	3	4	5	6	7	8	9	10	12	14
C (g/m^3)	0	1	5	8	10	8	6	4	3	2.2	1.5	0.6	0

a) Construct figures showing C (t) and E (t) as functions of time.

b) Determine fraction of material leaving the reactor that has spent between 3 and 6 min in the reactor.

c) Determine fraction of material that has spent 3 min or less in the reactor. **18**

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T.E. (Chemical) (Sem. – II) Examination, 2009
(2003 Course)
TRANSPORT PHENOMENA

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn wherever **necessary.***
*4) Black **figures** to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed.***
*7) **Assume** suitable data, **if necessary**.*

SECTION – I

1. a) Explain Theory of Viscosity of gases at low density. **12**

b) Compute the mean molecular velocity $\bar{u}$, cm sec^{-1} and the mean free path λ, of O_2 at 1 atm and 273.2°K. Assume d = 3.0°A. What is the ratio of mean free path to the molecular diameter in this situation.

Data : $K = 1.38 \times 10^{-16}$ erg/mol. k

$N = 6.023 \times 10^{23}$ l/g.mol

n = flow behavior index = 2.68×10^{15} **6**

OR

2. a) Derive the expression for ratio of average velocity to the maximum velocity for a Newtonian fluid flow through a circular tube. **12**

b) What pressure gradient is required to cause N, N-diethylaniline to flow in a horizontal smooth circular tube of inside diameter D = 3 cm at a volume rate of Q = 1.1 lit/sec at 20°C. At this temperature, the density of diethylaniline is 0.935 g/cm^3 and its viscosity is 1.95 Cp. **6**

P.T.O.

3. a) Determine the ratio $\mu^{(t)}/\mu$ at $S = R/2$ for water flowing at a steady rate in a long smooth round tube under the following conditions

R = tube radius = 3 in

τ_0 = wall shear stress = 2.36×10^{-5} lb_f in^{-2}

ρ = density = 62.4 lb_m ft^{-3}

ν = kinematic viscosity = 1.1×10^{5} ft^2 sec^{-1}. **8**

b) Define instantaneous pressure, time smoothed pressure and pressure fluctuations. **8**

OR

4. a) Explain friction factor and friction losses in pipe fittings, sudden expansion and contraction. **8**

b) Water enters a boiler at 18.33°C and 137.9 KPa through a pipe at an average velocity of 1.52 m/s. Exit steam at a height of 15.2 m above the liquid inlet leaves at 137.9 KPa, 148.9°C and 9.14 m/s in the outlet line. At steady state, how much heat must be added per kg mass of steam ? The flow in two pipes is turbulent. **8**

5. a) Deduce the expression for heat conduction with chemical heat source. **8**

b) A cold storage room is constructed of an inner layer of 12.7 mm of pine, a middle layer of 101.6 mm of cork board, and an outer layer of 76.2 mm of concrete. The wall surface temperature is 255.4K inside the cold room and 297.1°K at the outer surface of the concrete. Use thermal conductivities for pine 0.151, for cork board 0.0433 and for concrete 0.762 W/m°k. Calculate the heat loss in W for 1 m^2 and the temperature at the interface between the wood and cork board. **8**

OR

6. a) Give the physical significance of Brinkman number and explain when will the temperature become maximum. **10**

b) A 60 W bulb is buried in soil (K = 0.84 W/m.k) and burnt until a steady state is reached. Find the temperature 0.3 m away from it. **6**

SECTION – II

7. a) Derive the expression for heat flux of the composite cylinders of radii r_1 and r_2 respectively. **10**

b) Explain heat transfer coefficients for forced convection around submerged object. **8**

OR

8. a) A standard schedule 40, two inch steel pipe (inside diameter 2.067 in) carrying steam is lagged with 2 in. of 85 percent magnesia covered in turn with 2 in. of cork. Estimate the heat loss per hour per foot of pipe if the inner surface of cork is at 250°F and the outer surface of the cork is at 90°F. The thermal conductivities of the substances concerned are : **10**

Material	**Conductivity**
Steel	26.1 Btu $hp^{-1}ft^{-1}$ F^{-1}
85 percent magnesia	0.04
Cork	0.03

b) Discuss in brief heat transfer coefficients for forced convection through packed beds. **4**

c) State and explain comparison of forced and free convection in nonisothermal systems. **4**

9. a) Explain in the brief the hydrodynamic theory and stokes-Einstein relation. **8**

b) Calculate the mass flux of benzene through a layer of air 10 mm thickness at 25°C and 200 kN/m^2 (total pressure), partial pressure of benzene is 6×10^3 N/m^2 at the left side of the layer and 1 kN/m^2 at the right side. The mass diffusivity at this temperature and pressure is 4.4×10^{-6} m^2/S. **8**

OR

10. For a diffusion through a stagnant gas film show that

$$N_{AZ}\Big/ z = z_1 = \frac{C\,D_{AB}}{(z_2 - z_1)(X_B)_{ln}}\ (x_{A_1} - x_{A_2})$$

if the rate of mass transfer is related to a characteristic concentration driving force $x_{A_1} - x_{A_2}$. **16**

11. a) Write analogies among mass, heat and momentum transfer. **8**

    b) Explain diffusion in Laminar falling film. **8**

OR

12. a) Explain concentration profiles of A in the neighbourhood of a gas-liquid interface in the light of binary-mass transfer coefficient. **8**

    b) State and explain Penetration theory for transfer coefficients at high mass transfer rates. **8**

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T.E. (Chemical) (Semester – II) Examination, 2009
CHEMICAL PROCESS TECHNOLOGY
(2003 Course)

Time: 3 Hours Marks: 100

Instructions : *1) Answer* ***any 3*** *questions from* ***each*** *Section.*
2) Answer to the Sections should be written in ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*

SECTION – I

1. a) Discuss the significance of membrane cell process over the mercury cell process. **6**
   b) Discuss the engineering problem associated with the liquid chlorine storage and transport. **6**
   c) Explain the Frasch process for manufacture of elemental sulphur with a neat diagram. **4**

OR

2. a) Write overall reaction and step wise reaction for solvay process. **6**
   b) List five different chemical which are abundant in sea. Also give its application. **10**

3. a) What are the pollution problem associated with phosphorous industry ? Discuss in detail. **8**
   b) Explain the process for manufacture of ammonia and discuss the major engineering problems involved. **8**

OR

4. a) Explain the electrolytic process of obtaining Aluminium. **8**
   b) Explain the production of Ethyl alcohol by fermentation. **8**

5. a) Explain in detail manufacturing of detergent with major Ingg. problem. **10**
   b) Explain in detail manufacturing of styrene. **8**

OR

6. Write short notes on (**any three**) : **18**
   a) Triple super phosphate
   b) Kraft pulp process
   c) Hydrogenation of oil
   d) Prilling process for ammonium Nitrate.

SECTION – II

7. a) Explain in brief the destructive distillation of coal. **8**
   b) Describe the extraction of sucrose from sugarcane with neat flow diagram. **8**

OR

8. a) Enlist the various refining operations and explain catalytic cracking in brief. **8**
   b) What are antibiotics, what are the Bio-sources for antibiotics ? **8**

9. a) What are aromatic compounds ? Discuss the manufacting of phenol by any one method. **8**
   b) Discuss the reaction involved in alkylation along with reaction conditions. **8**

OR

10. a) Describe the manufacture of water gas by regeneration and continuous process. **8**
    b) Explain with neat flow diagram the extraction of vegetable oils. **8**

11. a) What are aromatic compounds ? Discuss the manufacturing of phenol by any one method. **10**
    b) Discuss the construction of fuel cell. **8**

OR

12. Write short notes on (**any three**) : **18**
    a) Acetone by dehydrogenation of Isopropanol.
    b) Steam cracking of Hydrocarbons
    c) Producer Gas
    d) Interesterification.

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T.E. (Chemical) (Sem. – II) Examination, 2009
(2003 Course)
MASS TRANSFER – II
(Common to Biotechnology)

Time : 3 Hours   Max. Marks : 100

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

SECTION – I

1. a) What do you mean by reflux ratio ? Derive Feneske's equation for number of theoretical stages at total reflux. **5**

b) A continuous column is to be designed to separate a binary feed mixture containing 50 mole % n-heptane with a distillate product containing 98 mole % n-heptane and bottom product containing 98 mole % n-octane. The feed is at its boiling point and operation is at 1 atm. Using following equilibrium data. Calculate :

i) Minimum reflux ratio

ii) No. of plates at total reflux

iii) If the reflux ratio is greater than the minimum reflux by 50% used, how many plates are required

X	0.10	0.30	0.50	0.70	0.90	1.0
Y	0.195	0.585	0.690	0.840	0.950	1.0

13

OR

2. a) Define differential distillation and derive Rayleigh's equation. **6**

b) In the system of chlorobenzene and water, if steam is blown in the still containing a mixture of these two components and the total pressure is 130 mm Hg, estimate the temp. of boiling of mixture and the composition of distillate, the two components are immiscible in the liquid.

Vapour pressure of chlorobenzene and water are given below :

Pressure, mm Hg	100	50	30	26
Temp. °C chlorobenzene	70.4	53.7	42.7	34.5
Temp. °C Water	51.7	38.5	29.9	22.5

8

c) What are the drawbacks of Mc-Cabe Thiele method ? Give significance of q-line. **4**

3. a) Obtain expression for the optimum concentration for minimum process time in the diafiltration of a solution of protein content S in an initial volume V_o a) If the gel polarisation model applies, b) If the osmotic pressure model applies. It may be assumed that the extent of diafiltration is given by,

$$V_d = \frac{\text{Vol. of liq permeated}}{\text{Initial feed volume}}$$

$$= V_p / V_o$$

8

b) Give classification of membrane processes. **6**

c) State and explain general membrane equation. **2**

OR

4. a) Give advantages of membrane separation over conventional processes. **5**

b) Explain electrodialysis with neat sketch. **6**

c) What are the various membrane modules ? Define membrane fouling. **5**

5. a) Derive equation $(H \uparrow U \text{ and } N \uparrow U)$ for continuous countercurrent extraction unit. **6**

b) Acetone is to be recovered from an aqueous solution containing 20% by weight of acetone using kerosene as solvent. The equilibrium distribution of acetone in water and kerosene follows the relationship X = 6.45 Y.

Where X $\rightarrow$ kg of Acetone/kg of water

Y $\rightarrow$ kg of Acetone/kg of kerosene

If extraction is to be done in counter current using 6 kg of solvent per kg of solution in continuous tower. Determine the no. of stages required to reduce the conc. from 0.2 to 0.04 in aqueous phase. **10**

OR

6. 1000 kgs of a batch of pyridene – water solution containing 50% pyridene by weight is to be extracted with an equal weight of chlorobenzene. The raffinate from first extraction is to be extracted with a weight of solvent equal to the raffinate and so on ($S_2 = R_1$, $S_3 = R_2$ etc).

a) What is the exit concentration and % recovery of pyridene after 3 stages. ?

b) If all the solvent is used in single stage what is the % recovery and exit concentration ? The equilibrium and tie line data are given below : **16**

Chlorobenzene Layer			**Water Layer**		
Pyridene (y)	**C.B.**	**Water**	**Pyridene (x)**	**C.B.**	**Water**
0.0	99.95	0.05	0.0	0.08	99.92
11.05	88.28	0.67	5.02	0.16	94.82
18.95	79.90	1.15	11.05	0.24	88.71
24.10	74.28	1.62	18.90	0.38	80.72
28.60	69.15	2.25	25.50	0.58	73.92
31.55	65.58	2.87	35.10	1.85	62.05
35.05	61.00	3.95	44.94	4.18	50.87
40.60	53.00	6.40	53.20	8.90	37.90
49.00	37.8	13.2	49.00	37.8	13.20

SECTION – II

7. a) What are the types of adsorption ? Give various types of adsorbents available with their uses. **8**

b) Give material balance for multistage cross. Current adsorption and explain how to find total amount of adsorbent used. **8**

c) State equilibria in ion exchange. **2**

OR

8. a) Derive an equation for finding length of bed. **8**

b) State and explain principles of ion exchange. **8**

c) What is adsorption hysteresis ? **2**

9. Caustic soda is being made by treatment of slaked lime, $Ca(OH)_2$, with a solution of sodium carbonate. The resulting slurry consists of particles of calcium carbonate, $COCO_3$ suspended in a 10% solution of sodium hydroxide, NaOH 0.125 kg suspended solid/kg solution. This is settled to clear sodium hydroxide solution withdrawn and replaced by an equal weight of water, and the mixture thoroughly agitated. After repeatation of this procedure (a total of two fresh water washes), what fraction of the original NaOH in the slurry remains uncovered and therefore lost in the sludge ? The settling characteristics of the slurry, determined under conditions representing the practice to be followed in the process. Show adsorption of solute on the solid.

Data :

x = weight fraction NaOH in clear solution	N = kg $CaCO_3$/kg solution in settled sludge	Y – weight fraction NaOH in solution of settled sludge
0.0900	0.495	0.0917
0.0700	0.525	0.0762
0.0473	0.568	0.0608
0.0330	0.600	0.0452
0.0208	0.620	0.0295
0.01187	0.650	0.0204
0.00710	0.659	0.01435
0.00450	0.666	0.01015

16

OR

10. a) Discuss in brief, factors affecting the rate of leaching. **4**

b) Derive an expression for finding number of stages required in case of multistage counter current leaching. **12**

11. a) Sodium nitrate solution at 50° C contains 45% by weight of sodium nitrate :

i) find out the percentage saturation of this solution

ii) find out the weight of sodium nitrate crystals formed if 1000 kg of this solution is cooled to 10° C

iii) find out percentage yield of this process.

Data solubility at 50° C $= 104.1 \text{ kg } NaNO_3 / 100 \text{ kg } H_2O$

Solubility at 10° C $= 78 \text{ kg } NaNO_3 / 100 \text{ kg } H_2O$. **8**

b) Give construction and working of vacuum crystallizer. **8**

OR

12. A Swenson Walker crystallizer has to produce 800 kg per hour of $FeSO_4.7H_2O$ crystals. The saturated solution enters the crystallizer at 49° C and the slurry leaves at 27° C. Cooling water enters the crystallizer jacket at 15° C and leaves at 21° C.

The overall heat transfer coefficient has been estimated to be 175 $\text{kcal} / \text{hr.m}^2.^\circ\text{C}$.

There are 1.3 m^2 of cooling surface per meter of crystallizer length.

i) estimate the cooling water requirement in kg/hr

ii) determine the number of crystallizer sections, each section being 3 meter long.

Data : Saturated solution of $FeSO_4$ at 49° C and 27° C contains 140 parts and 74 parts of $FeSO_4.7H_2O$ per 100 parts of free water respectively.

Average specific heat of the initial solution is 0.70 and heat of crystallization is 15.8 Kcal/kg.

Atomic weight : S = 32, Fe = 56, O = 16, H = 1. **16**

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T.E. (Computer Engineering) (Sem. – II) Examination, 2009
MICROPROCESSOR BASED SYSTEM
(1997 Course) (Old Course)

Time : 3 Hours Max. Marks : 100

Instructions : *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) What are the sources of interrupts in 8051 ? Give their vector addresses. How are they generated ? Which SFRs are involved in interrupt handling of 8051 ? **10**
   b) How can you program timers in 8051 ? **4**
   c) What are the SFR contents of 8051 on reset ? **4**

2. Answer the following :
   a) Write the instructions to set and clear bits in bit-addressable area of 8051. **4**
   b) What is the significance of DPL, CPL and RPL ? **4**
   c) What is the use of barrel sfiter in 80386DX ? **4**
   d) How are ERROR, BUSY and PEREQ signals of 80386 useful during co-processor communication ? **4**

3. a) How privilege level can be changed in 80386 ? What are the descriptors used for this purpose ? **8**
   b) What do you mean by IOPL field and I/O permission bit map ? **8**

4. a) Differentiate between Virtual 8086 mode and Real mode of 80386 microprocessor. How is paging helpful in Virtual 8086 mode ? **10**
   b) What is Task gate descriptor ? Where it is present ? Explain in detail its use in multitasking. **6**

P.T.O.

5. a) What is a selector in 80386 ? **4**

b) Interface 4 KB of program memory to 8051 micro controller. Also draw memory map. **8**

c) What do you mean by LDT ? **4**

SECTION – II

6. a) Explain with the help of flow chart the 80386 activity after RESET. **8**

b) What does it mean by "aligned and misaligned data transfer in 80386DX ? **4**

c) What is the significance of $\overline{\text{BS16}}$ pin ? **4**

7. a) Explain different modes of operation of serial port found in 8051. **8**

b) With the help of neat diagram, explain the address translation in 80386DX if 31^{st} bit of CR0 is set. **8**

8. a) With the help of neat diagram explain internal memory map of 8051. **8**

b) What do you mean by Nested task ? Explain the process of switching to and from nested task. Which flags, fields and instruction are required to indicate this process ? **8**

9. a) What are trap gate descriptor, interrupt gate descriptor and task gate descriptor ? **8**

b) What is TSS (Task State Segment) ? What can be its minimum and maximum size ? How is it different from data segment ? Explain in brief how TSS is helpful in multitasking. **10**

10. a) How protection is provided at segmentation level in 80386 ? **8**

b) What are the power saving modes of 8051 ? Explain in detail. **8**

T.E. (Chemical Engg.) (Semester – II) Examination, 2009
INDUSTRIAL ORGANIZATION AND MANAGEMENT
(2003 Course) (Common to Biotechnology)

Time : 3 Hours Max. Marks : 100

Instructions : *i) Answer* ***any one*** *questions from* ***each*** *Unit of Section –* ***I*** *and Section –* ***II****.*
ii) Answer to the ***two*** *Sections should be written in* ***separate*** *answer books.*
iii) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

SECTION – I

UNIT – I

1. a) "Decision making is the primary task of the manager" comment. **5**

b) "Planning is looking ahead and control is looking back" comment. **5**

c) Is managing a science or an art ? Could the same explanation apply to engineering ? Why ? **6**

OR

2. a) State the various forms of Business organisation and explain in detail partnership as a business form. **8**

b) List down various organisation structures. Explain any two with neat diagram. **8**

UNIT – II

3. a) What is meant by manpower planning ? What are the objectives and benefits of manpower planning ? **8**

b) Describe any two methods of job evaluation along with merits and demerits. **8**

OR

4. a) Discuss the objectives and functions of wage and salary administration. **8**

b) Explain the process of recruitment and types of recruitment. **8**

UNIT – III

5. a) Explain the process of purchase through quotation, tender and comparative. **9**

   b) List and explain various cost associated with inventory. **9**

OR

6. a) Define control chart and explain any two. **9**

   b) Explain the various functions of a store keeper in pharmaceutical company and chemical industry. **9**

SECTION – II

UNIT – IV

7. a) State the various parameter to be considered in pricing of petrochemical products. **8**

   b) Explain how will you carryout market research for selling of fertilizers. **8**

OR

8. a) Explain the concept of pricing and distinguish between skimming pricing and penetration pricing. **10**

   b) Explain the different selling methods for selling chemical products. **6**

UNIT – V

9. a) Explain role of international trade in supporting Indian economy. **8**

   b) Explain various costs involved in experting a product. **8**

OR

10. a) Define TQM. Explain the role of TQM to improve the productivity of chemical industry. **8**

    b) Explain role of ISO 14000 in chemical organisation. **8**

UNIT – VI

11\. a) Define time study. Explain how will you carry out time study in chemical organisation. **9**

b) Define patent. Explain the procedure of getting patent. **9**

OR

12\. Short note on : **18**

i) FERA and FEMA

ii) Need of work study

iii) Contracts.

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T.E. (Polymer Engg.) (Semester – I) Examination, 2009
MATHEMATICAL METHODS IN POLYMER ENGG.
(2003 Course)

Time : 3 Hours | Max. Marks : 100

Instructions : *1) In Section – **I** attempt Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**.*
*In Section – **II** attempt Q. **7** or **8**, Q. **9** or Q. **10,** Q. **11** or Q. **12.***

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black 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) With usual notations, establish the following :

i) $\delta = E^{1/2}\nabla = E^{-1/2}\Delta$

ii) $\Delta = \mu\delta + \frac{1}{2}\delta^2$

iii) $hD = \log E = 2\sinh^{-1}\left(\frac{\delta}{2}\right)$. **9**

b) For the following tabulated data

x	1	2	3	4	5
y	3.47	6.92	11.25	16.75	22.94

Find y at x = 4.5 and $\frac{dy}{dx}$ at x = 1.5. **8**

OR

2. a) Use Regula-Falsi method to find real root of the equation $e^x - 4x = 0$ correct to three decimal places. Write algorithm for the above method. **8**

   b) Obtain one root of the equation $8x^3 - 6x - 1 = 0$, correct to four decimal places, by using method of successive approximations. Take initial value as 0.95. Write algorithm for above method. **9**

3. a) Evaluate $I = \int_1^2 \frac{dx}{x^2}$ by using Trapezoidal rule, taking h = 0.5 and h = 0.25. Compare the results with exact value.

   Write algorithm for Trapezoidal rule. **8**

   b) Solve $\frac{dy}{dx} = \sqrt{x^2 + y}$ using Runge-Kutta method to find y at x = 0.4. Given that y (0.0) = 1.0 and h = 0.2. **8**

OR

4. a) Use Simpson's rule to evaluate $\int_0^1 \frac{\sin x}{2 + 3\sin x} dx$ by dividing the interval in to six parts. **8**

   b) Use modified Euler's method to solve the differential equation $\frac{dy}{dx} = \frac{1}{x + y}$ with x = 0, y = 1 to calculate y at x = 0.2 and 0.4, take h = 0.2. **8**

5. a) Solve the system of equations by Gauss-Seidel iteration method.

$$10\,x_1 + 2x_2 + 3x_3 = 17$$

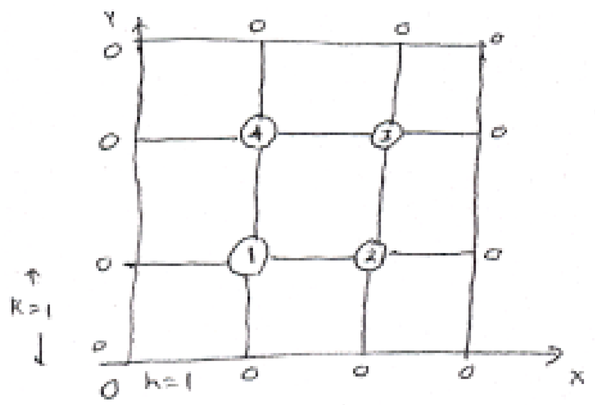
$$x_1 + 8x_2 - x_4 = -3$$

$$2\,x_1 + 7x_3 + 11x_4 = 30$$

$$2\,x_1 + 10x_3 + 2x_4 = 27.$$

8

b) Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -500$ at the pivotal points of the grid shown in the figure.



9

OR

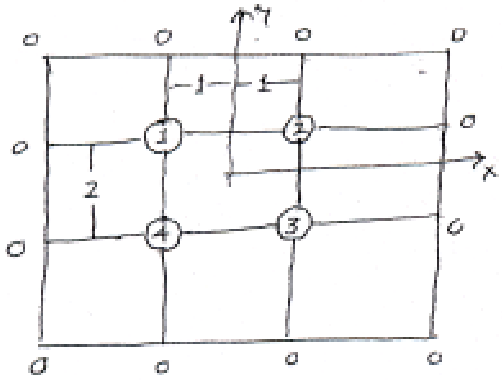
6. a) Values of x and y are tabulated as under

x	1	1.5	2.0	2.5
y	25	56.2	100	156

8

Find the law of the form $x = ay^n$ to satisfy the given data using the method of least squares.

b) Solve the equation $\frac{\partial^2 f}{\partial x^2} + 2\frac{\partial^2 f}{\partial y^2} = \frac{1}{xy}$ corresponding to the grid shown in the figure.



9

SECTION – II

7. a) Fluctuations in the marks obtained by two groups of students are given below. Find out which of the two shows greater variability.

Group A	40	32	35	45	47	36	39	41	42	49
Group B	35	31	26	29	33	37	41	26	42	35

8

b) Calculate the first four moments about the mean of the given distribution. Find coefficients of skewness and kurtosis. The first four moments about the value 5 are 2, 20, 40 and 50. **8**

OR

8. a) Compute correlation coefficient between supply x units and price of commodity y units. Find the regression line of y on x.

x Supply	152	158	169	182	160	166	182
y Price	198	178	167	152	180	170	162

8

b) Five boys and five girls are to be seated in a row. In how many ways can they be seated if

i) All boys must be seated in the five left-most seats.

ii) No two boys can be seated together. **4**

c) The Mean and standard deviation of 30 items is found to be 12 and 4 respectively. It was observed that one item 10 was incorrect. Calculate the mean and standard deviation if the wrong item is replaced by 14. **4**

9. a) A box contains 6 red balls, 4 white balls and 5 blue balls. Three balls are drawn successively from the box. Find the probability that they are drawn in the order red, white and blue if each ball is not replaced. **5**

b) Probability of Man aged 60 years will live for 70 years is $\frac{1}{10}$. Find the probability of out of 5 men selected at random

i) two will live for 70 years ii) at least two will live for 70 years. **6**

c) A manufacturer of cotter pins knows that 2% of his product is defective. If he sells cotterpins to boxes of 100 pins and guarantees that not more than 5 pins will be defective in a box, find the probability that a box will fail to meet the guaranteed quality. **6**

OR

10. a) For a normal distribution when mean $\bar{x} = 1$, S.D. = 3. Find the probabilities for the intervals.

i) $3.43 \le x \le 6.19$ ii) $-1.43 \le x \le 6.19$

$[Z_1 = 1.73, A_1 = 0.4582; Z_2 = 0.81, A_2 = 0.2910]$. **6**

b) The demand for a particular spare part in a factory was found to vary from day to day. In a sample study the following information was obtained.

Days	**Mon.**	**Tues.**	**Wed.**	**Thurs.**	**Fri.**	**Sat.**
No. of parts demanded	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the day of the week. $[\psi^2_{5;0.05} = 11.07$. **6**

c) Find the unique fixed probability vector $\bar{t}$ of the following regular stochastic matrix.

$$\bar{P} = \begin{bmatrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{bmatrix}$$

Which matrix does P^n approach as n becomes larger ? **5**

11. a) Show that sum of two tensors of the same rank and type is a tensor of the same rank and type. **6**

b) A covariant tensor has components x^2, xy, $y^2 - z$ in cartesian system. Find its covariant components in spherical polar system. **6**

c) Prove that δ^p_q is a mixed tensor of the second rank. **5**

OR

12. a) A covariant tensor has components x^2y, y^2z, z^2x in cartesian system. Find its covariant components in cylindrical system. **6**

b) Show that the contraction of the outer product of the tensors A^p and B_q is an invariant. **5**

c) Show that

i) $[pq, r] = [qp, r]$

ii) $\left\{ \begin{matrix} s \\ pq \end{matrix} \right\} = \left\{ \begin{matrix} s \\ qp \end{matrix} \right\}$. **6**

T.E. (Polymer Engineering)(Semester – I) Examination, 2009
POLYMER CHEMISTRY – I
(2003 Course)

Time: 3 Hours　　　　Total Marks: 100

Instructions : *1) **All** questions are **compulsory**.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*3) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Give the structures for any four typical addition and condensation polymers respectively. **6**

b) Define the terms with suitable examples. **6**
1) Condensation
2) Addition
3) Oligomer

c) Explain how polyurethanes can be classified as addition as well as condensation polymer ? **6**

OR

2. a) Derive and explain Carother's equation. **6**

b) How will the chemical compound having one, two, three, four and five functional groups behave towards polymerization ? **6**

c) Give the structures and IUPAC names for the following polymers. **6**
1) PET
2) Nylon 6
3) PMA

3. a) How will you make use of viscosity behaviour of polymer solution to determine the molecular weigtht ? Explain the method. **6**

   b) Explain the method to determine molecular weight of a polymer utilizing its functional groups. **5**

   c) Discuss why it is difficult to get monodispersed polymer system by any polymerization technique ? **5**

OR

4. a) Polymer molecular weight is always referred in terms of ‘average’ whereas for low molecular weight it is not so. Explain. **6**

   b) How important is polymer molecular weight and its distribution from the processing and application point of view ? Explain. **5**

   c) Explain the molecular weight determination of polymer utilizing ‘osmosis’ as the basis of technique. **5**

5. a) Can sedimentation technique to determine molecular weight be used to determine MWD ? Explain the technique. **6**

   b) How will you separate the polymer into various fractions according to their molecular weight by partial dissolution technique ? **5**

   c) Explain the concept of polydispersity. **5**

OR

6. a) Explain gel permeation chromatography in detail. **6**

   b) Write a note on gradient elution technique. **5**

   c) Making use of solvent power how will you separate polymer fractions according to their molecular weight ? **5**

SECTION – II

7. a) Explain plasma polymerization in detail. **9**

   b) Compare bulk and solution polymerization with reference to similarities, dissimilarities, advantages and disadvantages. **9**

OR

8. a) Discuss in detail emulsion polymerization. **9**

   b) Explain phase transfer catalyst and explain interfacial polymerization. **9**

9. a) Give an account of various initiators of free radical polymerization. **9**

   b) Explain group transfer polymerization. **7**

OR

10. a) Discuss various catalysts used in ionic polymerization. **9**

    b) Explain how will you differentiate inhibitors and retarders ? **7**

11. a) Explain with suitable examples (two) ROP. **9**

    b) Write a note on polyaddition polymerization. **7**

OR

12. a) Write a note on gelation and crosslinking. **9**

    b) Explain importance of the stoichiometric balance in polycondensation reaction. **7**

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T.E. (Polymer) (Semester – I) Examination, 2009
POLYMER MATERIALS – I
(2003 Course)

Time: 3 Hours Max. Marks: 100

Instructions : *1) Answers to Section **I** and Section **II** should be written on **separate** answer books.*
*2) Solve **3** questions from Section **I** and **3** questions from Section **II**.*
*3) **Neat** diagrams should be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume suitable data, if **necessary**.*
*6) **Use** of electronic pocket calculator is **allowed**.*

SECTION – I

1. a) Give 2 examples of Engineering Thermoplastics with their repeating unit structures. **3**
b) LDPE has better impact strength HDPE. True or False. Justify your answer. **3**
c) Explain the effect of tacticity on properties of polypropylene. **4**
d) What are the various forms of Modified polystyrene ? Explain any one in brief. **6**
e) What do you understand by UPVC and PPVC ? **2**

OR

2. a) Give 2 examples of commodity thermoplastics with their repeating unit structures. **3**
b) What is LLDPE ? How is it different from LDPE and HDPE ? **3**
c) Isotactic PP is crystalline while atactic PP is amorphous. True or False. Justify. **3**
d) Compare the properties of UPVC and PPVC. **4**
e) Why is PPMA used in contact lens applications ? **2**
f) Give 3 properties of PMMA. **3**

3. a) Enumerate various cellulose derivatives. Explain any one in detail. **8**

   b) Polyvinyl acetate belongs to saturated polyesters family. True or False. Justify. **3**

   c) Enlist 2 properties of polyvinyl acetate. **2**

   d) Give applications of polyvinyl alcohol. **3**

OR

4. a) What do you understand by Degree of Acetylation and degree of nitration in case of cellulosics ? Explain in brief their effect on properties. **6**

   b) Why is it necessary to modify cellulose before converting into product ? **3**

   c) Comment on Cold Flow phenomena in case of polyvinyl acetate. **3**

   d) Give 2 properties of polyvinyl alcohol. **2**

   e) Polyvinyl alcohol finds application as protective colloid in emulsion polymerization having water as a continuous phase. Why ? **2**

5. a) Write a short note on importance of various additives in PVC processing. **4**

   b) Comment on the norms for deciding toxicological level of additives. **4**

   c) Enlist various types of property modifiers. Give one example of each type. Explain any one in detail. **8**

OR

6. a) Enumerate various Processing Aids used in polymers. Give one example of each. Explain any one in detail. **8**

   b) Explain in brief how additives are classified. Give suitable examples. **4**

   c) A plasticized PVC pipe turned into rigid one after few days. What could be the possible reason behind this phenomenon ? **4**

SECTION – II

7. a) Nylons are generally not suitable for high frequency electrical insulation applications especially under humid conditions. Why ? **2**

b) Briefly discuss the effect of distance between repeating -CONH groups on nylon properties in general. **4**

c) What are the points to be taken into consideration for nylon processing ? **4**

d) Give applications of polycarbonates. **3**

e) Compare polyacetal with polyethylene w.r.t. structure-properties. **5**

OR

8. a) Nylon 6,12 is more flexible than Nylon 6,6. True or False. Justify your answer. **3**

b) Explain in brief the reason behind toughness of polycarbonate. **3**

c) What are the merits and demerits of polycarbonates ? **6**

d) Why polycarbonates are not classified under polyesters although it has "-ate" in its nomenclature ? **2**

e) Explain in brief various routes of POM degradation. **4**

9. a) PET and PBT are saturated or unsaturated polyesters ? Justify your answer. **2**

b) Why PBT has lower T_g and T_m values than PET ? **2**

c) Give 2 applications each of PET and PBT. **4**

d) Why is PTFE chemically inert ? **2**

e) Give 3 important properties of PTFE. **3**

f) Comment on Flammability/Burning characteristics of polyimide/polyetherimide. **3**

OR

10. a) Give 5 important characteristics of PBT. **5**

b) For non-stick cookware application, between PTFE and Nylon which polymer is more suitable. Why ? **3**

c) Comment on effect of presence of C-F bond on properties of PTFE. **4**

d) Give 4 applications of polyimide/polyetherimide. **4**

11. a) Why purging is very much essential after processing PEEK ? **2**

b) Enlist 3 applications of PEEK. **3**

c) Mention 2 important properties which make PEEK suitable for high performance applications. **2**

d) Why PPO is one of the preferred polymers for pump components, valves and pipes ? **3**

e) Briefly comment of flammability characteristics of PPS. **3**

f) Write down 3 applications of PPS. **3**

OR

12. a) Why is PEEK suitable for nuclear applications ? **2**

b) Mention 3 factors/properties which cause good dimensional stability in PPO. **3**

c) Give 3 applications of PPO. **3**

d) Which properties make Polysulphone/polyethersulphone suitable for medical and food service applications ? **3**

e) Mention 3 properties of PPS. **3**

f) What do you understand by “Curing or Cross-linking or Chain Extension” phenomena in case of PPS ? **2**

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T.E. (Polymer Engineering) (Sem. – I) Examination, 2009
CHEMICAL ENGINEERING OPERATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*
2) Draw neat diagrams ***wherever*** *necessary.*
3) Numbers to the ***right*** *indicate* ***full*** *marks.*
4) Assume suitable data, ***if necessary****.*
5) Use of logarithmic table, electronic pocket calculators is ***allowed****.*

SECTION – I

1. a) Oxygen (A) is diffusing through Carbon monoxide (B) under steady state condition, with the Carbon monoxide as non-diffusing. The total pressure is 1×10^5 N/m^2 and temperature 0°C. The partial pressure of Oxygen at two planes 2 mm apart is 13000 N/m^2 and 6500 N/m^2 respectively. The diffusivity for the mixture is 1.87×10^{-5} m^2/sec. Find the rate of diffusion of oxygen through each square meter of the two planes. **8**

b) Derive an expression for the steady state Equimolal Counter Diffusion for the gases binary system. **8**

OR

2. a) Find the rate of diffusion of Acetic acid (A) across a film of non diffusing water (B) solution 1 mm thick at 17°C. When the concentration on the opposite sides of the film are 9 wt% and 3 wt% acid respectively.

Diffusivity of Acetic Acid in the solution = 0.95×10^{-9}m^2/sec.

Density of 9 wt% acetic Acid = 1012 Kg/m^3.

Density of 3 wt% acetic Acid = 1003.2 Kg/m^3. **8**

b) Write a note on classification of Mass Transfer Operations. **8**

P.T.O.

3. a) Describe in detail any one equipment with necessary diagram used for providing intimate contact of gas-liquid operation. **10**

b) Create y-x diagram by using relative volatility term for Methanol-Water system. **8**

Component	Boiling Point (°C)	Vapor Pressure at 65.5°C (KPa)	Vapor Pressure at 100°C (KPa)
Methanol	65.5	104.54	351.76
Water	100	25.43	100.85

OR

4. a) Discuss the Interphase Mass Transfer in terms of Equilibrium, Local Mass transfer coefficient and Overall Mass transfer coefficient. **10**

b) Write a note on "Choice of Solvent" for gas Absorption. **4**

c) Describe in detail term "Minimum Liquid-Gas ratio" used under gas absorption. **4**

5. a) In a drying experiment, tray dryer with 1 m^2 available areas used to handle feed system. Following data has been collected. Find the rate of Drying and find the critical moisture content. **12**

Time in hour	Weight of wet material (Kg)	Time in hour	Weight of wet material (Kg)
0	5.31	3.0	4.74
0.4	5.24	3.4	4.67
0.8	5.16	4.2	4.52
1.0	5.12	4.6	4.47
1.4	5.05	5.0	4.43
1.8	4.97	6.0	4.34
2.2	4.88	Infinite	4.12
2.6	4.82		

b) Discuss the term Drying with one application. **4**

OR

6. a) Discuss with applicable terminologies the properties of water vapor-air mixture. **8**

   b) Write a note on Diffusion through Porous solid. **8**

SECTION – II

7. a) Discuss the Danckwarts concept of Scale of Segregation and Intensity of Segregation. **8**

   b) Explain the concept "Scale of Scrutiny and Scale of Examination" for describing State of Admixture. **8**

OR

8. a) Describe various mixing indices used to describe the state of admixture. **8**

   b) Write a short note rate of Mixing. **8**

9. a) Explain the desired characteristics of distributive and dispersive mixing section in single screw extruder. **6**

   b) Write a short note on Ribbon blenders and Paddle mixers. **6**

   c) Discuss the constructional features and mixing action in Maddock Mixing section and Egan mixing Section. **6**

OR

10. a) Explain with neat sketches constructional features and mixing action with Double block head mixing section and Blister Ring. **6**

    b) Discuss the construction and mixing action of double arm mixer. **4**

    c) Write a note on Two Roll Mill. **8**

11. a) Sketch and explain flow diagram for calendaring plant for poly vinyl chloride. **8**

    b) Write a note on various additives used in dry blending of poly vinyl chloride. **8**

OR

12. a) Write a short note on constructional features and mixing action in Ko-kneaders. **8**

    b) Sketch and explain flow diagram for Rubber compounding. **8**

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T.E. (Polymer) (Semester – I) Examination, 2009
(2003 Course)
DESIGN OF EQUIPMENTS AND MACHINE ELEMENTS

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, in **necessary**.*

1. a) Explain in detail maximum principal and maximum shear stress theories of failure for a member subjected to biaxial stress system. **6**

b) A belt is subjected to 15 KN of load along its axis and transverse shear force of 6 KN. Find diameter of belt required as per any one theory of failure. Take permissible tensile stress at elastic limit = 100 MPa and Poisson's ratio = 0.3. **6**

c) As per BIS, state what is meant by X10Cr18 Ni 9 and XT 75 W18 Cr4V1. **4**

OR

2. a) Draw Mohr's circle and show principal stresses for the following stress condition $\sigma_x = 100\,\text{MPa}$; $\sigma_y = 20\,\text{MPa}$; $\tau_{xy} = 60\,\text{MPa}$. Also calculate maximum shear stress. **8**

b) Write short notes **any 2** : **8**

i) Stress concentration and methods to reduce it.

ii) Steel designation based on mechanical and chemical composition as per BIS.

iii) Factor of safety and its criterion for its selection.

3. a) Design a bush pin type flexible coupling to connect a pump shaft to a motor shaft transmitting 35 KW at 1000 rpm. The overall torque is 25% more than mean torque. The material properties are as follows :

i) Allowable shear and crushing stress for shaft and key material is 40 MPa and 80 MPa respectively.

ii) Allowable shear stress for cast Iron is 15 MPa.

iii) Allowable bearing pressure for rubber bush is 0.8 N/mm^2.

iv) The material of pin is same as that of shaft and key. **14**

b) Explain what is meant by slip and velocity ratio of a belt drive. **4**

OR

4. a) Derive an expression for a solid shaft subjected to i) twisting moment T only ii) Bending moment M only. **4**

   b) A shaft of mild steel is required to transmit 120 KW at 315 rpm. The supported length of the shaft is 3m. It carries two pulleys each weighing 1200 N supported at a distance of 1 m from the ends respectively. Taking allowable shear stress as 60 N/mm^2, determine shaft diameter. **8**

   c) Explain various types of keys with neat diagrams. **6**

5. a) Explain with neat sketches **any two** of the following for obtaining different speeds of spindle :
      i) Gene Pulley arrangement
      ii) Sliding gear arrangement
      iii) Norton gear box
      iv) Clutched system. **8**

   b) A machine spindle is to operate on ferrous metals at 40 m/min and is required to have 6 speeds. The spindle can accommodate cutters ranging from 10 to 60 mm diameters. Determine the spindle speeds. **8**

OR

6. a) With reference to hydro dynamic journal bearing define :
      i) Diametral clearance
      ii) Diameterial clearance ratio
      iii) Eccentricity
      iv) Attitude or eccentricity ratio. **6**

   b) Explain with neat sketches various types of rolling contact bearings. **6**

   c) Explain with neat sketches, various types of gears used for power transmissions. **4**

SECTION – II

7. a) Explain the basic concept of following operations :
      i) Clamp force/tonnage development
      ii) Decompression of tonnage
      iii) Mold open and mold close
      iv) Mold safety

   With hydraulic circuit, explain how these operations take place in conventional direct hydraulic locking machine. **14**

b) Explain why injection unit needs to be held in forward condition with contract force during injection. **2**

OR

8. a) With neat sketch, explain any one type of lock and block clamping system. **4**

b) With a neat sketch of hydraulic circuit, explain how velocity/fill phase and pressure/hold on phase is achieved in a conventional hydraulic system. Explain also injection with single pump and dual pump system. **8**

c) Explain how clamp force is generated in toggle system. Give stepwise procedure for setting clamp force in toggle machine. **4**

9. a) Explain with neat sketch brake value and its functioning. **6**

b) Explain with neat sketch, the functioning of sequence valve. **4**

c) Explain with neat sketch, the functioning of balance piston relief valve. **4**

d) Explain with neat sketch external gear type hydrometer. **4**

OR

10. Answer **any three** : **18**

a) With a neat hydraulic circuit, explain accumulator charging and unloading circuit.

b) With neat hydraulic circuit, explain sequencing circuit with limited clamping pressure.

c) Explain pump unloading circuit with neat sketch for a two pump system.

d) Explain traverse and feed circuit – rapid advance, feed and rapid return, with neat sketch.

11. a) In a certain chemical industry, nitrogen and hydrogen gas is introduced in a vessel. The vessel is pressurised to 3 kg/cm^2. The vessel should be remain under pressure for maximum one hour. Calculate a) shell thickness b) head thickness c) thickness of nozzle d) reinforcement design for nozzle.

Calculate various stresses induced in the vessel and compare them with permissible stress in the material.

Given data :

a) Shell

i) Internal diameter : 1200 mm

ii) Material : stainless steel

iii) Permissible stress : 130 N/mm^2

iv) Internal pressure : 0.3 N/mm^2

v) Weight of vessel : 32000 Newton with contents.

b) Head (flanged and shallow dished)
external diameter : 1200 mm
crown radius : 1200 mm
material : stainless steel
torque : 500 N-m

c) Nozzle
internal diameter : 150 mm
thickness : 3 mm
material : stainless steel
For all joints, consider efficiency to be equal to 1. **12**

b) A cylindrical pressure vessel 2 m in diameter is to operate at a pressure 4 kg/cm^2. The permissible stress in material is 960 kg/cm^2. Welded joint efficiency is 85%. Calculate the thickness required for the vessel. If this vessel is fabricated in spherical form, find the maximum pressure it will withstand. **4**

OR

12. a) Calculate the thickness of torispherical (100 – 6) head, torispherical (80 – 20) head and elliptical (2 : 1) for vessel with 1 m diameter and a design pressure of 3.5 kg/cm^2. Welded joint efficiency can be considered to be 100%. Permissible stress in material = 1250 kg/cm^2. **6**

b) A cylindrical vessel has inside diameter of 25 cm and an outside diameter of 37.5 cm. The maximum allowable tensile stress is 1400 kg/cm^2. Calculate the maximum internal pressure that the vessel can sustain. **6**

c) List the different types of heads used in pressure vessels. State the criterion for selecting heads for pressure vessels. **4**

T.E. (Polymer Engineering) (Semester – II) Examination, 2009
POLYMER CHEMISTRY – II
(2003 Course)

Time : 3 Hours Marks : 100

Instructions : *1) **All** questions are **compulsory**.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*3) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) 'Polymer degradation can be used advantageously'. Justify the statement giving suitable examples. **9**

   b) Differentiate the thermodynamics of polymer dissolution from that of LMW compounds. **8**

OR

2. a) Compare and contrast polymer dissolution process with other compounds. **9**

   b) Is it possible to determine the size and shape of a macromolecule ? Explain. **8**

3. a) How will you establish that the polymers obtained by Z-N catalyst are more superior to other catalyst systems ? **9**

   b) What is coordination polymerization ? Explain giving suitable example. **8**

OR

4. a) Write a note on polymerization using zirconocene catalyst. **9**

   b) Explain the tacticity of a polymer obtained from a 1, 2-disubstituted monomer having the same substituents. **8**

5. a) Give various methods to determine reactivity ratios. **8**

b) Explain which type of copolymer will you get when r_1 or $r_2 = 0$. Draw the graph for the same. **8**

OR

6. a) Write a note on ionic copolymerization. **8**

b) Write with suitable examples, copolycondensation. **8**

SECTION – II

7. a) How will you synthesize polyester resin for paints ? **9**

b) Give the manufacture of PU resins. **8**

OR

8. a) Explain crosslinking reactions in amino resins. **9**

b) Discuss the chemistry involved in the synthesis of epoxy polymers. **8**

9. a) Give the substitution reactions of PVC and explain chlorosulfonation of polyethylene. **9**

b) How will you convert polyvinyl alcohol into its ether derivatives ? **8**

OR

10. a) Explain various cyclization reactions. **9**

b) Give one example each for crosslinking of butadiene by thioacids and silicone rubber and polychloroprene by any agent. **8**

11. a) Explain the kinetics of polymerization using Lewis acid catalyst. **8**

b) How will you arrive at the rate of polymerization equation in case of BPO as catalyst. **8**

OR

12. a) Give the kinetic expression for polymerization reaction where the counter ion is a positive species. **8**

b) Derive the kinetic expression for non-catalysed polycondensation. **8**

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T.E. (Polymer) (Semester – II) Examination, 2009
(2003 Course)
POLYMER MATERIALS – II

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to Section **I** and Section **II** should be written on **separate** answer books.*

*2) Solve **3** questions from Section – **I** and **3** questions from Section – **II.***

*3) **Neat** diagrams should be drawn **wherever** necessary.*

*4) Figures to the **right** indicate **full** marks.*

*5) **Assume** suitable data, **if necessary**.*

*6) **Use** of electronic pocket calculator is **allowed**.*

SECTION – I

1. a) What do you understand by "cross-linking" of Thermosets ? Briefly explain its significance. **3**

b) What are Novolaks and Resols ? **2**

c) What are the different additives used in Novolak moulding powders ? **4**

d) Why is it necessary to know the Epoxy equivalent or epoxy value before curing of epoxy resin ? **2**

e) Write down applications of epoxy. **4**

f) Write a short note on "Reactive Diluents" used in USPS. **3**

OR

2. a) What are the various monomers used to synthesize Phenolics ? **2**

   b) What are Amino resins ? Give examples. **3**

   c) Write a short note on "wet process" used for compounding UF moulding powders. **4**

   d) What is DGEBA ? What will be its epoxy equivalent ? **3**

   e) Write down applications of USPS. **4**

   f) Why styrene is added to USPS resins ? **2**

3. a) Write short note on Furan resins. **3**

   b) Give 2 applications of allyl resins. **2**

   c) What are polyurethane resins ? What are the various applications of polyurethanes ? **5**

   d) What is the role of blowing agents in PU foams ? **2**

   e) What are silicones ? What are the various types/forms of silicones ? **4**

OR

4. a) Give at least 2 applications of Furan resins. **2**

   b) Write short note on Allyl resins. **3**

   c) Blowing agent is essential in Flexible PU foam while not in Rigid PU foam. True or False. Justify your answer. **2**

   d) Compare Flexible and Rigid PU foams. **5**

   e) Write short note on Silicone fluids. **4**

5. a) Define the term “Adhesive”. What are the different types of adhesives ? Name at least one polymer and one application of each type. **6**

b) Explain the significance of Thickeners in adhesive formulations. Give examples of thickening agents used in adhesives. **6**

c) Comment on the property requirements for the paint to be used in automobiles. **4**

OR

6. a) Write short notes on Pressure-sensitive adhesives and Hot-melt adhesives. **6**

b) Explain in brief various criteria for selecting the solvents in adhesive formulations. **4**

c) Explain with their role the various raw materials used in paint formulations. **6**

SECTION – II

7. a) Write a short note on Raw rubber technology. **6**

b) Comment on chemical changes taking place during mastication and vulcanization. **6**

c) Why masticated NR is tacky while masticated SBR is not ? True or False. Justify. **4**

OR

8. a) Explain the terms - Mastication, Vulcanization, Elastomer, Rubber. **4**

b) Give two examples of hydrocarbon based rubbers and one example of Nitrogen and Halogen containing rubbers. Draw the repeating unit structures of these rubbers. **6**

c) Write a short note on Latex rubber technology. **6**

9. a) Explain in brief various methods of rubber vulcanization. **6**

   b) What is the function of accelerators and activators used in rubber curing ? **4**

   c) Write short notes on Antioxidants and Peptizers used in rubber formulations. **6**

OR

10. a) What are the various additives used in rubber formulation ? Mention the function of each additive. **10**

    b) Explain the non-sulphur vulcanization system used for rubbers. **6**

11. a) Give properties and applications of SBR. **6**

    b) Acrylonitrile content affects the properties of Nitrile rubber. True or False. Justify your answer. **4**

    c) What are Thermoplastic elastomers ? Give examples. Mention their applications. **6**

    d) Draw repeating unit structure of Butyl rubber. **2**

OR

12. a) Give properties and applications of NR. **6**

    b) Write a short note on Neoprene (polychloroprene) rubber. **6**

    c) Draw repeating unit structure of Polybutadiene rubber. Give its merits and demerits. **6**

B/II/09/110

T.E. (Polymer Engineering) (Semester – II) Examination, 2009
INSTRUMENTATION AND PROCESS CONTROL
(2003 Course)

Time: 3 Hours Max. Marks: 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Draw neat diagrams **wherever** necessary.*
*3) Numbers to the **right** indicate **full** marks.*
*4) Assume the suitable data, **if necessary**.*
*5) **Use** of logarithmic table, electronic pocket calculators is **allowed**.*

SECTION – I

1. a) Explain the different parts of measuring instruments illustrate with suitable examples. **6**

   b) Explain the terms in brief Range, Static error, Sensitivity, Drift, Precision. **10**

OR

2. a) An instrument is specified as having range of 100-500 bar and an accuracy of +/- 0.5 bar and sensitivity of 0.3 divisions/bar and resolution of 0.1 % full scale deflection. Find range, sensitivity and accuracy. **6**

   b) What do you understand by the term Calibration and how will you calibrate a thermometer ? **10**

3. a) Explain with neat diagram, principle, construction, working, merits and demerits of any one instrument used to measure temperature. **14**

   b) Define the term temperature. **2**

OR

4. a) What is LVDT and explain its construction and working ? **6**

   b) What are Elastic Element Gauges to measure pressure and explain any one in detail. **10**

P.T.O.

5. a) With a neat sketch explain construction, working, advantages and disadvantages of venturi meter. **10**

b) Explain the importance of density measurement in polymer industry and suggest suitable instruments for doing so. **8**

OR

6. a) Explain the importance of viscosity measurement in polymer industry and suggest suitable instruments for doing so. **10**

b) Discuss the classification of level measurement techniques. **8**

SECTION – II

7. a) Explain the following terms : **8**

i) Set Point ii) Error iii) Time constant

iv) Dead time v) Load

b) A thermometer (first order system) with time constant of 15 sec is placed in temperature bath and after it reaches steady state of 60° C, it is placed into hot fluid which is at 80° C. Find out the response of thermometer and find out the temperature at time = 15 sec. **10**

OR

8. a) Derive the transfer function of second order system. **10**

b) A thermometer which is observed to exhibit the first order dynamics with time constant of 15 sec, which is placed in bath at temperature of 50°C and after reaching steady state, temperature of bath linearly increases with time at 10°C/min. find out the response of same at time = 5, 10, 15, 20, 25, 30 min. **8**

9. a) Explain the terms used to describe an under damped second order response. **8**

b) Write a note on Servo and Regulator problem control system. **8**

OR

10. a) Differentiate between the positive feedback system and negative feedback control system. **8**

b) Discuss the components of feedback control system with suitable examples. **8**

11. a) Discuss any two examples of PC based control system. **10**

b) Discuss the effect of proportional control action. **6**

OR

12. a) Discuss the importance of advanced process control to polymer processing. **10**

b) Write a note on Programmable Logic Control. **6**

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T.E. (Polymer) (Semester – II) Examination, 2009
POLYMER THERMODYNAMICS AND REACTION ENGINEERING

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. A) Give the statement of first law of thermodynamics and derive expression for first law of thermodynamics for non-flow process. **6**

B) What is enthapy ? How it related with internal energy (V) and heat (Q) at constant volume and pressure ? **6**

C) Calculate change in Internal energy (ΔE) and change in enthapy (ΔH) for 1 kmol water as it is vaporised at constant temperature of 373 K and constant pressure of 101.3 kpa. Specific volume of liquid and vapour at the these condition are 1.04×10^{-3} m^3/kmol and 1.675 m^3/k mol respectively. Amount of heat 1030 KJ is added to water for this change. **6**

OR

2. A) Calculate the heat of formation of methane gas from the follow heat of combustion data :

a) $CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(l)}\,;\ \Delta\overset{\circ}{H}_{298} = -890.94\,KJ$

b) $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}\,;\ \Delta\overset{\circ}{H}_{298} = -393.78\,KJ$

c) $H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(l)}\,;\ \Delta\overset{\circ}{H}_{298} = -286.03\,KJ$ **6**

B) Give statement of second law of Thermodynamics. **4**

C) Explain with neat sketch carnot principles. **6**

D) Define entropy. **2**

3. A) How thermodynamic properties are classified with example ? Explain in brief about Helmholtz free energy and Gibb's free energy. **6**

B) Using fundamental Thermodynamics properties prove that : **6**

$$\left(\frac{\partial T}{\partial V}\right)_S = -\left(\frac{\partial P}{\partial S}\right)_V \quad \text{————————} \quad (a)$$

$$\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P \quad \text{————————} \quad (b)$$

$$\left(\frac{\partial V}{\partial T}\right)_P = -\left(\frac{\partial S}{\partial P}\right)_T \quad \text{————————} \quad (c)$$

$$\left(\frac{\partial P}{\partial T}\right)_P = -\left(\frac{\partial S}{\partial P}\right)_T \quad \text{————————} \quad (d)$$

C) Derive expression for Clausius-Clapeyron equation. **4**

OR

4. A) What is partial molar properties ? State any three partial molar properties with example. Write the significance of partial molar properties. **6**

B) Define fugacity. Explain effect of temperature and pressure on fugacity. **4**

C) Derive Gibb's - Duhem equation and application of equation. **6**

5. A) Differentiate between upper critical solution temperature (UCST) and lower critical solution temp. (LCST) and explain its significance. **8**

B) Define solubility parameter with example. Explain solubility parameter is useful while blending two polymer. **8**

OR

6. A) Derive expression for Flory-Huggnis equation. **8**

B) State the different types of organic solution. How polymer solution differ from organic solution expression with example ? **6**

C) Draw neat label Binodal curve. **2**

SECTION – II

7. A) Write a short note of "rate of reaction" and explain in detail about elementary and non elementary reaction. **6**

B) $A \rightarrow$ Product

Above reaction is first order irreversible reaction. Calculate the rate constant for above reaction with given data.

t(min)	0	100	200	300	400	500
C_A(mole/min)	1000	500	333	250	200	170

C) Also find out relationship between time and concentration for above reaction with rate constant. **10**

OR

8. A) List the method of interpretation of data of batch reactor. Explain difference between any two method. **4**

B) Define Half life period. Explain the significances of half life period with concentration with respect to zero, first and second order reaction. **6**

C) In certain irreversible half order reaction, experimental data shows that 75% of reactant is get converted in 10 minute then what would be fraction conversion take place in an half an hour time. **6**

9. A) Explain mixed flow reactor with neat sketch and with respect to following points

a) Performance equation

b) Ideal MFR

c) Graphical representation of design equation **8**

B) A reaction stiochiometry

$A \rightarrow 3R$

with 50% inerts gas follows the 1^{st} order irreversible kinetics with feed concentration of 'A' is 100 m mole/lit and 50% conversion find molar flow rate for same volume of PFR and MFR. Compare the result. **8**

OR

10. A) Explain the following terms.

a) Ideal PFR b) Space time

c) Holding time d) Space time

e) Expansion **10**

B) A gaseous feed of pure 'A' (1 mole/lit) enter MFR of size two liter and reacts as

$$2A \rightarrow R \quad , \quad -r_A = 0.05\,C_A^2 \text{ mole/lit/(sec)}$$

with outlet concentration 0.5 mole/lit. Calculate feed rate in lit/min (Assume $r_A = 0$). **6**

11. A) Prove that : **8**

$$\left(\frac{\partial G}{\partial E}\right)_{T,P} = \mu_B - \mu_A$$

where-G-Gibbs free energy, E-Extent of reaction, μ_A and μ_B chemical potential.

B) Explain in brief about reaction co-ordinates and its significance with respect to chemical reaction. **4**

C) State the different method of evaluation of equilibrium constant and explain any one method in detail. **6**

OR

12. A) Prove that **8**

$$\frac{d(nck)}{dT} = \frac{\Delta H^{\circ}}{RT^2}$$

where ΔH° -standard heat of reaction. T = Temp. K = equilibrium constant.

B) Derive expression for equilibrium constant and standard free energy change. **6**

C) What is equilibrium constant ? State the factor on which equilibrium constant depend. **4**

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T.E. (Production S/W) (Semester – II) Examination, 2009
BEHAVIOURAL SCIENCE
(1997 Course) (Old)

Time : 3 Hours Total Marks : 100

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

SECTION – I

1. a) List out various form of business organization and explain any two of them. **8**
   b) Discuss the external factors influencing the enterprise. **8**

2. a) List out various types of organisation structure and discuss any two of them. **8**
   b) Discuss the main functions of management. **8**

3. a) Define motivation. Discuss various types of motivations. **8**
   b) Discuss need hierarchy and two factors theory of motivation. **8**

4. Write short notes on (**any three**) : **18**
   a) Need of industrial laws.
   b) Personality Traits.
   c) Trade Unions and their role
   d) Organisation theories.

P.T.O.

SECTION – II

5\. a) What is group dynamics ? What is its role ? **8**

b) What is the nature and clause of conflicts ? How there are addressed ? **8**

6\. a) Define leadership. What are essential qualities of good leader ? **8**

b) What is a meaning of ‘Managerial Grid’ ? Discuss briefly the leadership styles. **8**

7\. a) Define communication. What is its role in industrial management ? Mention the factors of good communication. **8**

b) Discuss the various types of interviews in detail. **8**

8\. Write short note on (**any three**) : **18**

a) Transactional Analysis

b) Grooming of leadership

c) Types of communication

d) Organisation culture.

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[3663] – 191

T.E. (Comp./I.T.) (Semester – I) (2003 Course) Examination, 2009
DATABASE MANAGEMENT SYSTEMS

Time : 3 Hours | Max. Marks : 100

SECTION – I

1. a) What are the superclass and subclass entity types ? Explain. **4**

   b) Explain the difference between disjoint and overlapping design constraints. **4**

   c) A musical company has decided to store information about musicians who perform in their albums. Each musician is identified with unique identifier. The instruments are used in songs. Song has title and an author. Each musician may play several instruments and a given instrument may be played by several musicians. Each album has exactly one musician. Who acts its producer ? A musician may produce several albums. **8**

      i) Draw an E-R diagram.

      ii) List the key attributes.

OR

2. a) What do you mean by connectivity, cardinality and dependency of a relationship ? **4**

   b) Specify CODD's norms to be satisfied by RDBMs. **6**

   c) Discuss the entity integrity and referential integrity constraints. **6**

3. a) Consider the relational database : **8**

   dept (<u>dept-no</u>, dname, LOC)

   emp (<u>emp-no</u>, ename, designation)

   project (<u>proj-no</u>, proj-name, status)

   dept and emp are related as 1 to many.

   project and emp are related as 1 to many.

   Write relational or sq 1 expressions for the following :

      i) List all employees of 'INVENTORY' department of 'PUNE' location.

      ii) Give the names of employees who are working on 'Blood Bank' project.

      iii) Give the name of managers from 'MARKETING' department.

      iv) Give all the employees working under status 'INCOMPLETE' projects.

b) Specify the need for embedded SQL. List and explain various embedded commands. **6**

c) Explain : stored procedures and triggers with example. **4**

OR

4. a) The outer-join operation extend the natural-join operation so that tuples from the participating relations are not lost in the result of the join. How the theta join operation can be extended so that tuples from the left, right or both relations are not lost from the result of a theta join ? Explain. **8**

b) What is view ? List two major problems with processing update operations expressed in terms of views. **4**

c) State and prove Arm Strong's axioms for functional dependency. **6**

5. a) Consider a relation R with attributes ABCDE. You are given following dependencies :

$A \rightarrow B,\ BC \rightarrow E,\ ED \rightarrow A$

i) List all keys for R ii) Is R in 3 NF. **8**

b) Explain why 4 NF is more desirable than BCNF. Rewrite the definitions of 4 NF and BCNF using the notions of domain constraints and general constraints. **8**

OR

6. a) Let R = (A, B, C, D, E) and let M be the following set of multivalued dependencies.

$A \rightarrow\rightarrow BC \quad B \rightarrow\rightarrow CD \quad E \rightarrow\rightarrow AD$

List the non trivial dependencies in M^+. **8**

b) Which are different fact finding techniques ? State advantages and disadvantages of each. **6**

c) Define : User Interface design. **2**

SECTION – II

7. a) Write in detail various RAID levels and the factors to be taken into account when choosing a RAID Level. **8**

b) Construct a B^+ tree for following set of the key values. **8**

(2, 3, 5, 7, 11, 17, 19, 23, 29, 31)

Assume order of tree is 4.

OR

8. a) Describe a hash-join technique to implement a natural join. **4**

b) How can we estimate a cost of query ? **4**

c) Explain basic steps involved in query processing. What is the role of relational algebra in query processing ? **8**

9. a) Explain the concept of 'transaction'. Describe ACID properties for transaction. **8**

b) Why concurrent executions or transactions is desirable ? Support your answer with example. **4**

c) Explain time stamp based concurrency control. **4**

OR

10. a) Explain deferred database modification and immediate database modification and their difference in the context of recovery. **8**

    b) Differentiate between serial and serializable schedule. **2**

    c) Explain two-phase locking protocol. How does it ensure serializability ? **6**

11. a) Differentiate between persistent and transient object. How persistence is handled in a typical object oriented databases ? **8**

    b) State and explain the advantages of distributed database systems. **6**

    c) Explain the need for Backup and Replication. **4**

OR

12. a) Explain in detail ODMG language constructs for object definition and object manipulation. **8**

    b) How does the concept of an object in the object oriented model differ from the concept of an entity in the E-R model. **6**

    c) Explain how a persistent pointer is implemented. **4**

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T.E. (Computer) (2003 Course) (Semester – I) Examination, 2009
MICROPROCESSORS AND MICROCONTROLLERS

Time : 3 Hours Max. Marks : 100

Instructions : *1) 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**.*

*2) 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**.*

*3) Answers to the **two** Sections should be written in **separate books**.*

*4) Neat diagrams must be drawn **wherever** necessary.*

*5) **Black** figures to the **right** indicate **full** marks.*

*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Discuss whether Pentium is a RISC or CISC microprocessor. Justify your answer. **6**

   b) How real address mode of Pentium is different than 8086 microprocessor ? **5**

   c) Describe on chip cache organisation of Pentium. **5**

OR

2. a) What are instruction pairing rules in Pentium for integer and floating point instructions ? **8**

   b) Which different data types for real numbers are supported by floating point unit of Pentium ? **4**

   c) What is the function of following pins ?

   1) NA# 2) AP **4**

P.T.O.

3. a) What are privileged instructions ? Give two examples. **6**

   b) Draw programmer's model of Pentium. **4**

   c) How pipelined bus cycles are different than non pipelined bus cycles ? Explain with timing diagram. **6**

OR

4. a) Which pins of Pentium are checked to decide the mode it enters after RESET ? **6**

   b) Describe following instructions :

      1) SGDT 2) ARPL. **4**

   c) Draw and explain how 16 bit memory is interfaced with Pentium. **6**

5. a) Which different system descriptors are placed in GDT ? **4**

   b) Describe the linear to physical address translation for 4 MB pages in Pentium with the help of diagram. **8**

   c) What is the significance of CPL, RPL and DPL while accessing other code and data segments ? **6**

OR

6. a) Describe the call gate mechanism in details. Draw the related descriptor formats. **8**

   b) Describe logical to linear address translation in protected mode in Pentium using segmentation. **6**

   c) Describe PDE and PTE formats. **4**

SECTION – II

7. a) What are the contents of TSS ? Discuss the use of TSS in multitasking. **8**

   b) What is I/O permission bit map ? Under which circumstances is it referred by Pentium ? **6**

   c) What are error codes ? What is their use ? **4**

OR

8. a) Describe IDT in Pentium in details. How interrupt handling in protected mode is dependent on contents of IDT ? **8**

   b) How virtual 8086 mode is different than protected mode in Pentium ? **6**

   c) Explain nested tasks in Pentium. **4**

9. a) Describe various timer modes supported by 8051 microcontroller. **8**

b) What is program status word (PSW) ? Describe its format. **4**

c) What are the functions of $\overline{EA}$ and $\overline{PSEN}$ pins ? **4**

OR

10. a) Draw and explain architecture of 8051 microcontroller. **8**

b) Discuss interrupt structure of 8051 in details. **8**

11. a) Describe the features of PIC 16C61 / 16C71. **6**

b) Explain the working of watchdog timer in PIC 16C6X/7X in details. **6**

c) Describe following SFRs :

1) INDF 2) TRISA **4**

OR

12. a) Draw and explain memory banks supported by PIC 16C6X/7X. **6**

b) Describe the significance of different bits that control the timer operation in PIC. **6**

c) Explain the following instructions :

1) bsf STATUS, 05 2) retfie. **4**

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8. a) Define twiddle factor. Compute it for N = 4. Express DFT and IDFT using twiddle factor. Discuss its properties. **8**

   b) How linear convolution can be obtain using circular convolution ? Obtain 4 point DFT using Goertzel algorithm for x(n) = {0.5, 0.5}. **10**

9. a) Define a DT filter. What are the characteristics of ideal filter ? Compare between FIR and IIR filter. **8**

   b) Design IIR filter using BLT method with given specifications $H(s) = \frac{s}{s+1}$, $F_c = 200\ H_z$, $F_s = 2k\ H_z$. Use frequency prewarping. **8**

OR

10. a) What do you mean by linear phase response ? Show that the FIR filter described as y(n) = x(n) – x(n – 1) has linear phase response. **8**

    b) Compare between Hamming and Hanning window. Write down the design steps of FIR filter using window. **8**

11. a) State the 4 types of GLPS (generalised linear phase system). Draw the linear phase FIR filter structure for M = 7 (order 6). Specify the no. of hardware elements required. **10**

    b) Realize direct form II IIR filter structure for y (n) = 2 x(n) – x(n – 1) + 2y (n– 1). **6**

OR

12. a) Describe FIR filter by means of H(z) with example. Explain cascade form of FIR filter structure. **8**

    b) List the different types of internal buses and memory pointer registers present in ADSP 2105 processor. What is MAC ? **8**

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3. a) Using Z-transform properties obatin ZT of x(n) = (n + 1) u (–n) specify ROC. **8**

b) State and prove the time shifting property of Fourier transform. Apply it for x (n) = δ (n – 2). **8**

OR

4. a) Obtain inverse ZT using residue method for a causal sequence having

$$X(z) = \frac{3z^2 - z}{2.(z-1)^3}.$$ **8**

b) Obtain the Fourier transform of a DT sequence x(n) = $(a)^n$ u (n), | a | < 1.

Explain how to plot the magnitude spectrum. **8**

5. a) Define system function H(z). How it is obtained from the general difference equation ? How it describes the properties of DT system ? **8**

b) Solve the difference equation using ZT and obtain the step response,

$\rightarrow y(n) - x(n) + 2y(n-1) = 0$. **8**

OR

6. a) A causal DT system described by means of a pole zero plot has one zero Z1 = 1 and one pole P1 = 0 obtain the difference equation of the system. Obtain frequency response using simple geometric construction. **8**

b) Determine the closed form expression of a n^{th} term of Fibonacci sequence by solving difference equation.

(diff.equation : y(n) = y(n – 1) + y(n – 2)) **8**

SECTION – II

7. a) Compare DIF FFT algorithm with DJT FFT algorithm. Draw basic butterfly structure for both. **8**

b) How circular shifting is different than linear time shifting ? Compute six point circular convolution of the following sequences :

$x_1(n) = \{1, 1, 1, 1\}$ **10**

$x_2(n) = \text{Sin}\left(\frac{3\pi n}{8}\right), 0 < n \le 5$

OR

T.E. (Computer) (2003 Course) (Semester – I) Examination, 2009
DIGITAL SIGNAL PROCESSING

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) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*4) Assume suitable data, if **necessary**.*
*5) Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section **I**.*
*6) Q. **7** or Q. **8**, Q.**9** or Q. **10**, Q. **11** or Q. **12** from Section **II**.*

SECTION – I

1. a) Define a DT system. How its properties can be described by means of impulse response h(n) ? **6**

b) With example explain the time scaling and time reversal operations performed on a DT signal. **6**

c) Which operations are performed on DT signals in linear convolution ? Obtain the computational complexity of linear convolution. **6**

OR

2. a) What is aliasing ? Show that all the frequencies $F_k = F_0 + K.F_s$, K = ± 1, ± 2, ... are the aliases of frequency F_0. **6**

b) Express the general form of N^{th} order general difference equation. How it could be expressed for FIR and IIR system ? **6**

c) Define :

1) Quantication
2) Recursive system
3) Dynamic system
4) Sampling **6**

P.T.O.

SECTION – II

7. a) Prove "Let L be a language accepted by deterministic PDA, then the complement of L, can also be accepted by DPDA". **8**

b) Let L = $\{a^n b^n c^m d^m / n, m \geq 1\}$ find a PDA that accepts L. **10**

OR

8. Let L = $\{a^j b^j c^k / i, j, k \geq \text{ and } i + j = k\}$ **18**

a) find a PDA (which accepts via final state) that recognizes L

b) find a PDA (which accepts via empty stack) that recognizes L.

9. Draw a transition diagram for a Turing machine accepting each of the following languages **16**

1) $\{a^i b^j / i < j\}$

2) the language of balanced string of parenthesis

3) the language of all non palindromes over {a, b}

4) $\{www / w \in \{a, b\}^*\}$

5) $\{a^n b^n c^n / n \geq 0\}$.

OR

10. a) Design the post machine which accepts the strings with an equal number of 0's and 1's. **6**

b) Construct the Turing machine to accept the language **10**

1) $\{w \in \{a, b\}^* / w$ contains the same number of a's and b's $\}$

2) $\{w \in \{a, b\}^* / w = w^R\}$.

11. a) Explain with example complexity class P and complexity class NP problems. **4**

b) What is undecidability ? How do you prove that a problem is undecidable ? Prove that "The blank tape halting problem is undecidable". **12**

OR

12. a) Define recursive and recursively enumerable languages. **4**

b) What is undecidability ? How do you prove that a problem is undecidable ? Prove the theorem "the ambiguity problem for CFG is undecidable". **12**

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4. a) Prove that $L = \{ww^R$ / w is in (0/1)* and w^R is reverse of w} is not regular. **6**

b) Give the examples of sets that demonstrate the following inequality. Here r_1, r_2, r_3 are regular expressions : **10**

1) $r_1 + \varepsilon \neq r_1$

2) $r_1 \cdot r_2 \neq r_2 \cdot r_1$

3) $r_1 \cdot r_1 \neq r_1$

4) $r_1 + (r_2 \cdot r_3) \neq (r_1 + r_2) \cdot (r_1\ r_3)$.

5. a) In each case, find a CFG generating the given language : **12**

1) The set of odd length strings in {a, b}* with middle symbol a

2) The set of even length strings in {a, b}* with the two middle symbols equal

3) The set of odd length strings in {a, b}* whose first, middle and last symbols are all same.

b) Prove that $L = \{a^i b^i c^i / i \geq 1\}$ is not a CFL. **6**

OR

6. a) Describe the language generated by each of these grammar and justify your answer with the example string derive from the grammar of the productions given below : **12**

1) $S \rightarrow aA / bC / b$

$A \rightarrow aS / bB$

$B \rightarrow aC / bA / a$

$C \rightarrow aB / bS$

2) $S \rightarrow bS / aA / \varepsilon$

$A \rightarrow aA / bB / b$

$B \rightarrow bS$

b) Prove that $L = \{a^i\ b^i\ c^j / j \geq i\}$ is not a CFL. **6**

T.E. (Computer) (2003 Course) (Semester – I) Examination, 2009
THEORY OF COMPUTATIONS

Time : 3 Hours Max. Marks : 100

*N.B. : 1) Answer **three** questions from **each** Section.*
*2) Answer to the **two** Sections should be written in **separate** answer books.*
*3) **Neat** diagrams must be drawn **whenever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Show for any $n \geq 0$, **6**

$1 + 2 + ... + n = (n^2 + n) / 2$

Using principle of mathematical induction.

b) Construct NFA and DFA for accepting all possible strings of zeroes and ones not containing 101 as a substring. **10**

OR

2. a) Show by the principle of mathematical induction that $n^4 - 4n^2$ is divisible by 3 for all $n \geq 0$. **6**

b) Construct NFA and DFA for accepting all possible strings of zeroes and ones not containing 011 as a substring. **10**

3. a) Prove that L = {ww / w is in (0/1)*} is non Regular. **6**

b) Design the finite automata and then equivalent regular expression using Arden's theorem that accepts the set of all strings over the alphabet {a, b} with an equal number of a's and b's. such that each prefix has atmost one more a than b's and atmost one more b than a's. **10**

OR

T.E. (Comp.) (Sem. – II) (2003 Course) Examination, 2009
PRINCIPLES OF PROGRAMMING LANGUAGES

Time : 3 Hours Max. Marks : 100

Instructions: *i) Answer **any three** questions from **each** Section.*
*ii) Answers to the **two** Sections should be written in **separate** books.*
*iii) **Neat** diagrams must be drawn **wherever** necessary.*
*iv) Black figures to the **right** indicate **full** marks.*
*v) Assume **suitable** data, **if necessary**.*

SECTION – 1

1. a) Briefly discuss Role of Programming Languages for following areas of applications with the help of common data structure and control structure supported, special features/characteristics needed, suitable high level language. **8**

i) System level programming

ii) Scripting kind of applications.

b) For the following binding examples identify corresponding binding times **6**

i) Star sign (*) bound to multiplication.

iii) int bound to $[-2^{k, \ldots,} 2^k - 1]$

iii) Variable bound to type.

iv) Call to subprogram bound to subprogram address.

v) Variable bound to storage cell.

vi) Variable bound to value.

c) Identify error with following declaration. **2**

```
{  int i, j;
   String s;
   i = j * s;     }
```

OR

2. a) What is significance / importance of language evaluation criteria ? List the most common language evaluation criteria. **4**

   b) Assume a language allows a function or procedure to return results of some types but not all types. Which language evaluation criteria is violated ? **2**

   c) What do you mean by Type Checking ? Explain static and dynamic type checking. **6**

   d) List advantages and disadvantages of functional (Declarative) and object oriented programming paradigm. **4**

3. a) Explain in brief significance of following attributes of a variable. **6**

   i) Name ii) Address iii) Value

   iv) Type v) Lifetime vi) Scope

   b) What do you mean by checked Exceptions ? What are Pros and Cons of the same ? **6**

   c) List and explain in brief different run time elements of a program that needs storage at run time. **6**

OR

4 a) Justify the statement "Scope of Variable ≠ Lifetime of Variable". **4**

   b) Define Lexical scope and Dynamic scope. What are advantages and disadvantages of the same ? **6**

   c) What do you mean by Activation record ? How system stack is used to store activation records ? **4**

   d) What are the advantages of breaking a program into subprograms ? **4**

5. a) What are the features of procedural programming ? How procedures and modularity
   makes procedural programming as a better choice for programs ? **8**

   b) What are different data types supported by PASCAL ? How sub-ranges and set acts as a data structures with respect to PASCAL. **8**

OR

6. a) With suitable example demonstrate the use of pointer in PASCAL. **4**

b) What is a Variant record ? How variant records are implemented in PASCAL ? **6**

c) What are typical features of statement oriented structured programming language. **6**

SECTION – 2

7. a) Answer the following questions with respect to Arrays in Java. **8**

1) What kind of arrays does Java implement regarding binding times of subscription range and memory ?

2) What options for array initialization does Java offer ?

3) Can we use multi-dimensional arrays in Java ?

4) Can programmer use subscript ranges other than 0 ...N for Java arrays ? Can programmer use enumeration types for subscription ?

b) For following sample JAVA code what will be output ? **2**

```
public class test {
public static void main (String [] args) {
        signed int x = 10;
        for (int y = 0; y < 5; y++, x --)
        System.out.print(" " + x);
    }
}
```

c) Explain in brief for types of access specifiers associated with JAVA. **4**

d) What is role of framework class library with respect to. Net framework. **4**

OR

8. a) What is difference between Abstraction, Encapsulation and Data Hiding ? **6**

b) Comment on "C# is strongly typed language". **4**

c) Explain in brief following constructs with respect to .NET framework. **8**

i) Arrays　　ii) Interfaces

iii) Assemblies　　iv) Event handler.

9. a) What are different searching techniques supported by logic programming ? **8**

b) With suitable examples explain following terminologies in PROLOG **8**

i) Facts ii) Rules iii) Queries.

OR

10. a) Draw and explain typical program structure of PROLOG. **4**

b) Explain control structure and variable declaration uses in PROLOG. **8**

c) Why recursions are so naturally applies to defining relations in PROLOG ? Justify with suitable example. **4**

11. a) Write a LISP functions **6**

i) To identify last element of Non-Null list

ii) To calculate factorial of a given number.

b) What is output of following LISP functions **6**

I) (EXPT 4 3) II) (RECIP 5)

III) (> 6 6) IV) (ONE P 1.0)

V) (SETQ X' (1 2 3)) VI) (SETQ Y X)

c) What do you mean by association list with respect to LISP ? **4**

OR

12. a) Write equivalents LISP function for following Ackermann's function **6**

$$Ack(0, n) = n + 1$$
$$Ack(m, 0) = Ack(m-1, 1)$$
$$Ack(m, n) = Ack(m-1, Ack(m, n-1)))$$

b) Explain in brief functions for reading and writing from files in LISP. **6**

c) Write simple DO LOOP in LISP to count down from N to 0. **4**

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B/II/09/2,215

T.E. (Computer) (Semester – II) Examination, 2009
COMPUTER NETWORKS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer* ***any 3*** *questions from* ***each*** *Section.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***whenever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*

SECTION – I

1. a) What are the network design issues involved in designing a typical network ? **8**
   b) Give an example of a situation in which multicast address might be beneficial. **4**
   c) Show that two dimensional parity allow detection of all 3 bit errors. **4**

OR

2. a) Two network each provides reliable connection oriented service. One of them offers a reliable byte stream and other offers a reliable message stream. Are these identical ? If so, why is the distinction made ? If not give an example of how they differ ? **8**
   b) What is the principal difference between connectionless and connection oriented protocol ? Also compare TCP/IP and OSI reference model ? **8**

3. a) Physical service is non-confirmed service. If some data bits are lost during the transmission over the interconnecting media which layer detect the loss and take recovery action ? Explain. **8**
   b) Which of the OSI layer handle each of the following ? **8**
      1) Dividing the transmitted bit stream into frames
      2) Determine which route through the subnet to use.

OR

4. a) Store and forward switches have an advantage over cut through switches with respect to damaged frames. Explain what is it ? **8**

b) Give a two example of computer application for which connection oriented service is appropriate. Give two examples for which connectionless service is best. **8**

5. a) In stop and wait protocol define and discuss the handling of **9**

i) Damaged frame ii) Lost frame

b) What is the basic purpose of MAC layer protocol ? Explain function of Ethernet protocol. **9**

OR

6. a) Write a short notes on : **18**

1) Wireless LAN protocol

2) Difference between routers and bridges

3) Routing algorithm.

SECTION – II

7. a) A COMPUTER ON 6 Mbps network is regulated by token bucket. The bucket is filled at the rate of 1 Mbps. It is initially filled to capacity with 8 megabits. How long can the computer transmit at the fill 6 Mbps ? **8**

b) Explain design issue of Network layer. **8**

OR

8. a) Explain the working of RIP. Also explain common problem occurs in RIP. **8**

b) Find the sub network address for the following : **8**

Sr. No.	IP Address	Mask
1	141.181.14.16	255.255.224.0
2	200.34.22.156	255.255.255.240
3	125.35.12.57	255.255.0.0

9. a) What is count to infinity problem ? Explain it with suitable example. **8**

b) Describe the format of TCP header. **8**

OR

10. a) Explain the congestion prevention policy of the Data link layer, Network layer, Transport layer. **8**

b) Explain three way handshakes in transport layer. **8**

11. a) How FTP works ? Explain. **9**

b) What is WWW ? How it works ? What is the difference between static and dynamic web pages ? **9**

OR

12. Write short notes on : **18**

1) MIME

2) LDAP

3) DNS

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[3663] – 2

T.E. (Mechanical) (1997 Course) (Sem. – II) (Old Course) Examination, 2009
ENGINEERING METALLURGY – II

Time : Three Hours | Max. Marks : 100

Instructions : *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, scientific electronic calculator is* ***allowed****.*
vi) Assume suitable data if ***necessary****, state* ***clearly*** *the assumptions you have made.*

SECTION – I

1. Give reasons for the following (**any six**) : **18**

a) High carbon steels must be tempered immediately after hardening.

b) Alpha brass cannot be cold worked.

c) Welded austenitic stainless steels if heated to 1050-1100°C, and quenched do not show weld decay.

d) Spark test is used to determine exact amount of carbon in steel.

e) Reinforced cement concrete is a composite.

f) Sulphur printing test is used to observe flow lines in a component.

g) Carbon increases the ductility of steel.

P.T.O.

2. a) What is allotropy ? What are the various allotropic transformations that take place in iron ? **6**

b) Explain any two important phase transformations in Iron-Iron carbide equilibrium diagram. Write the reactions, composition of the reactants and the products and the temperature at which they occur. Explain for each transformation the importance of study of these reactions to a mechanical engineer. **10**

3. a) Explain the difference between hardness and hardenability. Draw experimental set up to measure hardenability. **7**

b) What is Austempering ? What are the advantages of Austempering ? **4**

c) What are the reasons for quench cracks ? How can quench cracks be avoided ? **5**

4. a) Differentiate between :

i) Macroscopy and Microscopy

ii) Tempering and martempering

iii) Pearlite and Bainite

iv) Induction hardening and flame hardening. **8**

b) Describe the process of Physical vapour deposition. **6**

c) Why nitriding is carried out at a temperature range of 500-550°C ? **2**

SECTION – II

5. a) What is the effect of chromium and tungsten on properties of steel ? Give two advantages of alloy steel over plain carbon steel. **6**

b) What are different types of composite materials ? What unique properties they have over conventional materials ? **4**

c) Give typical chemical composition and use of the following materials (**any 3**). **6**

i) High speed steel

ii) Berylium bronze

iii) OHNS

iv) 03 Cr 18Ni8

v) Constantan

vi) Gun metal

vii) Invar.

6. a) Draw well labeled microstructure of an etched ferrito-pearlitic SG iron surface that is polished and etched. **4**

   b) What properties of Grey cast iron make it most suitable material for machine tool beds ? **4**

   c) How are malleable cast irons produced ? Give its important application. **4**

   d) If an SG iron component is re-melted and re-cast will it again from SG iron ? Explain with reasons. **4**

7. a) What is precipitation hardening ? Explain how the hardness of Aluminium – 4.5% copper alloy can be increased by precipitation hardening. **6**

   b) Suggest suitable material for the following (**any six**) : **6**

      i) Cylinder block for an IC engine for motorcycle.

      ii) Cartridge case.

      iii) Needle of Hypodermic syringe.

      iv) Non-sparking tool.

      v) Car radiator.

      vi) Flywheel.

      vii) Brazing rod.

   c) Write a short note on copper and copper alloys. **4**

8. Write short notes on (**any four**) : **18**

   a) Surface preparation for coating

   b) Heat affected zone

   c) Classification and specification of steels

   d) Retained Austenite

   e) Metallurgical Microscope

   f) Carburising.

T.E. Computer (Sem. – II) Examination, 2009
(2003 Course)
SOFTWARE ENGINEERING

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** answer books.*
*2) Figures to the **right** indicate **full** marks.*
*3) From Section **I**, Answer (**Q1** or **Q2**) and (**Q3** or **Q4**) and (**Q5** or **Q6**).*
*4) From Section **II**, answer (**Q7** or **Q8**) and (**Q9** or **Q10**) and (**Q11** or **Q12**).*
*5) **Neat** diagrams must be drawn **wherever** necessary.*
*6) Make suitable assumptions **wherever** appropriate and relevant.*

SECTION – I

1. a) Explain the Personal Software Process (PSP). **5**
   b) Explain with neat diagram, the waterfall model for software development. What are its drawbacks ? **6**
   c) Explain the capability levels of Capability Maturity Model Integration (CMMI). **6**

OR

2. a) Explain the Team Software Process (TSP). **5**
   b) Explain in detail the management myths and the practitioner's myths as types of software myths. **6**
   c) Write short note on the Incremental model. **6**

3. a) Why are models important in software engineering ? Explain the roles of analysis and design models. **5**
   b) Explain the various elements of computer-based system. **6**

P.T.O.

c) Explain the following factors that should be considered when constructing a system model : **6**

i) Simplifications

ii) Limitations

iii) Constraints.

OR

4. a) What is the purpose of activity diagram in the context of system modeling ? Explain activity diagram notations with suitable example. **5**

b) Explain with diagram Hatley Pirbhai modeling for system context diagram. **6**

c) Explain the following software engineering practices : **6**

i) Communication practices

ii) Planning practices.

5. a) Explain Inception, Elaboration and Validation as the requirements engineering tasks. **6**

b) For "Banking System", make your assumptions about the scope of the system, identify four use cases and depict them in a diagram. **4**

c) Explain the following elements of analysis model : **6**

i) Class – based elements

ii) Behavioral elements

iii) Scenario – based elements.

OR

6. a) Explain the following data modeling concepts : **6**

i) Data objects

ii) Relationships

iii) Cardinality and modality.

b) Explain data-flow oriented modeling with the notations for Data Flow Diagram (DFD). **4**

c) What is use case ? What are the various elements of use case template ? **6**

SECTION – II

7. a) Explain the following design concepts : **4**
   i) Modularity
   ii) Architecture.

   b) What are the golden rules of user interface design ? Explain. **6**

   c) Explain the following : **7**
   i) Component level design elements
   ii) Data design elements.

OR

8. a) Explain in short the following design concepts : **4**
   i) Functional independence
   ii) Information hiding.

   b) Explain the design quality guidelines and the design quality attributes. **6**

   c) Explain the following : **7**
   i) Types of design classes
   ii) High cohesion and low coupling as the characteristics of a design class.

9. a) Explain top down integration testing strategy in detail. **6**

   b) Explain performance testing as a type of system testing. **3**

   c) Explain in detail, basis path testing as a white box testing technique with following details : **8**
   i) Flow graph notation
   ii) Cyclomatic complexity
   iii) Test case derivation.

OR

10. a) Explain the following types of control structure testing : **6**
    i) Condition testing
    ii) Data flow testing.

    b) Explain security testing as a type of system testing. **3**

    c) Explain the following : **8**
    i) Smoke testing
    ii) Unit testing.

11. a) Explain in detail metrics for testing. **6**

    b) Give brief explanation for the term "Metrics". What are the attributes that software metrics should satisfy ? **6**

    c) Explain the following quality factors : **4**
    i) Maintainability
    ii) Reusability.

OR

12. a) Write short note on product metrics landscape. **6**

    b) What is software quality ? Explain the metrics for maintenance. **6**

    c) Give short explanation for following : **4**
    i) Reliability as a software quality factor
    ii) Coupling as a measurable characteristic of an object oriented design.

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[3663] – 211

T.E. Production (Semester – I) (2003 Course) Examination, 2009
MATERIAL SCIENCE AND COMPOSITE MATERIALS

Time : 3 Hours   Max. Marks : 100

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

SECTION – I

1. Explain the following :

1) Explain the reactions on iron carbon equilibrium dia with critical temperature. **5**

2) Sulphur printing. **4**

3) What do you understand by the term widmanstatten structure ? How it can be avoided ? **4**

4) Draw and explain ray diagram for Metallurgical Microscope. **5**

OR

2. 1) Draw Iron-carbon equilibrium dia and lable it. **5**

2) Write a short note on Non-equilibrium cooling. **4**

3) Explain the following with composition. **6**

a) 80 T 11   b) C45   c) AISI 1050
d) Fe 460 K   e) St 49   f) T 85 W 6M05 Cr 4V2

4) Draw and explain about electrolytic polishing. **3**

P.T.O.

3. 1) What are the advantages of salt bath furnace over air furnaces ? **2**
   2) Draw T.T.T. diagram for eutectoid steel. **4**
   3) Explain Jominey end Quench test. **4**
   4) What is Retained Austenite and it can be eliminated ? **4**
   5) Is tempering is necessary after Hardening ? Explain. **2**

OR

4. 1) What is Martensite ? What are charactoristics of Martensitic transformation ? **4**
   2) Differentiate between Annealing and Normalising. **4**
   3) What is retained Austenite ? How it can be eliminated ? **4**
   4) Explain the following.
      a) Secondary Hardening b) Temper embrittlement. **4**

5. 1) Explain Heat treatment after carburising. **6**
   2) Explain Nitriding with its advantages and disadvantages. **4**
   3) Write a short note on Induction Hardening. **4**
   4) Which Heat treatment is preffered for gears and Why ? **2**

OR

6. Write short Note on **16**
   1) Carburising
   2) Austempering
   3) Flame Hardening
   4) Sursulf Process.

SECTION – II

7. 1) What are the advantages of alloy steel over plain carbon steel ? **4**
   2) Explain different types of stainless steels with its applications. **8**
   3) Write a short note on heat-treatment of cast Iron. **4**
   4) What is role of Cr in alloy steel ? **2**

OR

8. 1) What are different types of cast Iron explain with its applications ? **8**

   2) Explain Heat treatment of HSS. **4**

   3) What is sensatization of stainless-steel ? **3**

   4) Which material will be used for following applications. **3**

      a) Razor blade b) Lathe bed c) Stellite

9. 1) Describe effect of increase in Zn content on properties of brass. **3**

   2) What are the requirements of Bearing materials ? How they are fullfilled ? **4**

   3) What is Berylium Bronze ? Give its typical composition and properties. **3**

   4) Give typical composition and use of any three. **6**

      a) Babbits b) Gun Metal c) Invar d) LM2

OR

10. 1) What is equivalent zinc ? **3**

    2) Explain the term season cracking. **3**

    3) Give typical composition and one use of following (**any five**) **10**

       a) Alnico b) Elinvar c) German silver

       d) Meentz metal e) LM 13 f) Tinman's solder.

11. 1) How carbon fibers are produced ? **3**

    2) What is Biocompactible material ? Give some examples. **3**

    3) What is aspect ratio ? Explain effect of fiber length on Tensile strength of composite. **4**

    4) What is Nano-Materials ? Give its typical application. **4**

    5) Describe iso-strain. **2**

OR

12. 1) How Boron fibres are produced ? **4**

    2) What is Metal Matrix composite ? Give typical use of this. **4**

    3) What is Alclad ? Explain. **4**

    4) How reinforced composites are produced ? **4**

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T.E. (Production & Prod. S/W) (Semester – I) Examination, 2009
(2003 Course)
KINEMATICS & DESIGN OF MANUFACTURING MACHINES

Time : 4 Hours Marks : 100

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

SECTION – I

1. a) Explain with neat sketch, the kinematic analysis of bevel gear generator. **8**

b) Analyse a slider crank mechanism for 45° inclination of the crank, which rotates at an angular speed of 30 rad/sec. The line of stroke of slider is offset by a perpendicular distance of 35 mm. If the crank length is 175 mm and that of connecting rod is 700 mm, find the distance of slider from crank center, angular position of connecting rod, linear velocity of slider, and angular velocity of connecting rod. **8**

OR

2. a) Synthesize a four bar mechanism to generate a function $y = x^{1/3}$ for $1 \leq x \leq 4$ at three precision points. The crank rotates from an angle 30° to 120°, whereas the follower link rotates from an angle 60° to 150°. Assume length of fixed link as 60 mm. **8**

b) Explain the use of differential mechanism in machine tools. **8**

3. a) A helical compression spring carries a fluctuating load varying from 500 N to 700 N. The spring index is 6 and factor of safety is 1.5. The yield strength in shear is 650 MPa and endurance strength in shear is 375 MPa. Calculate the spring wire diameter and number of effective turns, if the deflection due to variation in load is 4 mm. Modulus of rigidity of spring material = 80 KN/mm^2. **8**

b) Calculate the fatigue strength of specimen made of material having endurance limit of 280 MPa and ultimate strength of 600 MPa. For a life of 200×10^3 cycles of stress reversal. **4**

c) Explain how the effect of corrosion on endurance limit can be minimised. **4**

OR

4. a) A machine component is subjected to a bi-axial stress condition 'σ_1' varying from 60 MPa to 160 MPa, and 'σ_2' varying from 30 MPa to 200 MPa. Determine the factor of safety. The strength properties of material are : Ultimate strength = 550 MPa, yield strength = 450 MPa, endurance limit = 275 MPa. **8**

b) Explain how factor of safety is determined under varying loading by different methods. **4**

c) Draw and explain S-N diagram. **4**

5. a) Design a pair of spur gear with 20° full depth involute teeth consisting of 25 teeth pinion meshing with 60 teeth gear. Pinion shaft is connected to 25 kW, 1000 rpm motor. Ultimate tensile strength for gear and pinion material is 300 MPa and 450 MPa respectively. Factor of safety is 2. Design gears based on Lewis equation. Also check the gears for dynamic load. The gears are machined to grade 10 for which $e = 32 + 2.5\,(m + 0.25\sqrt{D})$, Lewis Form factor $Y = 0.154 - \dfrac{0.912}{Z}$

where, Z is number of teeth. **12**

b) In which applications the spur gears are preferred over helical gears ? Why ? **4**

c) Explain force analysis of helical gear with neat sketch. **2**

OR

6. a) A pair of 20° spur gear has centre distance of 360 mm. The number of teeth on pinion and gear are 20 and 70 respectively. Speed of pinion is 1200 rpm. Assume following data :

Tooth hardness = 300 BHN

Permissible beam strength of steel pinion = 140 MPa.

Permissible beam strength of steel gear = 120 MPa

Service factor = 2, Grade = 10

Calculate the maximum power that can be transmitted by gear pairs. **12**

b) Explain with neat sketch the nomenclature of helical gear. **6**

SECTION – II

7. a) A deep groove ball bearing has a dynamic capacity of 20200 N and is to operate on following work cycle. Radial load of 5800 N at 200 rpm for 25% time, radial load of 3500 N at 400 rpm . for 55% time and radial load of 8900 N at 500 rpm for remaining time. Assuming loads are study and inner race rotates. Find the expected average life of bearing in hours. **8**

b) Draw a graph of bearing characteristics number and coefficient of friction and explain its significance. **8**

OR

8. a) Explain how following factors affect the life of bearing **8**

i) Load ii) Speed

iii) Temperature iv) Reliability

b) Explain the design procedure for journal bearing. **8**

9. a) A machine shaft runs at a mean speed of 300 rpm. It requires a torque which varies uniformly from 1500 N-m to 4000 N-m during first half revolution, during next one revolution. The torque remains constant and then decreases uniformly to 1500 N-m during next one revolution, then it remains constant for remaining one revolution. The machine is coupled by a constant speed motor to which is connected a solid flywheel of radius 0.80 m. If the fluctuation of speed is $\pm$ - 2% of mean speed. Find

i) Power of motor

ii) Mass of Flywheel

iii) Thickness of flywheel if $\rho = 7200$ Kg/m^3. **10**

b) Explain the principles of design for assembly. **6**

OR

10. a) The speed of a C.I. flywheel is limited to 5 m/s at mean radius. The flywheel runs at 50 rpm and supplies 12000 N-m energy during punching. The actual punching time occurs for 30° rotation of wheel and speed drops by 20%. Find the cross section of the rim, assuming width to thickness ratio for rim 2:1. Take $\rho = 7200$ Kg/m^3. **10**

b) Explain the general guidelines for design for casting. **6**

11. a) Prove that for helical spring minimum weight for a given condition occurs when the spring is designed so that the maximum load on it is twice the initial load. **10**

b) A spigot and recess having nominal diameter of 90 mm has a fit 46 – j5. Find the probability of interference fit. **8**

	H6 (μ)	j5 (μ)
ϕ 90	+22	+20
	+0	–15

The area below standard normal distribution curve is :

Z	1.0	1.1	1.2	1.3	1.4
area	0.3413	0.3643	0.3839	0.4032	0.4192

Use linear interpolation for intermediate values.

OR

12. a) Explain the difference between the design tolerance and natural tolerance. How the designer should select a tolerance for minimum rejection of component ? **8**

b) Explain with suitable example the method of Lagrange multiplier for optimum design. **10**

T.E. (Production and Prod. S/w) (Semester – I) Examination, 2009
MATERIAL FORMING (2003 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Sketch and explain stress-strain diagrams for the material exibing
(i) elastic behaviour (ii) plastic behaviour (iii) Rigid with strain hardening
(iv) Elastic-plastic behaviour. State the suitable example. **8**

b) In a plane-stress system, σx = 750 N/mm^2, σy = 150 N/mm^2, σz = 0 and Jxy = 150 N/mm^2. If the stress system just causing yielding, what is the uniaxial yield stress (Y) of the material according to (i) Tresca criteria (ii) Von-mises criteria. **8**

OR

2. a) Explain hot-forming and cold forming. State the advantages and disadvantages. **6**

b) Engineering strains are more convenient than true strains. State true or false. Justify your answer. **4**

c) What is formability ? Explain the significance of forming limit diagram with sketch of it. **6**

3. a) Explain and suggest the equipment required to manufacture the following components. **8**

   i) Headed bolt ii) Connecting rod

   b) Explain and differentiate between open die and closed die (impression) die forging with neat sketch. **7**

   c) Explain the importance fillet and corner radius during forging die design. **3**

OR

4. a) Explain the forging of gear blank and coupling hook considering grain flow structure. **8**

   b) A piece of lead 25 mm × 25 mm × 150 mm having yield stress of 7 N/mm^2 is to be pressed between flat dies to a size of approximately 6.25 mm × 100 mm × 150 mm. Coefficient of friction , u is 0.25. Determine pressure distribution and total forging load. **10**

5. a) Derive an equation for drawing stress developed during wire drawing operation. **12**

   b) Explain rod drawing operation with the proper sketch. **4**

OR

6. a) The following is the data related to wire drawing operation. **12**

Initial diameter = 1.55 mm

Final diameter = 1.40 mm

Radius of drum (bull block) = 125 mm

Yield strength of material, σ_o = 250 MPa

Die angle = 16°

Coefficient of friction, μ = 0.15

Speed of bull block = 200 rpm

Calculate (i) drawing stress (ii) drawing load (iii) motor power required (iv) drawing speed.

b) Explain various die materials used for wire drawing die. **4**

SECTION – II

7. a) Calculate rolling load to reduce steel 600 mm wide and 30 mm thick by 20%. Roll diameter 800 mm. Flow stress of steel 150 N/mm^2. Assume μ = 0.15. Calculate rolling load if slipping and sticking friction occurs. **8**

b) Explain the following : **8**

i) Roll cambering ii) Mill modulus

iii) Point of NO slip iv) AGC -T method.

OR

8. a) Explain the problems in rolling and defects occurs due to these problems. **8**

b) A steel slab of initial thickness 300 mm and width 1000 mm is hot rolled at 1000°C on a mill with rolls of diameter 600 mm. A reduction 27 mm is taken. Roll speed is 1.2 m/s. The coeff. of friction, μ = 0.3. The flow stress 246 MPa. Calculate roll force and power requirement. **8**

9. a) What are the advantges of extrusion process over rolling ? State the limitations also. **6**

   b) Explain and differentiate between Forward Hot Extrusion and Backward Hot Extrusion. **6**

   c) Explain lubrication in extrusion. **4**

OR

10. a) Explain different types of dies used for producing hollow sections. **8**

    b) Derive an equation for workdone in extrusion. **8**

11. a) Explain important process variables which affects efficiency of electro hydraullic system. **12**

    b) Explain two types of fractures takes place in explosive forming. **6**

OR

12. a) Differentiate between explosive forming and electro hydraulic system. **6**

    b) Explain manual spinning and power spinning process with neat sketch. **8**

    c) Explain stretch forming. State the applications. **4**

T.E. Production (Semester – I) (2003 Course) Examination, 2009
PRODUCTION PLANNING AND CONTROL

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **any 3** questions from **each** Section.*
*2) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*3) Answers to the **two** Sections should be written in **separate** books.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Black figures to the **right** indicate **full** marks.*
6) Your answers will be valued as a whole.
*7) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed.***
*8) Assume suitable data, if **necessary.***

SECTION – I
UNIT – I

1. a) What is production planning ? What are the different levels of production planning? **8**
   b) How do you differentiate production planning and production control ? **8**

OR

2. a) What is PLC ? Explain in brief. **8**
   b) What are the different functions of PPC ? **8**

UNIT – II

3. a) Why the industry has to go for sales forecasting ? Explain in brief different judgmental sales forecasting techniques. **9**
   b) There is a correlation between population of the city and the Honda city model sold. This relation is shown in the following table :

Population in lakhs	3	6	8	11	15	18
Number of Honda city sold $\times$ 1000	6	8	11	13	16	18

Estimate the sales of Honda city with population 23 and 28 lakhs. **9**

OR

4. a) What are the different factors considered for sales forecasting ? **8**

b) The following table gives the demand for 9 months .

Month	1	2	3	4	5	6	7	8	9
Demand	200	350	450	600	780	900	1150	1400	1650

i) If the smoothing index 0.2 is used forecast the demands for remaining month As forecast for the I^{st} month is 150. **4**

ii) Calculate MFE (Mean Forecast Error) **3**

iii) Calculate MAPE (Mean Absolute Percentage Error) **3**

UNIT – III

5. a) Draw a route sheet/process sheet for any component of your choice. Assume component drawing dimensions and sequence of operations. **8**

b) Explain in brief priority sequencing rules. **8**

OR

6. a) What is Line of Balance ? Explain it with suitable example. **8**

b) Find the sequence, for the following eight jobs, that will minimise the total elasped time for the completion of all jobs. Each job is to be processed in the same order Z – X – Y,

Following table gives the time in hours on the machines.

Jobs	1	2	3	4	5	6	7	8
Machine X	6	8	9	6	7	5	8	4
Machine Y	10	12	9	10	13	10	11	15
Machine Z	7	8	4	5	6	11	17	13

Represent it on the Gantt chart showing idle times clearly. **8**

SECTION – II

UNIT – IV

7. a) Explain in brief what is ERP. What are the benefits to the ERP user if implemented ? **8**

b) Explain master production schedule (mps) used in industry. **8**

OR

8. a) Explain CRP with its input and outputs. **8**

b) What are the different documents used in purchase ? Explain any two in brief. **8**

UNIT – V

9. a) What is stock out cost ? Why stock outs occur in industry ? **9**

b) Annual demand for a component is 80000 units. The carrying cost is Rs. 15/unit /year, the ordering cost is Rs. 75/ per order and the shortage cost is Rs. 30/unit/year.

Find : i) Order Quantity **2**

ii) Cycle time **2**

iii) Maximum level **2**

iv) Represent the system graphically. **3**

OR

10. a) Derive EOQ formula for the inventory model without shortage. Represent it graphically. **8**

b) A company manufactures varieties of crank shafts required for automobiles. It allows orders to accumulate before undertaking manufacture of any crank shaft.

The firm estimates that back order costs on the average of Rs. 8 per unit for record keeping.

a) How many units should the firm produce in each production run of a crank shaft, for which following data is available: **3**

Annual consumption = 15000 units.

Manufacturing cost per unit = 40 Rs.

Set up cost per production run = 440 Rs.

Inventory carrying cost as percentage of average inventory is 20% on investment.

b) Determine the units that can be back ordered at the shortage cost indicated. **2**

c) How much will be the company will lose if no. stockouts are permitted ? **5**

UNIT – VI

11. a) What are the different ways to carry out stock verification in any organisation ? **8**

b) What are the different documents used in stores ? Explain MRNC (Material Recieved Note) and BIN card used in store. **8**

OR

12. a) What are the basic elements of JIT ? Explain in brief. **8**

b) Write short note on " Value Stream Mapping". **8**

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T.E. (Production & Production S/W) (Sem. – I) (2003 Course)
Examination, 2009
METAL CUTTING AND TOOL DESIGN

Time : 3 Hours Max. Marks : 100

Instructions : *1) Attempt **one** question from each Unit in Section – **I** and Section – **II**.*
*2) Answer to the Sections should be written on **separate** answer books.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Assume suitable data **if** necessary.*

SECTION – I

Unit – I

1. a) Prove that $e = \dfrac{K^2 - 2K \sin\alpha + 1}{K \cos\alpha}$
e = Shear strain
K = Chip reduction coefficient
α = Rake angle. **6**

b) Explain the mechanism of chip formation. What are the different conditions that promote formation of
i) Continuous chip with built up edge
ii) Continuous chip without built up edge. **7**

c) The following data were obtained under the orthogonal cutting test. **7**
Rake angle = 20°
Depth of cut = 4 mm
Feed = 0.30 mm/rev
Chip length before cutting = 30 mm
Chip length after cutting = 13 mm

The cutting forces were - axial force = 430 N

- vertical force = 1050 N.

Find :

i) Shear plane angle

ii) The frictional force

iii) The friction angle

iv) Magnitude of Resultant force.

OR

2. a) During a metal cutting test under orthogonal condition it was found that cutting force is 1000 N and feed force is 900 N when cutting at 160 m/min. The rake angle of the tool is 10 degree and shear plane angle was found to be at 19 degree. Find :

i) Shear velocity

ii) Chip flow velocity

iii) Work done per minute in shearing the metal and work done against friction

iv) Show that the work input is equal or not equal to the sum of work done in shearing and friction. **8**

b) Explain the effect of rake angle ranging from positive to negative on chip formation, cutting speed, force, power. **7**

c) Write a note on drill tool dynamometer. **5**

Unit – II

3. a) Explain different properties of a cutting tool material for efficient functioning. **7**

b) Write a note on :

i) Gussian tool

ii) ISO : P_{type}, T_{max}, P_{system} of tooling. **8**

OR

4. a) What are different grades of carbides ? Explain in detail. **6**

   b) What is Reaming ? Sketch a Reamer and show its different parts on it. Also explain the hand of Reamer and hand of helix. **9**

Unit – III

5. a) Discuss the factors which influences the cutting temperature. **5**

   b) The following equation for tool life is given for a turning operation $VT^{0.14} + 0.78 \, d^{0.38} = c$. **5**

   one hour tool life was obtained while at V = 28 m/min f = 0.3 mm/min, d = 2.6 mm. Calculate the tool life if cutting speed, feed and depth of cut are increased by 25% individually and also taken together.

   c) What is a cutting fluid ? State the functions and requirements of a cutting fluid. **5**

OR

6. a) Write a note on :

   i) Heat generation in metal cutting

   ii) Mechanism of abrasive and diffusive wear. **10**

   b) What do you understand by machinability ? Discuss the various factors which influence the machiability. **5**

SECTION – II

Unit – IV

7. a) With a neat diagram explain the various elements of a plain milling cutter. **7**

b) Calculate the cross section of a straight shank single point turning tool made of H.S.S. Data given are :

– Allowable bending stress of H.S.S = 200 MPa

– Young's modulus of H.S.S. = 2×10^5 MPa

– Main cutting force =1200 N

– Permissible deflection of tool tip = 0.05 mm. **8**

OR

8. a) Design and draw a keyway broach for cutting a keyway of size 8 mm wide×8 mm deep in a boss 70 mm long. Data given below :

Rise per tooth = 0.087

Number of finsih teeth = 4. **8**

b) Explain the design procedure for design of Reamer. **7**

Unit – V

9. a) Write a note on :

i) Hydraulic clamping in fixture

ii) Locating methods and devices. **10**

b) Describe in brief the manufacturing methods producing jigs and fixtures. **5**

OR

10. a) Describe principles of pin location. **5**

b) Explain different methods for mounting the bushes in jig plate. **5**

c) Find number of pieces produced/year and number of years required for earning on investment. **5**

For data give :

Fixed cost of fixture = Rs. 4,000/-

for one run/year saving of labour cost/unit = Rs. 2/-

Overhead saving = 45% on labour saved

Annual repair cost = 10%

Depreciation = 50%

Interest/annum = 8%

Annual rate of taxes = 2%

Setup cost = Rs. 300.

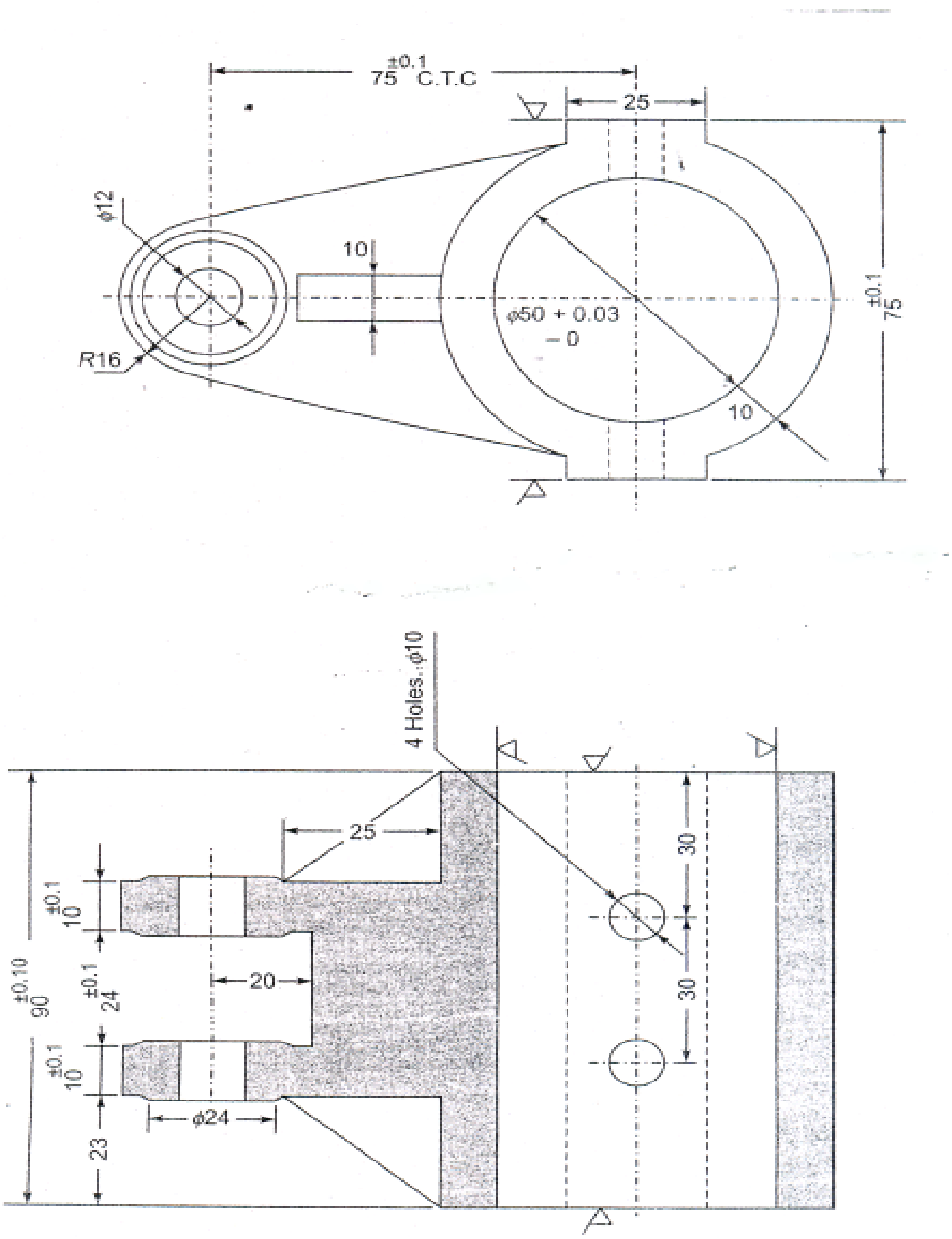
Unit – VI

11. Design a drilling jig for drilling of 4 holes of ϕ 10 mm for a component shown in fig. no. 1. **20**

OR

12. Deign a turning fixture for ϕ 50 mm bore for a component shown in fig no. 1. **20**

Draw minimum two views of your design, show the component in position, name all important elements on your drawing. Write a part list of your design and detail view for locators, clamping, bushing or tool setting element.



75 ±0.1 C.T.C
25
ϕ12
10
R16
ϕ50 + 0.03 − 0
10
75 ±0.1
4 Holes ϕ10
25
30
30
10 ±0.1
90 ±0.10
24 ±0.1
20
10 ±0.1
ϕ24
23

Fig. No. 1

T.E. (Production) (Semester – II) (2003 Course) Examination, 2009
MACHINE TOOLS AND ADVANCE MANUFACTURING SYSTEMS

Time : 3 Hours Max. Marks : 100

Instructions: *1) From Section **I**, solve Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** and Section **II**, solve Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **whenever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

UNIT – I

1. Referring to Fig. No. 1. Design the set of plate type of cams for a single spindle Automatic Machine. Assume suitable machining parameters depending upon the type of material to be machined. Include the information on the chart and draw the layout for turret cam. **18**

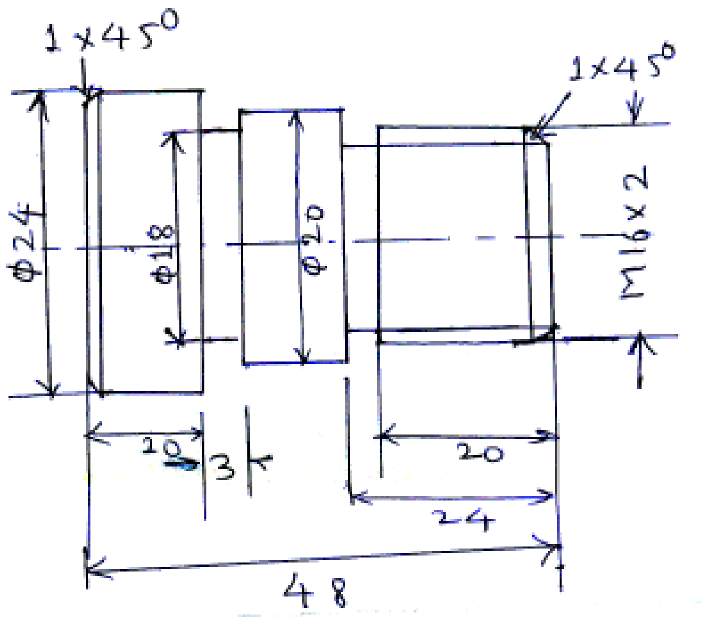


Fig. No. 1
Name of the Part – Screw
Material : Free cutting mild steel (FCMS)

OR

P.T.O.

2. a) Describe a typical single spindle automatic bar machine. What are the relative advantages and disadvantages of single spindle and multi-spindle automatic machine ? **8**

   b) Explain difference between automatic and semi-automatic machine and write difference between capstan and turret lathe. **8**

UNIT – II

3. a) Justify the need for numerical control of machine in advanced manufacturing. List and explain the function of the main components of a numerical control machine tool. **8**

   b) What are the additional features provided on the following ? **8**

      i) Machining centres

      ii) Turning centres.

OR

4. a) Explain different feed back devices used for position and velocity controls. **8**

   b) What do you understand by axes designation in NC machines ? Describe the motion direction on a three axis milling machine. **8**

UNIT – III

5. a) Explain why surface treatment of manufactured products may be necessary. **8**

   b) Explain micro machining ? Explain any one process of micro machining. **8**

OR

6. a) Explain following processes. **8**

      i) Galvanishing

      ii) Plasma coating

      iii) Phosphating

      iv) Anodising

   b) Write in detail about **8**

      i) Nano machining

      ii) CVD

SECTION – II

UNIT – IV

7. a) What are transfer line ? What are the different types of flow lines ? **4**

b) Write a note on partial automation. **4**

c) A ten-station transfer machine has an ideal cycle time of 30 secs. The frequency of line stop is F = 0.075 stop/cycle. When a line stop occurs the average down time is 4.0 min Determine :

i) average production rate in pc/hr. **4**

ii) line efficiency **3**

iii) proportion down time. **3**

OR

8. a) The procedure relationships and element times for assembling a new model of motor is given in the table below. The ideal cycle time = 1.2 minutes.

Work Element	1	2	3	4	5	6	7	8	9	10
Te (min)	0.5	0.3	0.8	0.2	0.1	0.6	0.4	0.5	0.3	0.6
Predecessor	–	1	1	2	2	3	4, 5	3, 5	7, 8	6, 9

i) Construct precedance diagram for this job. **3**

ii) Use largest candidate rule to assign work element to station. **4**

iii) Compute balance delay. **3**

b) Explain with neat sketch machine vision system. **8**

UNIT – V

9. a) What is FMS ? Explain with neat sketch **8**

i) FMM ii) FMC

b) What are the different elements of robot unit ? Explain in brief Robot Control Unit Functions. **8**

OR

10. a) What is G.T. ? Explain with appropriate example how it overcomes the short-coming of functional layout . **8**

 b) With neat sketch explain any one type of **8**

 i) Tactile sensors

 ii) Non-tactile sensor

 Used in robot system.

UNIT – VI

11. a) How control system are classified ? Explain pre-selective control system used in m/c tool ? **8**

 b) What are the different types of maintenance policy practised in manufacturing industries ? **8**

OR

12. a) What are the ergonomic consideration in design of m/c tool ? What is the need for standardization of controls in m/c tools ? **8**

 b) How vibrations can be minimized by proper installation in a m/c tool ? **8**

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T.E. (Prod.) (Sem. – II) Examination, 2009
MANUFACTURING PROCESSES – II
(2003 Course)
(Common to Production S/W)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Attempt **one** question from **each** unit in Section – **I** and Section – **II**.*

*2) Answers to the two Sections should be written in **separate** answer books.*

*3) Neat diagrams must be drawn **whenever** necessary.*

*4) Figures to the **right** indicates **full** marks.*

*5) Assume suitable data **if necessary**.*

SECTION – I

UNIT – I

1. a) The arc length characteristics of a D.C. arc is given by the equation $V = 24 + 4l$, where 'V' is the arc voltage and 'l' is the arc length in 'mm'. The static volt-ampere characteristics of a power source is approximated by a straight line with No-load voltage of 60 volts and short ckt-current of 600 amperes. Determine the optimum arc length and maximum power. **8**

   b) What are the differences between TIG and MIG or (GMAW) welding processes ? **8**

OR

2. a) Explain with suitable sketch Heat Affected Zones (HAZ) related with arc welding process. **8**

   b) Explain non-conductor ferrule method and semiconductor catridge method with neat sketch in stud welding. **8**

UNIT – II

3. a) Describe oxy-acetylene gas welding technique. Also list various fuel gases that are used in oxy-fuel gas welding. **8**

   b) Explain projection welding process with neat sketch. What are the controllable parameters in projection welding ? **8**

OR

4. a) Describe the principle of oxy-fuel gas cutting. What is meant by ‘kerf’ and ‘drag’ in gas cutting ? **8**

   b) Differentiate between upset welding and flash welding. **8**

UNIT – III

5. a) Suggest a suitable technique for welding heavy rail sections, how the heat necessary for joining process is obtained ? **9**

   b) Compare Soldering, Brazing and Braze welding in various respects. **9**

OR

6. Write short notes on : **18**

   a) Laser Beam Welding

   b) Fluxes used in soldering and Brazing

   c) Explosive welding.

SECTION – II

UNIT – III

7. a) Explain design considerations in casting. **8**

   b) What is the ideal profile of a sprue ? What are the criteria to be used for designing the pouring basin ? **8**

OR

8. a) Define gating ratio. Explain pressurised and unpressurised gating system with reference to applications. **8**

   b) What are the casting defects ? Give their causes and remedies. **8**

UNIT – V

9. a) Classify Gear manufacturing methods, explain Gear shaping process with neat sketch. **8**

   b) Discuss various methods of thread rolling. **8**

OR

10. a) Write a note on Gear grinding process. **8**

    b) Explain how thread milling with a single cutter and multiple cutter performed. **8**

UNIT – VI

11. a) Enlist the requirements that demands use of non-traditional machining processes. **6**

b) Explain the basic mechanisms of material removal in ultrasonic machining (USM) process. **6**

c) What is overcutting in EDM process ? What is the reason of producing overcut and how it is minimised ? **6**

OR

12. a) In an ECM process for machining iron, it is desired to obtain a metal removal rate of 5 cm^3/min. Determine the amount of current required for process, assuming that Atomic wt. of iron 56 gms, valancy 2, density of iron 7.8 gm/cm^3 and Faraday's constant 1609 amp-min. **6**

b) Explain the working principle of EBM process. **6**

c) Write a short note on Electrochemical Grinding (ECG) process. **6**

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T.E. (Production) (Semester – II) Examination, 2009
METROLOGY & QUALITY CONTROL (2003 Course)

Time: 3 Hours   Total Marks: 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, side rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Answer **one** question from **1** &**2**, **3** & **4**, **5** & **6**, **7** & **8**, **9** & **10**, **11** & **12**.*

SECTION – I

1. a) Describe with neat sketch the principle of working of on autocollimator and state its application. **10**

   b) Define slip gauge wringing and explain care of slip gauge, manufacturing of slip gauges and what are their grades. **8**

OR

2. Write a short note on :
   1) Constant deviation prism. **6**
   2) Angle dekor **6**
   3) Calibration. **6**

3. a) State and describe in brief the different types of errors in roundness.
   Describe the method of checking roundness with the help of polar graph. **8**

   b) Sketch and explain the use of Brook's level comparator for subdivision of end standard. **8**

OR

4. Write a short note on :
   1) Taylors principle **5**
   2) Sigma comparator **6**
   3) Parllelism test **5**

5. a) Explain different methods of evaluation of surface roughness. **8**

   b) Explain how to measure and effective diameter using floating carriage micrometer. **8**

6. Write a short note on :

   1) Talysurf **5**

   2) FCM **6**

   3) Profile projector. **5**

SECTION – II

7. a) Explain Dr. W. Edward Demings contribution to quality control and explain Demings fourteen points to quality control with PDCA cycle. **10**

   b) Explain the quality costs with their categories. **8**

OR

8. a) Explain Juran's contribution to quality control and sketch Juran trilogy diagram. **10**

   b) Differentiate between value of quality and cost of quality. **8**

9. a) Control charts for X and R maintained for crankshaft forged component. The subgroup size is settled as 5 the value of X and R are computed for each subgroups of values of $\bar{z}\ \bar{x}$ and $\bar{z}$ R after 25 sub groups are found to be 614.8 and 120.0 respectively. Compute the value of 3-sigma limits for X chart. **8**

   Assume $\overline{R}$ = 2.326 60

   b) Explain following OC curve characteristic.

      1) changing of lot size

      2) changing sample size

      3) change of acceptance number

      4) change of sample size. **8**

10. Write a short note on :

    1) Process capability index **6**

    2) Pareto analysis **5**

    3) TS 16949. **5**

11. Write a short note on :

    1) Implementing ISO 9000 Quality standard. **6**

    2) Zero defect. **5**

    3) ISO 14001. **5**

12. Write a short note on :

    1) Benefits of Environmental Management System. **5**

    2) Malcom Balbridge National Quality Award. **5**

    3) Quality Audit. **6**

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T.E. Production Semester – II Examination, 2009
DIE AND MOULD DESIGN
(2003 Course)

Time : 4 Hours　　　　　　　　　　　　　　　　　　Max. Marks : 100

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

SECTION – I

1. a) Sketch the assembly drawing of a progressive die for the component shown in figure 1. **6**

Given : stock thickness = 1 mm, Shear strength of material = 260 MPa.

b) Draw best strip layout and find material utilization, assume sheet of size 2500 mm $\times$ 1250 mm. **6**

c) For above layout find out press tonnage with staggering. **3**

d) If full shear is given what will be the press tonnage. **3**

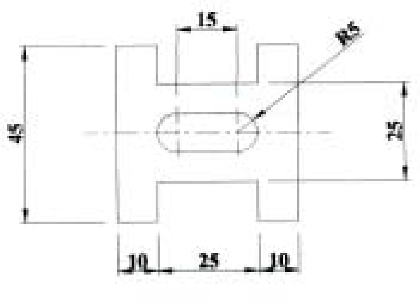


Fig: 1
Material: Al, 1mm thick

Fig. 1

OR

P.T.O.

2. a) List the name of different types of stoppers and draw a neat sketch of it that used in design of progressive die of component shown in Fig. 1 **8**

   b) Explain the methods of mounting of the punch and design and draw the punch plate for component shown in Fig. 1. **6**

   c) What is mean by clearance calculate it for the same problem ? What is an effect of excessive and insufficient clearance in press working ? **4**

3. Design a drawing die for the shell shown in fig. 2 drawn from CRC sheet of 2 mm thickness and UTS = 240N/mm^2. **16**

   Determine :

   1) Blank Size

   2) Number of draws

   3) Dimension of die and punch

   4) Force required and sketches for each draw.

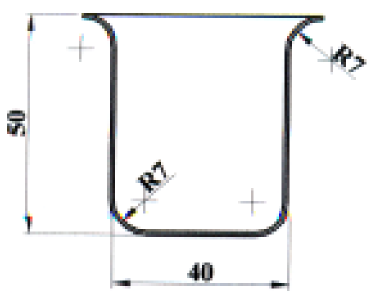


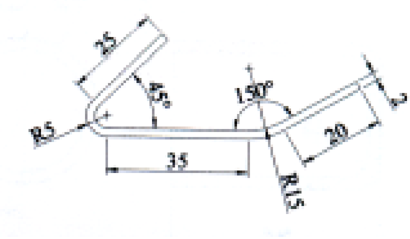
Fig. 2

OR

4. a) Differentiate Coining and Embossing. **4**

   b) Explain Spring back and its prevention. **6**

c) Calculate the develop length for following bend component. **6**



5. a) Explain the basic rules for die design in upsetting. **10**

b) Explain trimming and cut-off operation in forging. **6**

OR

6. a) What are the steps in designing impression forging dies ? **8**

b) How stock size is calculated in close die forging. **8**

SECTION – II

7. a) Explain with neat sketch ejection system in die-casting. **8**

b) Explain gooseneck hot chamber die casting with neat diagram. **8**

OR

8. a) Explain with neat sketch cold chamber die-casting. **8**

b) Explain different die locking methods. **8**

9. a) Explain with neat sketch : **16**

i) Compression moulding

ii) Blow moulding

iii) Thermoforming

OR

10. a) Explain cavity and core insert with neat sketch and also explain its method of fitting to bolster. **10**

b) How injection moulding machines are specified ? **6**

11. Design a single-impression injection mould to produce the component shown in fig. 3 **18**

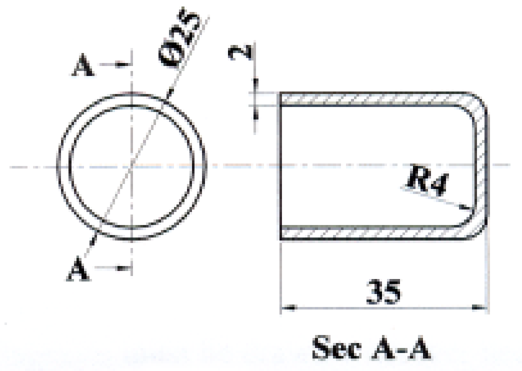


Fig. 3

OR

12. a) Explain various types of ejection in injection moulding. **10**

b) Write short note on CAD application in mould design. **8**

T.E. (Production Engg./Prod. Engg. S/W) (Semester – II) (2003 Course) Examination, 2009
DATABASE AND INFORMATION TECHNOLOGY FOR PRODUCTION ENGINEERING

Time : 3 Hours Max. Marks : 100

Instructions. : *1) Answer **any one** question from **each** Unit.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of electronic pocket calculator is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

UNIT – I

1. a) What are the advantages and limitations of database processing ? **5**
   b) Explain the entity-relationship model with a suitable example. **5**
   c) Explain the various components of DBMS with a neat sketch. **6**

OR

2. a) What is a data constraint ? Explain column level and table level constaints with an example. **7**
   b) Explain the following in brief : **9**
      i) First order normalization
      ii) Relational database management system
      iii) Procedural and Non procedural languages.

UNIT – II

3. a) Explain with an example the primary key and foreign key concepts in databases. **6**
   b) Create a table 'emp' with the following columns by assuming suitable data type and size with correct syntax in SQL.
      Emp–id, Ename, City, State, Salary, Age, Hire_ date. **4**

c) Give an expression in SQL to solve each of the following queries : **6**

i) Find the names of all employees whose name starts with ‘Sa’.

ii) List all the employees name and salary whose age is less than 40 years.

iii) Select the employees whose salary is between Rs. 20000 and Rs. 30000.

OR

4. a) Explain the use of compound conditions AND, OR, joining in SQL programming with an example. **6**

b) Explain the following with reference to SQL programming : **10**

i) Principles of NULL value

ii) Grouping data from tables

iii) SQL operators (any four).

UNIT – III

5. a) Distinguish between an algorithm and a program. What are the characteristics of an algorithm ? **8**

b) Draw a flow chart and psedo C-code for calculating the sum of following series : **10**

$$f(x) = 1 + \frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \frac{1}{8!} + \frac{1}{10!} + \text{------}$$

OR

6. a) What is a computer network ? What are the characteristics of local area networks ? Explain in brief types of transmission media. **10**

b) Write a loop that will calculate the sum of cubes of all odd numbers between 1 and 15. Write the loop in two different ways :

i) Using a ‘for’ statement

ii) Using a do-while statement. **8**

SECTION – II

UNIT – IV

7. a) Describe the output generated by the following C-program. **6**

```
# include <stdio.h>
  int funct 1(int n);
        main ( )
        {
             int n = 10;
             printf("%d",funct 1 (n));
        }
  int funct 1 (int n)
  {
        if(n>0)
               return(n+funct 1 (n-2));
  }
```

b) Explain the meaning of each of the following function prototypes :

i) int f(float a);

ii) double f(double a, int b);

iii) void f(long a, short b, unsigned c);

iv) char f(void); **4**

c) Find a real root of $x^3 - x = 1$ between 1 and 2 by bisection method. Compute five iterations. **8**

OR

8. a) Draw a flow chart and psedo C-program to find the root of an equation using. Newton-Raphson method. **10**

b) Solve the following system of linear algebraic equations upto four decimal places using Gauss-Seidal method. Perform seven iterations. **8**

$10x_1 - 2x_2 - x_3 - x_4 = 3$

$-2x_1 + 10x_2 - x_3 - x_4 = 15$

$-x_1 - x_2 + 10x_3 - 2x_4 = 27$

$-x_1 - x_2 - 2x_3 + 10x_4 = -9$

UNIT – V

9. a) If 0.333 is the approximate value of 1/3, find absolute, relative and percentage errors. **5**

b) If $u = \dfrac{4x^2y^3}{z^4}$ and errors in x, y, z be 0.001, compute the relative maximum error in u when x = y = z =1. **5**

c) Calculate the value of f (6) from the following data using Newton's interpolation formula : **6**

x	1	2	7	8
f(x)	1	5	5	4

OR

10. a) The function y = f(x) is given at the points (7, 3), (8, 1), (9, 1) and (10, 9). Find the value of y for x = 9. 5 using Lagrange's interpolation formula. **8**

b) For the data given below, find the equation to the best fitting exponential curve of the form $y = a.e^{b.x}$. **8**

x	1	2	3	4	5	6
y	1.6	4.5	13.8	40.2	125	300

UNIT – VI

11. a) Define electronic commerce. List the consumer's benefits of electronic commerce. **6**

b) What is electronic fund transfer ? How does it work ? **6**

c) Explain the difference between conventional and artificial intelligent computing. **4**

OR

12. a) What are intelligent agents ? What are the characteristics of intelligent agents ? **6**

b) Explain in brief the applications of IT in the following areas : **10**

i) Materials requirement planning

ii) Project management.

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T.E. (Prod/SW) (Semester – I) Examination, 2009
MANUFACTURING ENGINEERING TECHNOLOGY
(2003 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**.*
*6) **All** questions are **compulsory**.*

SECTION – I

1. a) Differentiate between (**any two**) : **10**
   i) Inspection and statistical quality control
   ii) Quality of design and quality of conformance
   iii) Quality policy and quality objective

   b) Mention any eight points suggested by Dr. Deming for the implementation of TQM. **8**

OR

1. a) Explain the methodology and implementation of 'Five S' in large scale manufacturing company. **9**

   b) What is TQM ? Describe internal and external customer and supplier link concept in TQM. **9**

2. a) Explain in brief the five steps in six-sigma. **5**

   b) Explain with neat sketch the Ishikawa diagram with its purpose. **6**

   c) Explain with suitable example the use of Pareto analysis. **5**

OR

2. Explain the following : **16**
   a) 'Poka yoke' b) Belts in six-sigma
   c) Zero defect d) Control charts

P.T.O.

3. a) Differentiate between : **9**
   i) Line and end standards ii) Gauges and comparators
   iii) Accuracy and precision

   b) Explain with neat sketch the electrical comparator. **7**

OR

3. a) Explain with neat sketch the Sigma comparator. **7**

   b) Explain the process of manufacturing of slip gauges. **5**

   c) Mention any four metrological properties of measuring instruments. **4**

SECTION – II

4. Write short notes on : **18**
   a) Parkinson geartester b) Base tangent method
   c) Talysurf

OR

4. a) For 20° pressure angle gear having 40 teeth and 4 mm module, calculate :
   i) Diameter of plug which fits in tooth space with its center on pitch circle
   ii) Distance over the plug in opposite tooth spaces **3**

   b) Write short note on : **15**
   i) Thread errors and their effects
   ii) Gear tooth vernier caliper
   iii) Three wire method

5. Write short note on : **16**
   a) Taylor's principle b) Angle dekor c) Auto collimeter

OR

5. Write short note on : **16**
   a) Tool makers microscope b) Optical flat c) Profile projector

6. a) Define flatness. Explain with neat sketch flatness testing method. **8**

   b) Explain the principles of alignment test. Discuss any three alignment tests on lathe machine. **8**

OR

6. Write short notes on : **16**
   a) CMM b) Roundness testing c) Straight wedge method

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T.E. Production S/W (Sem. – II) Examination, 2009
(2003 Course)
PROCESS PLANNING AND INDUSTRIAL STATISTICS

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Assume suitable data, if **necessary**.*
*3) **All** questions are **compulsory**.*

SECTION – I

1. a) Define Process Engineering. Explain functions of Process Engineer. **10**

b) Explain different types of tools and toolings required for manufacturing. **6**

OR

1. a) Explain Process Picture Sheet. Draw and explain Process Picture Sheet for turning a job from $\phi 40$ to $\phi 30$ over a length of 40 mm. **12**

b) Explain in precise technical words, why part print analysis is required. **4**

2. For a thick plate of 20 mm, a hole to be drilled at centre. Plate is rectangle of 80 × 100 mm size with anti-resistant coating for corrosion. **16**

For this process, suggest following with set-up figures :

i) Basic process operations

ii) Principal process operations

iii) Major operations

iv) Auxiliary operations.

OR

2. Explain following (**any two**) : **16**

i) Tolerance stacking

ii) Tolerance chart

iii) Work piece variations.

P.T.O.

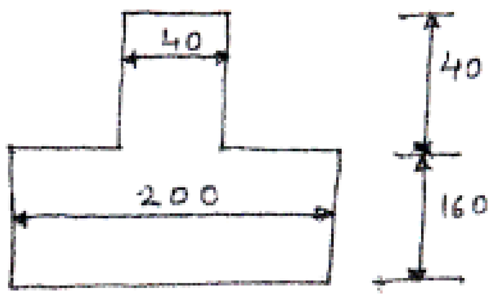
3. Prepare a process plan for machining a T-slot of machine table for removing 0.1 mm material from all surfaces. The process plan should include following :

   i) Manufacturing Process Plan : Selection of M/C tool, work-holding devices, cutting tools, lubricants etc.

   ii) Operation process plan in Tabular format explaining operation sequence, operation details, speed, feed, depth of cut and other machining parameters for each operation.

   iii) Estimate total time of manufacturing considering 5% special allowance of normal time.

   (Milling process should be used) **18**



OR

3. Prepare a process plan for producing a water bottle of one litre for commercial selling purpose by Blow Moulding Process. Assume suitable dimensions of product. **18**

SECTION – II

4. a) Explain the procedure of calibrating dial gauge. **4**

   b) Explain following (**any two**) : **12**

      i) Locating Area

      ii) Holding Area

      iii) Supporting Area.

OR

4. a) Explain : 60 H_7/f_8. **6**

   b) What is Selective Assembly ? How its is related with Batch Production ? **6**

   c) Define : **4**

      i) Flatness

      ii) Roundness.

5. a) Explain what do you understand by quality control. Explain process of quality control. **6**

   b) What are random causes of variation and assignable causes of variations ? Differentiate between two. **10**

OR

5. a) Draw and explain cause and effect diagram of errors in measurement by micrometer screw gauge. **10**

   b) Explain terms : C_p, C_{pk}. **6**

6. a) The gross sales of a company are given in table below :

Years	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Sales (Rs. lakhs)	230	290	355	425	495	555	595	695	800	925

   Calculate :

      i) Coefficient of correlation

      ii) Standard error of estimation. **14**

   b) Explain Regression Analysis in detail. **4**

OR

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

   a) OC curve

   b) P and np chart

   c) Average outgoing quality

   d) Hypothesis test

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T.E. (Petroleum) (Semester – I) (2003 Course) Examination, 2009
MATHEMATICAL METHODS FOR PETROLEUM ENGINEERING

Time: 3 Hours Max. Marks: 100

N.B. : 1) *In Section **I** attempt Q. No. **1** or Q. No. **2**, Q. **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.***

2) *Answers to the two Sections should be written in **separate** answer books.*

3) *Figures to the **right** indicate **full** marks.*

4) *Neat diagram must be drawn **wherever** necessary.*

5) *Use of non-programmable electronic pocket calculator is **allowed**.*

6) *Assume suitable data, if **necessary**.*

SECTION – I

1. a) f(z) is defined as

$$f(z)=\frac{x^2y^5(x+iy)}{x^6+y^{10}}, \quad 3\neq 0$$
$$= 0 \qquad\qquad 3=0$$

Show that f(z) is not analytic at origin, even though Cauchy – Riemann conditions are satisfied at origin. **6**

b) Show that under the transformation w = sinhz, family of straight lines parallel to y-axis and x-axis are mapped on to family of ellipses and hyperbolae respectively. **5**

c) If $u=\frac{1}{2}\log(x^2+y^2)$ find v such that f(z) = u + iv is analytic. Find f(z) in terms of z. **6**

OR

P.T.O.

2. a) Find the bilinear transformation, which maps the points 1, i, –1 from 3-phane on to the points i, 0, – i of the w-plane respectively. **5**

   b) If f(z) = u + iv is analytic, show that u, v satisfy Laplace equation in polar form. **6**

   c) If f(z) = u + iv is analytic, find f(z)

   if $u - v = (x - y)(x^2 + 4xy + y^2)$. **6**

3. a) Evaluate $\oint_c \frac{e^z}{(z+1)^3(z-1)^2} dz$

   where 'c' is the contour $|z+1| = \frac{1}{2}$ **6**

   b) Evaluate using Residue theorem. $\oint_c \text{Cot } z \, dz$ where 'c' is the circle | z | = 4 **5**

   c) Use complex variable method to evaluate $\int_0^{2\pi} \frac{\cos^2 3\theta}{5 - 4\cos 2\theta} d\theta$. **6**

OR

4. a) Apply residue theorem to evaluate $\oint_c \frac{(z^2 + 2z)}{(z+1)^3(z^2-9)} dz$ where 'c' is |z – 3| = 5. **6**

   b) Evaluate $\oint_c \frac{(z^2 + \cos^2 z)dz}{\left(z - \frac{\pi}{4}\right)^3}$ where 'c' is the circle | z | = 1. **5**

c) Using complex integration method, find the value of the integral

$$\int_0^{2\pi} \frac{d\theta}{1-2a\sin\theta+a^2},\ 0<a<1.$$ **6**

5\. a) Obtain regression lines for the following data : **6**

x	2	3	5	7	9	10	12	15
y	2	5	8	10	12	14	15	16

Find estimate of y when x = 6.

b) The first four moments of a distribution about the value 5 are 2, 20, 40 and 50. Find the first four moments about the mean, coefficient of skewness and kurtosis. **5**

c) Fluctuations in the Aggregate of marks obtained by two groups of students are given below. Find out which of the two shows greater variability. **5**

Group A	518	519	530	530	544	542	518	550	527	527	531	550	550	529	528
Group B	825	830	830	819	814	814	844	842	842	826	832	835	835	840	840

OR

6. a) A throw is made with two dice. Find the probability that i) the sum is 7 or less ii) the sum is a perfect square. **5**

b) Find the mean and variance of a binomial probability distribution. The mean and variance of Binomial distribution are 6 and 2 respectively. Find $p(r \geq 1)$. **6**

c) Assuming that the diameters of 1000 brass plugs taken consecutively from machine form a normal distribution with mean 0.7515 cm. and standard deviation 0.0020 cm. How many of the plugs are likely to be rejected if the acceptable diameter is 0.752 ± 0.004 cm ? [$z_1 = 2.25$, $A_1 = 0.4878$; $z_2 = 1.75$, $A_2 = 0.4599$] **5**

SECTION – II

7. a) With usual notations establish the following : **9**

i) $\Delta^r y_k = \nabla^r y_{k+r}$

ii) $y_4 = y_3 + \Delta y_2 + \Delta^2 y_1 + \Delta^3 y_1$

iii) $\left(E^{1/2} + E^{-1/2}\right)(1+\Delta)^{1/2} = 2 + \Delta$.

b) Evaluate $\int_4^{5.2} \log_e x \, dx$ taking h = 0.2 by using **8**

i) Simpson's $\frac{1}{3}$rd rule.

ii) Simpson's $\frac{3}{8}$th rule.

Compare the results with true value.

OR

8. a) Employ Stirling's formula to compute $y_{1.22}$ from the following data. **8**

x	1.0	1.1	1.2	1.3	1.4
$\mathbf{y_x}$	0.841	0.891	0.932	0.963	0.985

b) For the following tabulated data **9**

x	15	17	19	21	23	25
$\mathbf{y} = \sqrt{x}$	3.873	4.123	4.359	4.583	4.796	5.000

find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 16. Compare the result with exact values.

9. a) Find by Newton-Raphson iterative method, the real root of the equation 3x = cos x + 1. Write the algorithm for the method used. **9**

b) Use the method of least squares to fit a second degree parabola of the form $y = ax^2 + bx + c$ to satisfy the following data. **8**

x	–3	–2	–1	0	1	2	3
y	12	4	1	2	7	15	30

OR

10. a) Using Gauss-Seidal iterative method, solve the following system of equations.

$8x - 3y + 2z = 20$

$4x + 11y - z = 33$

$6x + 3y + 12z = 35$ **8**

b) Use Runge-Kutta method of fourth order to find y for x = 0.2 in steps of 0.1, if

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

Write the algorithm for the method used. **9**

11. a) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ at the pivotal points of the grid shown in the fig. 11 a.

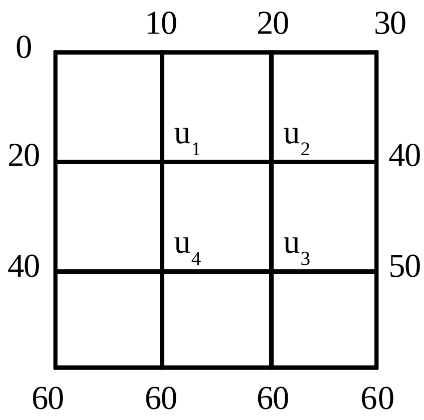

Fig. 11 a **8**

b) Solve the following Linear programming problem by Simplex method

Maximize : $Z = 4x_1 + 3x_2 + 6x_3$

Subject to $2x_1 + 3x_2 + 2x_3 \leq 440$,

$4x_1 + 3x_3 \leq 470$,

$2x_1 + 5x_2 \leq 430$,

$x_1, x_2, x_3 \geq 0$. **8**

OR

12\. a) Solve the equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square with sides x = 0, y = 0, x = 3, y = 3 with u is zero on the boundary and mesh length = 1. **8**

b) Solve the following Linear programming problems by simplex method.

Maximize : $Z = 5x_1 + 3x_2$,

Subject to
$$x_1 + x_2 \leq 2,$$
$$5x_1 + 2x_2 \leq 10,$$
$$3x_1 + 8x_2 \leq 12,$$
$$x_1, x_2 \geq 0.$$
8

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T.E. (Petroleum Engineering) (Semester – I) Examination, 2009
(2003 Course)
PETROLEUM GEOLOGY – I

Time : 3 Hours Max. Marks : 100

Instructions: *i) Answers to the* ***two*** *Sections should be written in* ***separate*** *answer books.*
ii) ***Neat*** *diagrams should be drawn* ***wherever*** *necessary.*
iii) Figures to the ***right*** *indicate marks.*

SECTION – I

1. a) What is a “Rock Cycle” ? Explain with suitable diagram. **6**

b) Discuss different processes/steps involved in the formation of sedimentary rocks. **9**

OR

1. a) Explain with the help of a neat sketch, relationship between rate of solubility of quartz and calcite with pH of water. **6**

b) Explain how igneous rocks are classified on the basis of mode of occurrence. **9**

2. a) What is weathering ? Discuss any two modes of chemical and mechanical weathering. **10**

b) In which tectonic setting, mid oceanic ridge and trenches occur ? **5**

OR

2. a) How is occurrence of an earthquake discussed on the basis of elastic rebound theory ? How earthquake waves are used to describe the internal structure of the earth ? **10**

b) Discuss the classification of mass movement based on moisture content and velocity. **5**

3. a) How is geometric classification of folds based on interlimb angle give broad idea about fold size ? Explain with suitable figures. **12**

b) Give brief account of ‘Quantitative Description of Discontinuities’. **8**

OR

3. a) How are faults recognized in field ? Explain Normal fault and Reverse fault with the help of a neat diagram. **12**

b) A sandstone bed found at depth of 6500 m below the surface has cohesive shear strength of 45 MPA and an angle of friction $\varphi = 45°$. Assume the density of overlying rocks is uniform and is 2750 kg/m^3. Calculate the differential stress at which it will fracture if σ_3 is vertical and equal to the lithostatic load. **8**

SECTION – II

4. a)

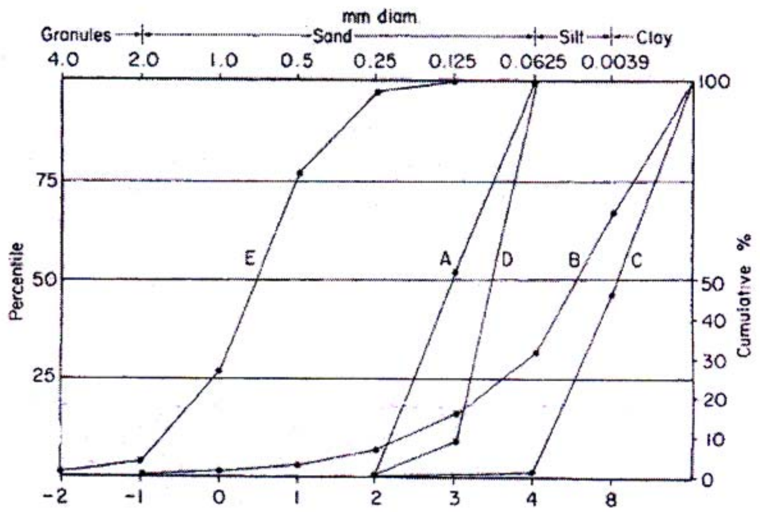

Figure-01 for Question 4(a)

How is textural maturity of clastic sedimentary rocks discussed using above diagram (Figure-01) ? **6**

b) Explain with suitable diagrams how compaction, recrystallisation and dissolution as post depositional changes alter original nature of sediments/sedimentary rocks. **9**

OR

4. a) What are the major components of clastic sedimentary rocks ? Distinguish between mud supported and grain supported framework of sedimentary rocks. **6**

b) What are bed forms ? Explain how different bed forms are generated in response to velocity of water flow and particles size. **9**

5. Write notes on **any two** of the following : **15**

a) Use of microfossils in the exploration of hydrocarbon

b) Evolution of coral reefs

c) Interpretation of sedimentary environment using ichnofossils

d) Marine depth zones and distribution of organism.

6. a) Write Standard Geological Time Scale in a tabular form with important events. **8**

b) Following lithology is encountered during drilling a well. A break in sedimentation exists between two successive units (Figure-2). Reconstruct the chronology of events based on emergence and submergence of coast. Give justification. How is transgression and regression discussed taking into consideration sedimentation and erosion ? **12**

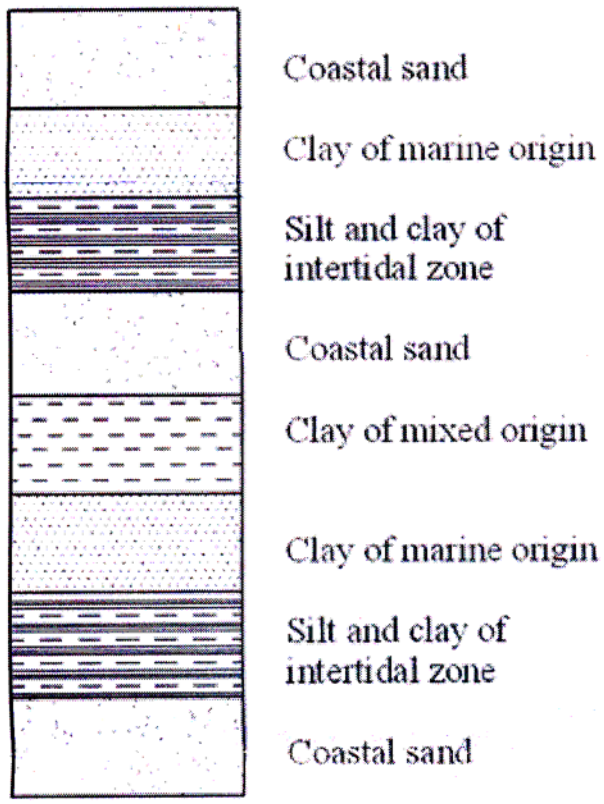

Figure-02 for Question 6(b)

OR

6. a) What is meant by Genetic Increment of Strata ? Draw a cross section illustrating relationship between environment, facies and increment of sedimentation. **8**

b) Discuss in brief classification of Petroliferous Basins of India given by ONGC. **8**

c) Write in a tabular form different types of depositional environments. **4**

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T.E. (Petroleum Engineering) (Sem. – I) Examination, 2009
DRILLING AND PRODUCTION OPERATIONS
(2003 Course)

Time : 3 Hours | Max. Marks : 100

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

SECTION – I

1. a) With the help of proper figure, describe the basic components of a drill string used to drill the well. **5**

b) Calculate minimum draw works horse power required to drill 10,000 feet of 19.5 ppf drill pipe with an O.D. 5 inch. And 50,000 lbs of drill collar. Minimum hoisting speed is recommended as 100 ft/min, hoisting efficiency = 0.65. **4**

c) Describe : i) Fleet angle ii) Journal angle. **4**

d) Discuss working of conventional coring barrel and uses of coring. **5**

OR

2. a) Discuss UTM coordinate system. Calculate displacement and direction of a target from surface location. Data given : UTM coordinates of surface and target are **6**

	Northing N/S	**Easting E/W**
Surface location	1,23,45,690 m	53,67,900 m
Target coordinate	1,23,46,090 m	53,67,400 m

P.T.O.

b) Discuss

i) Drill pipe upset

ii) Cone offset. **6**

c) Calculate :

i) Power at the draw works

ii) Motor power.

Data given :

No. of lines = 10, Efficiency = 0.81, Hook load max = 500,000 lbs.
Hook load speed = 120 ft/min., Mechanical efficiency of draw works = 0.88. **6**

3. a) With the help of neat and labeled figures describe mud circulating system. **6**

b) A single acting triplex pump with 6 inch liner 2 inch rod and 20 inch stroke is operated at delivery pressure of 2260 psi and 60 spm. The total volume of mud pumped was measured 200 ft^3. Determine volumetric efficiency and the hydraulic power. **4**

c) Determine the amount of weighing material with specific gravity 4.25 that must be added to a mud system to increase its pressure gradient from 0.52 psi/ft to 0.624 psi/ft. Initial volume of mud 60 m^3. **4**

d) Write function of the following mud additives : **2**

i) Bentonite ii) Starch

iii) Baritte iv) Lignosulphonate

OR

4. a) Calculate hydraulic horse power at bit if mud weight = 14.5 ppg, flow rate Q = 300 gpm, jet size = 12/32 inch, no. of jets 3. **6**

b) Determine density of a water base mud containing 8% bentonite by weight, density of bentonite is 20.8 ppg. **4**

c) Why mud cleaning is essential, describe different mud cleaning equipments. **6**

5. a) Draw BOP stack RSRRA. Discuss different types of ram preventer. **8**

b) A drill string has got stuck in 12,000 ft borehole. The overpull of 80,000 lbf results 3 feet stretch in drill string that of 1200 ft $6'' \times 3''$ drill collar and 19.5 ppf drill pipe. Determine the depth of stuck point of drill string. E = 30×10^6 psi. **4**

c) What are the symptoms of a possible kick during drilling and tripping operations. **4**

OR

6. a) What are the reasons for sticking of a drill string in borehole ? Discuss the mechanism of differential sticking and its controlling measures. **6**

b) A drill string consists of 15000 ft of 19.5 ppf drill pipe and 500 ft of 150 ppf drill collar. If drill string is differentially stuck at first drill collar below the drill pipe. Data given as

Mud weight = 13 ppg, steel density = 489.5 lb/ft^3, differential force = 108,000 lb.

Determine :

i) Buoyant weight of drill pipe

ii) Total hook load when pulling on differentially stuck pipe. **4**

c) Discuss :

i) Primary well control

ii) Secondary well control

iii) Tertiary well control. **6**

SECTION – II

7. a) Write the different types of casing pipes explain their function in brief. **6**

b) Draw the neat schematic sketch of primary cementation job and indicate various features of it. **6**

c) Write in brief different cementation equipments explain the function of each in brief. **6**

OR

8. a) What is squeeze cementation ? Explain the roll of squeeze cementation during water and gas shut off job. **7**

b) Define and explain any three important properties of oil well cement. **9**

c) Write API grades of cement. **2**

9. a) List various types of well completion methods and draw typical schematic sketch of well completion for a multilateral or horizontal well. Specify and indicate all the features. **8**

b) Draw neat sketch of well head equipment and indicate all the parts. **6**

c) What is the effect of pressure and temperature on production tubing packer setting ? **2**

OR

10. Write short note on : **16**

i) Production packer

ii) Coil tubing unit

iii) Unseating of packer

iv) Down hole production equipments.

11. a) Compare the difference between

i) Drilling fluid ii) Well completion fluid

iii) Workover fluid iv) Packer fluid **8**

b) List various workover problems and answer the remedy/solution for any four in brief. **8**

OR

12.a) What are the objectives of workover job ? What are the steps for evaluation and accomplishment of workover operation ? **6**

b) Define and explain the following in brief. **10**

i) IPR and PI

ii) DST and RFT

iii) Well perforation.

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T.E. (Petroleum) (2003 Course) (Sem. – I) Examination, 2009
PRINCIPLES OF CHEMICAL ENGINEERING – I

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Discuss the difference between 'Heat Engine' and 'Heat Pump' with the help of neat sketch. **6**

b) Define Entropy. Discuss its importance from statistical point of view. In this regard state 3^{rd} Law of Thermodynamics. **6**

c) What are limitations of 'Carnot Cycle' ? **4**

OR

2. a) What are limitations of first law of thermodynamics ? How Second law overcome these limitations ? Give statement of second law of thermodynamics. **8**

b) A vapour-compression cycle using ammonia as refrigerant is employed in an ice manufacturing plant. Cooling water are 288 K enters the condenser at a rate of 0.25 kg/s and leaves at 300 K. Ammonia at 294 K condenses at a rate of 0.50 kg/minute. Enthalpy of liquid ammonia at 294 K is 282.5 kJ/kg. The compressor efficiency is 90%. Saturated ammonia vapour at 258 K and enthalpy of 1426 kJ/kg enters compressor. What is the power requirement of the compressor and refrigeration capacity in tons ? **8**

P.T.O.

3. a) Explain with neat diagram working of Peristaltic and Gear Pump. **6**

b) Discuss various models of Non-Newtonian fluids along with one example each. **6**

c) You are lifting a gas-liquid mixture through a long vertical pipe, what are the different flow regimes possible ? Explain with help of neat diagrams. **6**

OR

4. a) A mixture of water and air is flowing through a tube. Calculate the values of ε, f, V_{slip}, If Q_g/Q_1 = 10 and Holdup ratio given is 3.5 and pressure drop $(-\Delta P) = 0.5_{\rho water}\, gh$ and Q_1 = 2.06 ft/sec A_{tube} = 1 ft^2. **8**

b) Define : Mach Number, Supersonic flow, Stagnation Properties. **6**

c) Write a short note on designing a baffled stirred tank to be applied for mixing two immiscible liquids. **4**

5. a) Obtain performance equation of steady state Constant Stirred Tank Reactor (CSTR). **6**

b) A second order reaction carried out in a single CSTR results in 70% conversion. It is proposed to arrange another CSTR in series with first one. If all the parameter remains same, calculate how this addition affects the conversion of reactant. **6**

c) How study of Combustion Engineering is helpful to Petroleum Industry ? **4**

OR

6. a) Define theoretical flame temperature and highlight its importance. **4**

b) A specific catalytic reaction is carried out with reactant as A. At given catalytic concentration the aqueous feed stream of 25 l/min, determine the size of plug flow reactor needed to achieve 95% conversion of reactant A(C_{A0} = 2 mol/l). The Kinetics of reaction $A \rightarrow R$ is given by :

$$-r_A = \frac{0.1C_A}{1 + 0.5C_A} \quad \text{mol/(lit.min).}$$ **8**

c) Write short note on Premixed and Diffussion flame with one example of each. **4**

SECTION – II

7. a) Determine the molar volume of gaseous methane at 300 K and 600 bar by the following methods : **8**

   a) Using the ideal gas equation.

   b) Using the Van der waals equation given that

   $a = 0.02285\ m^4/mol^2$; $b = 4.27\times10^{-5}\ m^3/mol$

   c) Using the Redlich-Kwong (RK) equation given that

   $T_c = 191.1$ K and $P_c = 46.4$ bar.

   b) Derive relationship in between measurable and non-measurable thermodynamics properties. **6**

   c) Draw a neat diagrams showing P-V-T behavior of Pure fluids. **2**

OR

8. a) Discuss with the help of phase diagram, how VLE data is generated ? What is importance of VLE data ? **6**

   b) Why ideal gas laws are not applicable to real gases ? Explain all the corrections necessary to modify the gas equation to represent the behavior of real gas. **6**

   c) Write a short note on Supercritical State and elaborate its importance in modern days. **4**

9. a) Define fugacity and explain its significance. **4**

   b) "Thermodynamic properties are not additive'. Justify with one example. How Partial Molar Properties are determined ? **6**

   c) Derive the relation of chemical potential with total free energy. **4**

   d) Write short note on : **4**

   i) Activity

   ii) Activity Coefficient.

OR

10. a) Write short notes on : **18**

    i) Raoult's law.

    ii) Determination of Bubble point temperature.

    iii) Critical Pressure and Temperature.

    iv) Stepwise procedure of flash calculation.

11. a) Why do we study Gas Hydrate ? **6**

    b) Discuss 'Gas Hydrate may cause of Tsunami and Land sliding'. **4**

    c) What are Advantages, Disadvantages and Challenges associated with gas hydrate ? **6**

OR

12. a) Discuss in details about mechanisms of 'Gas Hydrate Inhibition'. **4**

    b) Write a short note on occurrence of gas hydrates. **4**

    c) With help of a neat phase diagram explain formation of gas hydrates. **4**

    d) Write a short note on different structures of Gas Hydrates. **4**

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T.E. (Petroleum Engineering) (Semester – I) Examination, 2009
PETROLEUM FIELD INSTRUMENTATION AND CONTROL
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Attempt **Q. 1** or **2, Q.3** or **4, Q.5** or **6, Q.7** or **8, Q.9** or **10, Q.11** or **12**.*
*2) Figures indicated to the **right** are the marks.*
*3) **Use** of electronic calculator is **allowed**.*
*4) Draw **neat** figures **wherever** necessary.*

SECTION – I

1. a) Give the classification of measuring instruments. **9**

b) What is a standard of measurement ? Discuss the various standards of measurements. **9**

OR

2. a) Discuss the static characteristics of a measuring instrument. **9**

b) Differentiate between : **9**

i) Repeatability and Reproducibility

ii) Precision and Accuracy

iii) Static and Dynamic error.

3. a) Write a note on the RTD (Resistance Temperature Detector). **8**

b) Describe the construction and working of LVDT (Linear Variable Differential Transformer). **8**

OR

4. a) Give the principles used in torque measuring instruments and explain any one instrument in detail. **8**

b) Describe in brief the construction and working of a pH meter. **8**

P.T.O.

5. a) Describe in brief the pipe-line monitoring tools. **8**

   b) Describe the control equipment for automatic drilling operation. **8**

OR

6. a) Write a note on the principle, construction and working of a rotameter. **8**

   b) List the various methods for level measurement and describe the magnetic level switch method. **8**

SECTION – II

7. a) Write a note on the various types of process time lags with suitable examples. **8**

   b) Write a note on the block diagram used in process control and list the various types of blocks. **8**

OR

8. a) Write a note on automatic control system with emphasis on feed back control. **8**

   b) Write a note on the selection of type of controller for a particular application. **8**

9. a) Describe with a neat sketch :

   i) Force balanced amplifier

   ii) Motion balance amplifier. **8**

   b) Describe in brief temperature limit switches and pressure limit switches. **8**

OR

10. a) Describe the inherent and installed characteristics of control valves. **8**

    b) Write a note on electronic and pneumatic controllers. **8**

11. a) Write a note on telemetry and telecontrol production operations. **9**

    b) Describe the various components of SCADA system. **9**

OR

12. a) Describe the various control schemes for a heat exchanger. **9**

    b) Discuss the techniques for measurement of bottom hole pressure and mud weight. **9**

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T.E. (Petroleum Engineering) (Semester – II) Examination, 2009
PROPERTIES OF RESERVOIR ROCKS AND FLUIDS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the* ***two*** *Sections must be written in* ***separate*** *answer books.*
2) Question No. ***1*** *(one) is* ***compulsory****.*
3) Attempt ***three*** *questions from* ***each*** *Section.*
4) Figures to the ***right*** *indicate* ***full*** *marks.*
5) ***Neat*** *diagrams should be drawn* ***wherever*** *necessary.*
6) ***Use*** *of a non-programmable calculator is* ***allowed****.*
7) Assume ***suitable*** *data if* ***necessary****.*

SECTION – I

1. a) Derive an expression for radial turbulent flow of a gas in porous media. **12**

   b) State all the assumptions in this equation. **6**

2. a) Draw the stress strain diagram for steel, cast iron, limestone and shale. Explain all the important points on the graph. **8**

   b) What is Mohr's diagram ? Explain its usefulness. **6**

   c) What is the engineering classification of naturally fractured rocks ? **2**

3. a) Define Bo, Co, μo, Bg, μg, Cg, Bw and explain each with a variation in pressure. State the SI units of each. **16**

4. a) Derive an equation for oil flow in fractures. **6**

   b) Write a note on relative permeability. **5**

   c) How is Mohr's circle and Coulomb's criteria helpful in fracture analysis ? **5**

P.T.O.

SECTION – II

5. Draw and explain PV, PT, P-x, P-density diagrams for a single, dual and multi component system. **16**

6. a) Given the following table for the components of a mixture. Find N_g and N_L. Use Newton's method by choosing a starting value of 0.6 and do only two iterations. **6**

   b) Where does such a problem actually occur in Petroleum Industry ? **2**

   c) What is Flash and Differential Liberation ? Where does it occur ? **4**

   d) Can you solve the same problem with an EOS ? Explain in detail. **6**

Component	**Zi**	**Ki**
C3	0.8	1.45
nC4	0.1	0.5
nC5	0.1	0.2

7. a) Define Wettability. What is its importance to Petroleum Engineering ? **8**

   b) Derive Plateau Equation. How is this useful to Petroleum Engineering ? **8**

8. a) Derive the Suave EOS in terms of Z. What is Zv and Zl ? **10**

   b) What is the significance of three values of Z ? If four values were obtained, what would their significance be ? **6**

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T.E. (Petroleum) (Semester – II) Examination, 2009
PRINCIPLES OF CHEMICAL ENGINEERING – II
(2003 Course)

Time : 3 Hours | Max. Marks : 100

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

SECTION – I

1. a) With help of neat diagram discuss the stepwise procedure to be followed for calculation of actual number of stages for a distillation column. **6**

   b) Compare relative advantages between packed column and tray column. **6**

   c) Define : Relative Volatility, HETP. **4**

2. a) Briefly explain principle of membrane separations – highlight its applications both in industrial and domestic fronts. **8**

   b) Discuss principle of operation of cooling tower with help of neat diagram. **8**

3. a) Write a short note on TEMA specifications. **4**

   b) Water at the rate of 4 kg/s is heated from 35 to 55° C in a shell-and-tube heat exchanger. On the shell side 1 pass is used with water as the heating fluid, 2 kg/s, entering the exchanger at 95° C. Overall heat transfer coeff. = 1420 W/(m^2.K). Average water velocity in 20 mm diameter tube is 0.4 m/s. Due to space limitations, tube length must not be greater than 1.5 m. Calculate the number of tube passes, number of tubes per pass and length of the tubes for this case. **12**

4. a) A mixture of two liquids M and N are to be separated. From standard literature, relative volatility of the binary mixture is found to be 0.78. Discuss the possibility of separation and draw an equilibrium curve for the system. **4**

   b) What are the important characteristics of packing materials-discuss in brief ? **6**

   c) What do you mean by fouling factor ? Explain its significances. **4**

   d) Write a short note on q-line and its importance in design of binary distillation column. **4**

SECTION – II

5. a) Discuss the evil effects of environmental pollution on human civilization. **6**

   b) Waste water can be treated by both aerobic and an-aerobic means. Explain with help of suitable example. Draw necessary diagrams. **6**

   c) Write a short note on Acid Rain. **4**

6. a) You have been appointed by XYZ firm for obtaining a suitable location of their chemical plant. On what basis you will decide the best possible location – Explain. **6**

   b) P and ID is very useful and too much confidential – elaborate and explain with help of suitable example. **6**

   c) Discuss briefly the role and responsibility of plant layout engineer. **4**

7. a) Name three different types of valves and explain their mode of operation with help of neat sketches. **6**

   b) Discuss briefly about various types of joints often seen in chemical processing units. **4**

   c) What do you mean by Cross Country Piping ? Highlight its relative advantages and significances. **6**

8. a) Write short notes on : **18**

   i) Rig Layout
   ii) Process Flow Sheet
   iii) Non-destructive Testing
   iv) Assembly and Erection
   v) Insulation of Pipes
   vi) Aerosols.

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T.E. (Petrochemical) (Semester – I) (2003 Course) Examination, 2009
MATHEMATICS FOR PETROCHEMICAL ENGINEERS

Time: 3 Hours Max. Marks: 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** answer books.*
*2) 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**.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) **Use** of non-programmable electronic pocket calculator is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Find all the basic solutions to the following problem. **6**

Maximize $Z = x_1 + 3x_2 + 3x_3$

Subject to $x_1 + 2x_2 + 3x_3 = 4$,

$2x_1 + 3x_2 + 5x_3 = 7$ and $x_1 \geq 0$, $x_2 \geq 0$, $x_3 \geq 0$

Which of the basic solutions are i) non-degenerate basic feasible, ii) optimal basic feasible ?

b) A factory manufactures three products which are processed through three different production stages. The time required to manufacture one unit of each of the three products and the daily capacity of the stages are given in the following table :

Stages	Time per unit in minutes			Stage capacity in minutes
	Product 1	Product 2	Product 3	
1	1	2	1	430
2	3	-	2	460
3	1	4	-	420

Profit per unit of each product is Rs. 3, Rs. 2 and Rs. 5, respectively. Formulate the above as a LPP to maximize profit and using Simplex method, solve it. **10**

OR

2. a) State the general rules for converting any primal LPP into its dual. **6**

Construct the dual of the following problem.

Minimize $Z = 2x_1 + 3x_2 + 4x_3$, subject to

$$2x_1 + 3x_2 + 5x_3 \geq 2,$$
$$3x_1 + x_2 + 7x_3 = 3,$$
$$x_1 + 4x_2 + 6x_3 \leq 5,$$
$$x_1, x_2 \geq 0 \text{ and } x_3 \text{ is unrestricted.}$$

b) A firm makes two products A and B. Each product requires production on each of the two machines.

Machine	Product		Available (in hours)
	A	B	
M_1	6	4	60
M_2	1	2	22

Total time available is 60 hours and 22 hours on machines M_1 and M_2 respectively. Products A and B contribute Rs. 3 and Rs. 4 per unit respectively.

Determine the optimum product mix, to maximize profit. From the final simplex table, find the solution to the dual of this problem and give its economic interpretation. **10**

3. a) Five wagons are available at five stations 1, 2, 3, 4 and 5. These are required at five stations I, II, III, IV and V. The mileages between the various stations are given by. **6**

	I	II	III	IV	V
1	10	5	9	18	11
2	13	19	6	12	14
3	3	2	4	4	5
4	18	9	12	17	15
5	11	6	14	19	10

How should the wagons be assigned to the stations, so as to minimize the total distance covered ?

b) A company has three plants and four warehouses. The supply and demand in units and the corresponding transportation costs are given below. **10**

		Warehouse				
		I	**II**	**III**	**IV**	**Supply**
	A	5	10	4	5	10
Plants	B	6	8	7	2	25
	C	4	2	5	7	20
Demand		25	10	15	5	55

Using Vogel's Approximation Method, find an initial basic feasible solution to the transportation problem. Is it optimal ? Is it degenerate ?

OR

4. a) The personnel manager of a company decides to assign tasks 1, 2, 3, 4 and 5 among 5 employees A, B, C, D and E. Due to special nature of task 3, the manager decides to assign task 3 to D and remaining tasks among A, B, C, and E, so as to maximise the total effectiveness. The index of effectiveness of each employee is given below.

	1	**2**	**3**	**4**	**5**
A	25	55	60	45	30
B	45	65	55	35	40
C	10	35	45	55	65
D	40	30	70	40	60
E	55	45	40	55	10

How should the tasks be assigned so as to maximise the effectiveness ? Is the decision to assign task 3 to D correct ? Find also the value of maximum effectiveness. **6**

b) A company has factories at A, B, C and D which supply warehouses at I, II, III and IV. Monthly factory capacities are 50, 70, 30 and 50 respectively. Monthly warehouse requirements are 25, 35, 105 and 20 respectively. The unit transport costs (in rupees) are given in the table below. Determine the optimum distribution for this factory to minimize transport cost, using Vogel's Approximation Method. **10**

Warehouses

		I	**II**	**III**	**IV**
	A	4	6	8	13
Factories	**B**	13	11	10	8
	C	14	4	10	13
	D	9	11	13	8

5. a) The following data give the demand (X) and supply (Y) in market : **8**

X :	40	34	28	30	44	38	31
Y :	32	39	26	30	38	34	28

Find the two regression equations. Find also the correlation coefficient.

b) In 8 independent trials of an experiment of a random experiment with a constant probability of success in each trial, it is known that the probability of 5 successes is equal to the probability of 3 successes. If the experiment is repeated 6 times, what is the probability of obtaining 4 successes ? **5**

c) A car hire firm has 2 cars which it hires out day by day. The number of demands for a car on each day follows Poisson distribution with mean 1.5. Calculate the number of days in a week on which i) neither car is used, ii) some demand is refused. **5**

OR

6. a) The equations of the lines of regression of a bivariate distribution are $5x - y - 21 = 0$ and $16x - 5y - 60 = 0$.

Find

i) the means $\bar{x}$, $\bar{y}$. ii) correlation coefficient r

iii) s.d. of x if variance of y is 16. **6**

b) In a certain city, 2000 electric lamps are installed. If the lamps have average life of 1000 burning hours with standard deviation of 200 hours,

i) What number of lamps be expected to fail in first 700 burning hours ? **6**

ii) After what period of burning hours, 10% of lamps would still be burning ?

Given : Area under the standard normal curve :

from $z = -\infty$ to $z = 1.5$, Area is 0.933.

$z = -\infty$ to $z = 1.28$, Area is 0.900.

c) In an experiment on pea-breeding it was observed that 315 seeds were round and yellow, 101 wrinkled and yellow, 108 round and green, 32 wrinkled and green. According to the theory of heredity the numbers should be in the ratio 9 : 3 : 3 : 1. Is there any evidence to doubt the theory at 5% level of significance ? Given $\chi^2_{3,\,0.05} = 7.82$. **6**

SECTION – II

7. a) With usual notation establish the following : **9**

i) $\Delta \log f(x) = \log\left[1 + \frac{\Delta f(x)}{f(x)}\right]$

ii) $\frac{1}{\nabla} y_n - \frac{1}{\Delta} y_0 = y_0 + y_1 + y_2 + \ldots + y_n$

iii) $\delta = 2\sinh\left(\frac{hD}{2}\right)$

b) Evaluate $\int_0^{\pi} \frac{\sin^2\theta}{5 + 4\cos\theta}\, d\theta$ taking $h = \frac{\pi}{6}$ by using. **8**

i) Trapezoidal rule

ii) Simpson's $\frac{3}{8}$th rule.

OR

8. a) For the following tabulated data : **9**

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

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

b) Employ Stirling's formula to compute $y_{12.2}$ from the following table $(y_x = 1 + \log_{10} \sin x)$. **8**

x^0	10	11	12	13	14
$10^5 y_x$	23967	28060	31788	35209	38368

9. a) Find a positive real root of $x^4 - x = 10$ using Newton-Raphson method. **8**

b) Solve the following system of equations by Gauss-elimination method. **8**

$10x_1 - 7x_2 + 3x_3 + 5x_4 = 6$

$-6x_1 + 8x_2 - x_3 - 4x_4 = 5$

$3x_1 + x_2 + 4x_3 + 11x_4 = 2$

$5x_1 - 9x_2 - 2x_3 + 4x_4 = 7$

OR

10. a) Solve the following system of equations by Gauss-Seidel iterative method. **8**

$10x - 5y - 2z = 3$

$4x - 10y + 3z = -3$

$x + 6y + 10z = -3$

b) Use method of least squares to fit a second degree parabola of the form $y = ax^2 + bx + c$ to satisfy the following data **8**

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

11. a) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ at the pivotal points of the grid shown in the Fig. 11 a. **9**

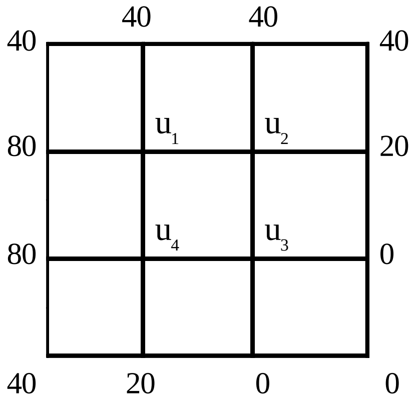

Fig. 11 a.

b) Using modified Euler's method solve the equation $\frac{dy}{dx} = x - y^2$; y(0) =1 to calculate y at x = 0.4 taking h = 0.2. **8**

OR

12. a) Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -500$ for pivotal values on a square plate bounded by x = 0, y = 0, x = 3, y = 3 and u = 0 at the every point on the boundary of square plate and mesh length = 1. **9**

b) Use Runge-Kutta method of fourth order to solve $\frac{dy}{dx} = xy + y^2$; y(0) = 1 to find y at x = 0.2 taking h = 0.1. **8**

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T.E. (Petrochemical Engg.) (Semester – I) Examination, 2009
DIFFUSION AND MASS TRANSFER
(2003 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. Answer the following questions in brief (**any four**) : **18**

a) Explain molecular diffusion by giving suitable examples.

b) The value of D_{AB} for a dilute solution of methanol in water at 288 K is given by $1.28\times10^{-5}\ \frac{cm^2}{s}$. Estimate D_{AB} for same solution for 373 K, using Wilke-Chang correlation.

Data : μ_1 at 288 K = 1.14 C_p

μ_2 at 373 K = 0.284 C_p

c) Differentiate between flash distillation, differential distillation and rectification.

d) State and explain Fick's law. Give meaning of all terms involved in it.

e) Classify mass transfer operations by giving suitable examples.

P.T.O.

f) Give correlations for estimation of diffusivity in gases and explain the terms involved in it.

g) Explain with suitable graph the moisture content in the solid.

h) Write final flux equation for equimolar diffusion and draw a graph showing concentration gradient.

OR

2. a) Derive from fundamentals the expression for steady state equimolar counter diffusion of gas P through another gas Q. State the assumptions made, if any. **9**

b) Gas A is diffusing from a gas stream at point 1 to a catalyst surface at point 2 and reacts instantaneously and irreversibly as follows : $2A \rightarrow B$. Gas B diffuses back to the gas stream. Derive the final equation for NA at constant pressure P and steady state in terms of partial pressure. **9**

3. a) The solute HCl (A) is diffusing through a thin film of water (B) 2.5 mm thick at 285 K. The concentration of HCl at point 1 at one boundary of the film is 15.0 wt% HCl (density $\rho 1$ = 1065 kg/m^3), and at the other boundary of the film at point 2 it is 6.0 wt% HCl (density $\rho 2$ =1035 kg/m^3). The diffusion coefficient of HCl in water is 2.5×10^{-9} m^2/s. Assuming steady state and one boundary impermeable to water, calculate the flux of HCl. **8**

b) The gas CO_2 is diffusing at steady state through a tube 20 cm long having a diameter of 1.0 cm and containing N_2 (MW = 28) at 298 K. The total pressure is constant at 101.32 kPa. The partial pressure of CO_2 at one end is 456 mm Hg and 76 mm Hg at the other end. The diffusivity D_{AB} is 0.167 cm^2/s at 298 K.

a) Calculate the flux of CO_2 in N_2.

b) Repeat your calculations in the diffusion is between (a) H_2 and N_2, where the diffusivity D_{AB} is 0.784 cm^2/s at 298 K, and (b) NH_3 and N_2, where the diffusivity D_{AB} is 0.230 cm^2/s at 298 K.

c) Discuss your results. **8**

OR

4. a) A well located in the desert is 10 m deep to the water level and 1.0 m in diameter. The stagnant air and water in the well are at 30°C and normal atmospheric pressure. A slight breeze of dry air is blowing across the top of well. Calculate the rate of steady-state diffusion of water vapour in the well. (Assume partial pressure of water vapour in the air = vapour pressure of water at 30°C).

Assume diffusivity of water vapour in air at 30°C is $D_{AB} = 2.6\times10^{-5}\ m^2/sec$.
Vapour pressure of water at 30°C = 4.112 kN/m^2. **8**

b) A narrow tube is partially filled with liquid and maintained at a constant temperature. A gentle stream of a gas is passed across the open end of the tube. As the liquid evaporates, the level drops slowly. At a given time t, this level in the tube is Z from the top. Derive an expression to calculate the value of diffusivity of liquid vapour in the gas. **8**

5. a) H_2 gas flows through a tube of neoprene rubber having ID = 30 mm and OD = 55 mm. The pressure and temperature of the gas are 3 std. atm. pressure and 298 K respectively. If the solubility of hydrogen in rubber is

$S = 55\times10^{-3}\ \frac{m^3\ (NTP)}{m^3.\ rubber.\ atm.}$ and diffusivity of H_2 through rubber

$D_{AB} = 1.8\times10^{-10}\ m^2/sec$. Calculate rate of H_2 loss per unit length of tube due to diffusion. **8**

b) Ammonia is absorbed by water in a wetted-wall column being operated at 20°C and 1 std. atm. The overall gas coefficient is 1k mole $NH_3/[(m^2)\ (std.atm.)]$. At one point in the column, the gas contains 10-mole% ammonia and the liquid phase contains 0.155 mole ammonia per m^3 of solution. 96% of the total resistance is in the gas phase. Assume Henry's law constant at
293 K = 4.247×10^{-3} std.atm./(mole NH_3/m^3 solution). Determine the interfacial film coefficient and the interfacial compositions. **8**

OR

6. a) Winklemann's method can conveniently determine diffusivity of vapour of volatile liquid in air, in which liquid is contained in a narrow vertical tube maintained at constant temperature. Air stream is passed over the top of tube rapidly to measure the partial pressure of vapour remains approximately zero. On the assumption, vapour is tarnsferred from surface of liquid to a stream by molecular diffusion. Calculate the diffusivity of CCl_4 vapour in air at 321 K and 1 atm. pressure from following experimental data as given in Table 1

Table 1 Experimental Data for Winklemann's experiment

Time from common cement of experiment (ks)	Liquid Level	
	(cm)	(mm)
0	0	0
1.6	0.25	0.025
11.1	1.29	0.129
27.4	2.32	0.232
80.2	4.39	0.439
117.2	5.47	0.547
168.6	6.70	0.670
199.7	7.38	0.738
289.3	9.03	0.903
383.1	10.48	1.048

Data : Vapour pressure of CCl_4 at 321 K is 37.6 kN/m^2 and density of liquid is 1540 kg/m^3. The kilogram molecular volume is 22.4 m^3. **9**

b) Develop the material balance equations for counter current mass transfer process by giving the graphical representations of the final equation. **7**

SECTION – II

7. a) The average heat transfer coefficient for natural convection from a single sphere in a large body of fluid is given by

$$\frac{hd}{k} = 2 + 0.6\left(\frac{d^3\rho^2 g\beta\beta\Delta}{\mu^2}\right)\left(\frac{c_p\mu}{k}\right)^{1/3} \text{ for } Gr^{1/4}\ Pr^{1/3} < 200$$

Where d is the diameter of the sphere and the fluid properties are evaluated at the mean temperature of the sphere and bulk fluid. Using the analogy between mass and heat transfer, calculate the instantaneous rate of sublimation at the surface of a naphthalene sphere in air at 140°C and 1 atm.

Explain the analogy between Nu = Sh, Sc = Pr, Gr = Gr_{AB}.

Data :

$P^{vap}_{naphthalene}$ = 0.15 atm, $D_{AB} = 5.95\times10^{-6} m^2/s$, $d = 7\times 10^{-2} m$

$\rho_{air} = 0.850\ kg/m^3$, $\mu_{air} = 2.4\times10^{-5} kg/m.s.$ **8**

b) A stream of air at 100-kPa pressure and 300 K is flowing on the top surface of a thin flat sheet of solid naphthalene of length 0.2 m with a velocity of 20m/sec. The other data are :

Mass diffusivity of naphthalene vapor in air = $6\times10^{-6}\ m^2/sec$

Kinematic viscosity of air = $1.5\times10^{-5}\ m^2.sc$

Concentration of naphthalene at the air-solid naphthalene

interface = $1\times10^{-5}\ kmol/m^3$

a) the overage mass transfer coefficient over the flat plate

b) the rate of loss of naphthalene from the surface per unit width

Note : For heat transfer over a flat plate, convective heat transfer coefficient for laminar flow can be calculated by the equation.

$$Nu = 0.664\, Re_L^{1/2}\ Pr^{1/3}$$

You may use analogy between mass and heat transfer. **10**

OR

8. a) For equimolar counter-diffusion from a sphere to a surrounding stationary infinite medium, the mass flux N_{Ai} of the diffusing component A at the interface is given by $N_{Ai} = D_A (C_{Ai} - C_{Ab})/R$ where D_A is the diffusivity, R the radius of the sphere and C_{Ai} and C_{Ab} the molar concentrations of A at the interface and at a point far away from the sphere. Show that the Sherwood number, based on the diameter of the sphere, is equal to 2. **6**

b) Calculate the maximum rate of absorption of O_2 in a fermenter from air bubbles at 1 atm having diameter of 100 μ m at 37°C into water having a zero concentration of dissolved oxygen. The solubility of O_2 from an air in water at 37°C is equal to 2.26×10^{-4} kg mole O_2/m^3.

Data : Diffusivity of O_2 in $H_2O = 3.25 \times 10^{-9} m^2/s$

Viscosity of water = 6.947×10^{-4} kg/ms, Density of Water = 994 kg/m^3,

Density of air particle = 1.13 kg/m^3

Assume that agitation is used to produce air bubbles.

Determine the following :

a) Connective mass transfer coefficient, k'_L

b) Mass transfer rate. **12**

9. a) Discuss in brief the significant parameters in convective mass transfer. **6**

b) How will express moisture content on dry basis and wet basis ? What is basic difference between these two moisture content ? **4**

c) Define the humidity term you know. **6**

OR

10. a) In a drying experiment, a tray dryer containing a single tray of 1 m^2 area is used to dry crystalline solids. The following table gives the data for drying experiment :

Table 2 Drying data

Sr. No.	Time, Hour	Weight of wet material, kg
1	0	5.314
2	0.4	5.238
3	0.8	5.162
4	1.0	5.124
5	1.4	5.048
6	1.8	4.972
7	2.2	4.875
8	2.6	4.819
9	3.0	4.743
10	3.4	4.667
11	4.2	4.524
12	4.6	4.468
13	5.0	4.426
14	6.0	4.340
15	Infinite	4.120

Data : Humidity of exit air (90°C and 5% saturation) = 0.068 $\frac{\text{kg}H_2O}{\text{kg dry air}}$

Do as follows :

a) Calculate and plot drying rates. Find the critical moisture content.

b) If dry air is available at 40°C with an absolute humidity of 0.01 kg H_2O per kg dry air and the dryer is maintained at 90°C, calculate the amount of air required in first 2 hours.
Assume that the air is heated upto 90°C and the dry air leaves the dryer at 90°C with 5% saturation.

c) Test the consistency of the falling rate period (choose critical moisture content and any one point in the falling rate period). **16**

11.a) In a laboratory drying test with a solid material the following relation for the falling rate period was obtained,

$$\frac{dX}{d\theta} = -0.8\,(X - 0.05)$$

Where X is the moistrure content on dry basis of θ is the time in hours. The critical moisture content is 1.4 kg moisture per kg of dry material.

Calculate :

a) the time required for dryig the material from $X_1 = 4.0$ to $X_2 = 0.1$.

b) the equilibrium moisture content. **7**

b) Classify industrial dryers. Discuss the working principles and construction of Rotary drum dryer with neat sketch. **9**

OR

12. a) Compare Tray towers versus Packed towers. **5**

b) State desirable characteristics of good packing material. Discuss in brief the types of packings with suitable sketches. **5**

c) Write a brief note on : "Types of Cooling Towers". **6**

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T.E. (Petrochemical) (Semester – I) Examination, 2009
CHEMICAL ENGINEERING THERMODYNAMICS
(2003 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Briefly explain the principle of corresponding states along with its relevance. **4**

b) Calculate and compare molar volume values for ammonia at 400°K and 20 bar using

i) Ideal Gas equation

ii) Vander Waals equation and

iii) Redlich Kwong equation

For ammonia, P_c = 112.8 bar and T_c = 405.5°K. **12**

2. a) State without proof the Maxwell's equations. Also explain their utility in thermodynamic analysis. **4**

b) Prove the following :

$$dH = C_p\, dT + \left[V - T\left(\frac{\partial V}{\partial T}\right)_P \right] dP$$

Using the above, also prove that for an ideal gas enthalpy is function of temperature alone. **12**

P.T.O.

3. a) Prove

$$\ln \phi = \int_0^P \frac{Z-1}{P} dP$$

Where ϕ =fugacity coefficient. **6**

b) Using the result in (a), derive an expression for fugacity coefficient of a gas obeying the following equation of state.

$z = a + bP + cP^2$, P in bar. **4**

c) Using the result in (b) determine fugacity of oxygen at 293°K and 100 bar given that for oxygen, $a = 1.0$, $b = -0.75\times10^{-3}$ and $c = 0.15\times10^{-5}$. **4**

d) State Clausius Clapeyron equation and explain its utility. **4**

4. a) State first law for closed and open systems. **4**

b) Comment on entropy change for an isolated system in case of reversible and irreversible processes. **3**

c) Oil at 500°K is to be cooled using cold water available at 295°K. Oil weighs 5000 Kg and has C_p of 3.2 kJ/kg K. Water weighs 3000 Kg and has C_p of 4.2 kJ/kgK. Assume oil-water contact taking place in isolated system. Calculate the final temperature and entropy change assuming irreversible cooling. **9**

SECTION – II

5. a) Define partial molar property. Explain its significance. **4**

b) State chemical potential as partial molar property. Discuss importance of chemical potential in phase equilibrium. **4**

c) State relationship between activity coefficient and excess Gibbs Free Energy of a solution. **2**

d) The volume of a mixture of two organic liquids 1 and 2 is given by

$V = 110 - 17\, x_1 - 3\, x_1^2$

V is volume in m^3/mol at 1 bar and 300 K.

Find expressions for partial molar volumes for 1 and 2 ($\overline{V}_1$ and $\overline{V}_2$). **6**

6. a) State Margule's and van Laar's two parameter equations for binary solution. **4**

   b) Liquids A and B form an azeotrope containing 46.1% A at 101.3 kPa and 345 K. Vapor pressures of A and B at 345 K are 85 kPa and 80 kPa respectively. Using one of the equations in (a), calculate the relevant parameters in that equation using the azeotropic data. **12**

7. a) State Gibbs Duhem equation. What is its utility ? **4**

   b) Discuss effect of temperature and pressure on chemical reaction equilibrium constant. **4**

   c) State phase rule. What is its significance ? **4**

   d) Distinguish between dew point and bubble point temperatures. **4**

8. a) Calculate equilibrium constant at 298°K for the reaction given as,

   $C_2H_{4(g)} + H_2O_{(g)} \rightarrow C_2H_5OH_{(g)}$.

   Data :

	$S^0_{298}, \text{J}/\text{mol}\,^\circ\text{K}$	$H^0_{298}, \text{J}/\text{mol}$
$C_2H_{4(g)}$	220.85	48.986
$H_2O_{(g)}$	189.12	–241.997
$C_2H_5OH_{(g)}$	278.00	–238.941

8

   b) Based on your calculation in (a), comment on the feasibility of spontaneous decomposition of ethanol obtained from molasses at 298°K into ethylene and water vapor. **4**

   c) Using the equilibrium constant calculated in (a), determine the equilibrium conversion of ethylene at 298°K if the initial mol ratio of ethylene to water vapor is 1:4. (Assume no ethanol present when the reaction is started). **6**

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T.E. (Petrochemical Engineering) (Semester – I) (2003 Course) Examination, 2009
PROCESS AND ANALYSIS INSTRUMENTATION

Time : 3 Hours Max. Marks : 100

Instructions : *1) Attempt Q.* ***1*** *or* ***2****, Q.* ***3*** *or* ***4****, Q.* ***5*** *or* ***6****, Q.* ***7*** *or* ***8****, Q.* ***9*** *or* ***10****, Q.* ***11*** *or* ***12****.*
2) Figures indicated to the ***right*** *are the marks.*
3) ***Use*** *of electronic calculator is* ***allowed****.*
4) Draw neat figures ***wherever*** *necessary.*

SECTION – I

1. a) Write a note on the calibration of instruments and explain hierarchy of standards. **8**

b) Define : Accuracy, Precision, Repeatability, Reproducibility, Hysterisis, Drift, Fidelity, Dead zone. **8**

OR

2. a) Differentiate between : **6**

i) Repeatability and Reproducibility.

ii) Precision and Accuracy.

b) Write a note on classification of instruments. **10**

3. a) Write a note on the use of thermocouple tables. **6**

b) Give the sources of errors in the head flow meters. **6**

c) Write a note on mechanical hygrometers. **6**

OR

4. a) Explain the principle, construction and working of the reciprocating piston type flow meter. **8**

   b) List down the hydrostatic methods of level measurement and explain the air purge method in detail. **6**

   c) Describe briefly the various radiation receiving elements used in a pyrometer. **4**

5. a) Write a note on Programmable Logic Control and ladder diagram. **8**

   b) Explain the feed back and the feed forward control system. **8**

OR

6. a) Explain the inherent and the installed characteristics of a control valve. **8**

   b) Write a note on the various process time lags with suitable examples. **8**

SECTION – II

7. a) Describe the various principles on which classification of instruments is done. **9**

   b) Explain in detail the method of measuring pH. **9**

OR

8. a) Write a note on the trends in analytical instrumentation. **6**

   b) Explain the polarizing cell method for determination of oxygen content. **6**

   c) Give the applications of analysis instrumentation. **6**

9. a) What is gas chromatography ? Describe with the help of neat schematic diaphragm the working of gas chromatography. **8**

   b) Write a note on Orsat analysis. **8**

OR

10. a) Discuss the various types of detectors used in HPLC. **8**

b) Explain how separation of mixture takes place in column chromatography. **8**

11. a) Describe in brief the different sections of a mass spectrometer and give the function of each. **8**

b) Write a note on double beam UV spectrometer. **8**

OR

12. a) Write a note on polarimeter. **8**

b) Explain in detail the non-dispersive IR analyzer. **8**

B/II/09/150

T.E. (Petrochemical Engg.) (Sem. – II) Examination, 2009
MASS TRANSFER OPERATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. Answer from the following (**any three**) : **18**

a) What is the operating line equation for the rectifying and stripping section ? How it is derived ? Does it have anything to do with equilibrium ?

b) Derive Raleigh's equation for simple distillation.

c) What is the equation for q line ? What are the five possible feed conditions ?

d) Write a brief note on : "Extractive distillation".

e) Describe the process principles involved in PSA and TSA.

f) Classify the equipments for liquid-liquid extraction operations.

OR

2. a) Solutions of methanol and ethanol are substantially ideal. Compute the vapour liquid equilibrium data for this system at 1 atm. pressure and plot x-y and t-x-y diagrams. Compute also relative volatilities determine an average value. The vapour pressure-temperature relationships are :

$$\log P M_c OH\ (\text{mmHg}) = 7.84863 - \frac{1473.11}{230 + t°C}$$

$$\log PE + OH\ (\text{mmHg}) = 8.04494 - \frac{1554.3}{222.65 + t°C}.$$ **8**

b) A continuous fractionating column has to be designed for separating a liquid mixture of 4050 kg/hr containing equimolar amounts of methanol and water into an overhead product of 95% methanol and residue containing 3% methanol. The feed is 30% vaporized.

Calculate :

i) Molar flow rate of overhead and bottom products

ii) The number of actual plates assuming tray efficiency of 0.7.

iii) Use a reflux ratio of 1.75 times the minimum reflux, locate the feed tray

Equilibrium data :

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
y	0.41	0.57	0.66	0.72	0.78	0.82	0.87	0.91	0.95

. **10**

3. 1000 kg/hr of a mixture containing 42 mole percent heptane and 58 mole percent ethyl benzene is to be fractionated to a distillate containing 97 mole percent heptane and a residue containing 99 mole percent ethyl benzene using a total condenser and feed at its saturated liquid condition. The enthalpy concentration data for the heptane-ethyl benzene at 1 atm pressure are as follows :

x heptane	0	0.08	0.18	0.25	0.49	0.65	0.79	0.91	1.0
y heptane	0	0.28	0.43	0.51	0.73	0.83	0.90	0.96	1.0
Hl (kJ/kmol) x 10^{-3}	24.3	24.1	23.2	22.8	22.05	21.75	21.7	21.6	21.4
Hv (kJ/kmol) x 10^{-3}	61.2	59.6	58.5	58.1	56.5	55.2	54.4	53.8	53.3

Calculate the following :

a) Minimum reflux ratio

b) Minimum number of stages at total reflux

c) Number of stages at reflux ratio of 2.5

d) Condenser duty

e) Reboiler duty. **16**

OR

4. Write short notes on : **16**

a) Steam and vacuum distillation.

b) Optimum reflux ratio.

c) Flooding and loading characteristics in packed towers.

5. a) Vapor pressures of chlorobenzene and water are given below :

Pressure, mm Hg	100	50	30	26
Temperature oC, Chlorobenzene	70.4	53.7	42.7	34.5
Temperature oC, Water	51.7	38.5	29.9	22.5

If steam is blown into the still containing a mixture of these two components and the total pressure is 130 mm Hg, estimate the temperature of boiling and the composition of the distillate. The two components are immiscible in the liquid. **6**

b) Carbon disulphide is to be absorbed from a dilute gas mixture of $CS_2 - N_2$ into pure non-volatile oil at atm. pressure in a counter-current absorber. The mole fraction of CS_2 in inlet gas stream is 0.05 and the flow rate of gas stream, G is 1500 k mole/hr. the equilibrium relation is given by $y = 0.5\,x$

Where x = mole fraction of CS_2 in liquid stream. It is desired to reduce the mole fraction of CS_2 in the exit gas stream to 0.005.

i) Calculate the minimum value of $\frac{L}{G}$ where L is the liquid flow rate in k mole/hr.

ii) Derive the equation for the operating line if $\frac{L}{G}$ is equal to 1.5 times the minimum value. **10**

OR

6. a) A mixture of acetone vapour and air containing 5% by volume of acetone is to be freed of its acetone content by scrubbing it with water in a packed bed absorber. The flow rate of the gas mixture is 700 m^3/hr of acetone-free air measured at NTP and that of water is 1500 kg/hr. The absorber operates at an average temperature of 20°C and a pressure of 101 kPa. The scrubber absorbs 98% acetone. The equilibrium relation for the acetone vapour-water system is given by : $Y^* = 1.68\,x$

Where, Y = k mole acetone/k mole dry air

X = k mole acetone/k mole water

Calculate : (a) Mean driving force for absorption, (b) Mass transfer area if the overall mass transfer coefficient is given by :

^kG = 0.4 k mole of acetone/m^2. hr (k mole acetone/per k mole dry air. **10**

b) Write down Kremser-Brown-Souders Equations for absorption and stripping operations. **6**

SECTION – II

7. In a continuous countercurrent cascade 200 kg/hr of a liquid mixture of 40:60 acetone-water solution is to be treated by extraction with pure 1, 1, 2-trichloroethane (TCE) at 25°C.

Weight% in water layer	Weight% in trichloroethane layer				
TCE	Water	Acetone	TCE	Water	Acetone
0.52	93.52	5.96	90.93	0.32	8.75
0.73	82.23	17.04	73.76	1.10	25.14
1.02	72.06	26.92	59.21	2.27	38.52
1.17	67.95	30.88	53.92	3.11	42.97
1.60	62.67	35.73	47.53	4.26	48.21
2.10	57.00	40.90	40.00	6.05	53.95
3.75	50.20	46.05	33.70	8.90	57.40
6.52	41.70	51.78	26.26	13.40	60.34

1) Plot the triangular diagram showing the tie lines. IF only one settler-mixture is used with 50 kg of solvent (TCE).
2) What is the % recovery ((kg acetone in L_1/kg acetone in L_0) × 100 ?)
3) If a raffinate composition of 10% acetone can be obtained in one stage, what solvent rate enables this ?
4) If the final extract has a composition of 45% acetone and its amount is 100 kg/hr.
5) What is the number of stages ?
6) Waht is the amount of solvent feed ?
7) What is the final raffinate composition ? **18**

OR

8. a) 100 g of Nicotine-Water solution containing 1% nicotine is to be extracted with 250 kg of kerosene at 273 K. Water and kerosene are essentially immiscible in each other. Determine the percentage of extraction of nicotine after one stage operation.

At the dilute end of the system, the equilibrium relationship is given by :

$Y^* = 0.795\ X$

Where, $Y = \dfrac{\text{kg of nicotine}}{\text{kg of kerosene}}$

$X = \dfrac{\text{kg of nicotine}}{\text{kg of water}}$. **10**

b) Discuss the triangular diagram for liquid-liquid extraction by taking suitable example. **8**

9. a) The adsorption of ethane as Linde molecular sieve 5A, was studied by Glessner and Myers (1969) at 35°C. Using the data given below,

a) Determine if the Langmuir equation can be used to model the data.

b) Calculate the total surface solid, if Density of Ethane = 0.3549 gm/cc.

Data :

P,[mm Hg)	Uptake, V [cm^3 (STP/gm)
0.17	0.059
0.95	0.318
5.57	1.638
12.09	3.613
111.32	24.236
220.87	34.278
300.05	38.340
401.25	41.779
500.18	44.037
602.74	45.693

10

b) Give the classifications of crystallizer. Explain the working principles and construction of any one types of crystallizer with neat sketch. **6**

OR

10. a) State the applications of leaching operation in industry. **8**

b) State Mier's theory of Supersaturation for Crystallization. **8**

11. Activated carbon is used to absorb ethanol vapor from an airstreams. The laboratory experiment to investigate this has a bed 4 cm in diameter and 15 cm high. Exit data for an input of 0.754 liter/second are as follows :

Time (hours)	0	3	3.5	4	4.5	5	5.5	6.0	6.2	6.5	6.8
C/C_o	0	0	0.002	0.030	0.155	0.396	0.658	0.903	0.946	0.978	0.993

Do as follows :

i) Determine breakthrough time if break point is $C/C_0 = 0.05$

ii) Calculate the height of a new column of the same diameter that has breakthrough at 8.5 hours.

iii) Calculate the diameter of this new column if it is to process 3 liter/min. **16**

OR

12. Write short notes on (**any three**) : **16**

a) Classification of membrane separation processes.

b) UF, MF and NF-principles and applications.

c) Tray Efficiency.

d) Membrane Modules.

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T.E. (Petrochemical) (2003 Course) (Semester – II) Examination, 2009
TRANSPORT PHENOMENA

Time : 3 Hours Marks : 100

Instructions : *1) Attempt **any 3** questions from each Section.*
*2) Figures to the **right** indicate **full** marks.*
*3) Use of electronic calculator is **allowed**.*
*4) Draw neat sketch **wherever** necessary.*

SECTION ONE

1. a) Give the overview of transport phenomena principles with respect to quantity, driving force, characterizing parameter and governing law for Momentum, heat and mass transfer respectively. **9**

b) Differentiate between : Laminar-Turbulent flow, Compressible-Incompressible flow, Viscid-Inviscid flow, Uniform-Nonuniform flow. **9**

2. a) Define Control Volume. What are the forces acting on a Control Volume ? **8**

b) Derive Hagen-Poiseuille’s equation and state its applications. **8**

3. a) Explain with neat diagram the development of turbulent boundary layer. **8**

b) Explain with significance the Prandtl’s Mixing Length theory. **8**

4. a) Explain various mixing problems in process industry. **8**

b) Derive power number for a agitated vessel. **8**

SECTION TWO

5. a) Discuss Heat Transfer in Agitated Vessels. **8**

   b) Derive the expression for cooling a batch with an external heat exchanger and an isothermal cooling medium. **8**

6. a) Write a short note on analogies in transport phenomena. **8**

   b) What is Computation fluid dynamics ? Explain in detail various steps involved in solution of a problem with CFD. **8**

7. a) Discuss the applications of multiphase flow analysis is Petrochemical Process Industry. **8**

   b) Explain with neat diagrams various flow regimes in a vertical gas-liquid flow through pipe. **8**

8. Write a short notes on **any three** of the following : **18**

   1) Designs of Mixing impellers

   2) Laminar and Turbulent velocity profiles for flow through pipes

   3) Navier Stokes equation for momentum transfer

   4) Discretization of Partial differential equation.

T.E. (Petrochemical Engg.) (Sem. – II) Examination, 2009
PROCESS EQUIPMENT DESIGN
(2003 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Discuss about 'Creative Design'. **4**

   b) What procedure is to be followed to design a equipment ? What are general design considerations ? **6**

   c) Discuss the factors on which Magnitude of Factor of safety depends. **4**

   d) How you will reduce stress concentration ? **2**

OR

2. a) Discuss importance of Codes and Standards in process equipment design along with its advantages. **4**

   b) Classify engineering materials and discuss important machanical properties of metals. **8**

   c) Which parameters you will provide to design a Heat Exchanger ? **4**

3. a) The load on a member consists of an axial pull of 30 KN, with shear force of 15 KN, find the diameter of member according to :

   a) Maximum Normal Shear Stress Theory.

   b) Maximum Principal Strain Theory.

   c) Maximum Strain Energy Theory.

   Assume permissible tensile stress of 100 N/mm^2 and poison's ratio 0.3. **8**

b) Discuss in details about various theories of failure. **8**

c) What are factors on which selection of belt drive depends ? **2**

OR

4. a) Design a cast iron protective type flange coupling to transmit 15 kW at 900 rpm from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used : **9**

Shear stress for shaft, bolt and key material = 40 MPa

Crushing stress for bolt and key = 80 MPa

Shear stress for cast iron = 8 MPa

Width of Key = 12 mm and number of bolts = 3.

b) A flat belt is required to transmit 30 KW from a pulley of 1.5 M effective diameter running at 300 rpm. The angle of contact is spread over 11/24 of the circumference. The coefiicient of friction between belt and pulley surface is 0.3. Determine taking centrifugal tension in account, width of the belt required. If it is given that belt thickness is 9.5 mm, density of its material is 1100 kg/m^3 and related permissible working stress is 2.5 MPa. **9**

5. a) What are selection criteria are to be followed for selecting material of construction for pressure vessel. **4**

b) Design a shell of pressure vessel with following details : **12**

Internal Diameter (Approx)	= 1400 mm
Permissible stress at 150°C	= 140 N/mm^2
Internal pressure	= 0.35 N/mm^2
Weight	= 38000 N
Joint efficiency	= 0.85
Torque offset piping	= 500 N-m

Material used is stainless steel.

SECTION – II

6. a) Explain the procedure to calculate shell thickness at different height of tall storage vessel. **6**

b) Design shell and bottom plate of Circular Cylindrical Tank for storage of crude oil with conical roof. **10**

Tank diameter = 20 m (Approx)

Tank height = 12 m (Approx)

Material carbon steel with permissible stress = 142 N/mm^2

Joint efficiency = 85%

Superimposed load = 1250 N/m^2

Density = 7.7

Plate size available are
(6300 mm × 1800 mm, 5000 mm × 2500 mm, 5600 mm × 1100 mm)

7. a) Calculate the shell diameter and Nozzle thickness of shell and tube heat exchanger :

Data :

Permissible stress = 95 N/mm^2

No. of passes = 2

No. of Tubes = 54 (with 2 pass U-Bundle)

Spacing between tubes = 2.5 cm (Square pitch)

B = 0.7

Joint Efficiency = 85%

Pressure = 0.5 N/mm^2

Nozzle inlet and outlet diameter = 75 mm. **14**

b) Write a note on Pressure relief valve and rupture disc. **2**

OR

8. a) Discuss various types of agitator in details with help of neat sketch along with their specific application. **6**

b) Discuss various types of floating roofs in Storage Tanks. **6**

c) Discuss various types of losses for volatile liquids in storage tank. **4**

9. a) Design a shell of circular cylindrical tank for storage of crude oil of 34° API. **9**

Tank diameter - 16 m (Approx)

Tank Height - 12 m

Material mild steel with permissible stress = 90 N/mm^2

Joint Efficiency = 85%

Plate size available are
(6300 mm × 1800 mm, 5000 mm × 2500 mm, 5600 mm × 1100 mm)

b) Estimate period of vibration for a tall vertical vessel 3 m in diameter and 50 m in height. The thickness of vessel is 20 mm column has no attachments. Weight of vessel per unit is 1400 kg/m. **9**

OR

10. Write short notes on (**any four**) : **18**

a) Different Drives for agitators

b) Critical speed of shaft

c) Power number and function of

d) Welded joints with neat sketch

e) Baffles and its need for mixing

f) ASME and TEMA CODES.

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T.E. (IT) (Semester – I) Examination, 2009
OPERATING SYSTEMS
(2003 Course)

Time : 3 Hours — Max. Marks : 100

***Instructions** : 1) Answer **any three** questions from **each** Section.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) State and explain different services provided by an operating system. **6**

   b) State in brief key features of each of the following types of operating system: **10**

      i) Real Time

      ii) Distributed

      iii) Parallel

      iv) Time sharing.

OR

2. a) Draw and explain the architecture of Windows 2000. **8**

   b) Differentiate system calls and library functions. **4**

   c) Discuss the advantages of multiprocessor system. What are different types of multiprocessor system ? **4**

P.T.O.

3. a) Explain the concept of context switching with the help of neat diagram. **6**

b) Two processes P_1 and P_2 need to access a critical section of code. Consider the following synchronization construct used by processes. **6**

```
/*    P1       */                      /*     P2       */
while (true) {                         while (true) {
wants 1 = true ;                       wants 2 = true ;
while (wants 2 = = true) ;             while (wants 1 = = true) ;
   /* critical section */                 /* critical section*/
   wants 1 = false;                       wants 2 = false
}                                      }
/* remainder section */                /*remainder section */
```

Here wants 1 and wants 2 are shared variables, which are initialized to false. Which one of the following statement is true about the above construct ? Justify.

a) Does the solution prevent Deadlock ?

b) Does this solution prevent mutual exclusion ?

Draw and explain the process state transition diagram. **4**

OR

4. a) Implement the producer-consumer problem using monitor and discuss how the critical section requirements are fulfilled. **8**

b) Describe bankers algorithm with pseudo-code. **8**

5. a) Consider the following processes : **8**

Process	**Arrival Time**	**Burst Time**
P_1	0.0 ms	6 ms
P_2	0.5 ms	4 ms
P_3	1.0 ms	2 ms
P_4	1.2 ms	1 ms

Find the average turnaround time and average waiting time with respect to FCFS, SJF and Round Robin (quantum = 1 ms). Also draw Gantt chart for each algorithm.

b) Discuss the design issues for multiprocessor scheduling. **6**

c) Compare and explain preemptive and non-preemptive CPU scheduling algorithms. **4**

OR

6. a) What are the characteristics of real-time scheduling ? Explain. **6**

b) State and explain the scheduling criteria for uniprocessor scheduling. **6**

c) Write an algorithm for scheduling the jobs using Short-Remaining Time Next (SRTN) Method. **6**

SECTION – II

7. a) What is page fault rate ? Explain with an example. **6**

b) Compare and explain paging and segmentation. **6**

c) Differentiate the contiguous and non contiguous memory allocation. **4**

OR

8. a) Write short note on virtual memory management. **6**

b) Explain in detail variable partitioning memory management. **6**

c) Describe the following terms in brief : **4**

i) Principle of locality

ii) Thrashing.

9. a) On a disk with 1000 cylinders numbers 0 to 999, compute the number of tracks the disk arm must move to satisfy all the request in the disk queue. Assume the last request serviced was at track 756 and the head is moving toward 0. The queue in FIFO order contains requests for the following tracks : **10**

811, 348, 153, 968, 407, 500.

What is the total distance that disk arm moves to satisfy all the pending request for following disk scheduling algorithms ? (With the help of diagram).

i) FIFO

ii) SSTF

iii) C-SCAN

iv) C-LOOK

b) Explain two-level, tree structured and acyclic graph directions. **6**

OR

10. a) Describe the following : **10**
    i) I/O Buffering
    ii) File sharing
    iii) Record Blocking

    b) Write short note on secondary storage management. **6**

11. a) Explain the use of following built-in variables in awk programming : **8**
    NR, FS, OFS, NF, FILENAME, ARGC, ARGV

    b) How will differentiate between program threats and system threats ? **6**

    c) Describe the following terms : **4**
    i) Trojan Horse
    ii) Virus.

OR

12. a) State and explain different methods used for implementing access matrix. **10**

    b) What do you understand by Unix shell ? What are different shells in Unix ? Explain. **8**

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T.E. (Information Technology) (2003 Course) (Semester – I)
Examination, 2009
MULTIMEDIA SYSTEMS

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**. (Q. **1** or Q. **2**, Q.**3** or Q.**4**, Q.**5** or Q.**6**, Q.**7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12**)*
*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.*

SECTION – I

1. a) Explain the need of multimedia. Explain with suitable examples the various building blocks of Multimedia. **10**

b) Explain the Bresenham's Line drawing algorithm. Write the sequence of pixels which will be turned on for a line segment with end points L1 (0, 0) and L2 (5, 10). **8**

OR

2. a) Derive the expression for decision parameter used in the Bresenham's circle drawing algorithm. **6**

b) Write the pseudo-C code for DDA Line drawing algorithm. **4**

c) Explain in brief, various methods for finding out whether a given pixel is inside a polygon or not. **8**

3. a) Define Shading. Justify statement 'Phong shading is superior to Gourand shading'. **8**

b) Assuming the homogeneous coordinate system for a point P, derive the transformation matrix for rotating the point P about origin (0, 0) by an angle θ in two dimensions. Also derive the matrix for rotating the point P by an angle θ about any arbitrary point (x_r, y_r). **8**

OR

4. a) State the transformation matrix for translating a point in three dimension. Also derive the matrices for rotating the point in three dimension about all the three coordinate axes. **8**

   b) Considering the top left corner of the screen to be the origin, clip the line with endpoints A(150, 350) and B (350, 200) against a rectangular clipping window with co-ordinates P(200, 100), Q (400, 100), R(400, 300) and S(200, 300) and find the clipped line end points through the steps of Cohen-sutherland Line Clipping algorithm. **8**

5. a) What is aliasing ? How does it occur in Computer Graphics ? Explain any one anti aliasing method in detail. **8**

   b) A Square located in the first quadrant has following co-ordinates W (0, 0), X(0, 20), Y (20, 20) and Z (20, 0). Perform the following 2D transformations on this square by using the respective transformation matrices and write down the new co-ordinates.

   1) Scaling by 3 units in x direction and 2 units in y direction

   2) Shearing by 2 units in x direction. **8**

OR

6. Write short notes on :

   1) Steps in Liang Barsky Line Clipping Algorithm. **6**

   2) Scan line seed fill Algorithm. **6**

   3) DVD. **4**

SECTION – II

7. a) Explain Wave file format for audio. **8**

b) What is animation ? Explain any three principles of animation by giving suitable examples. **8**

OR

8. a) With the help of the block diagram, explain the steps of JPEG compression technique. **8**

b) What is audio compression ? Explain DPCM in detail. **8**

9. a) What is MIDI ? Explain MIDI file format. **8**

b) Explain the important frames with reference to MPEG Compression. **8**

OR

10. a) Explain RGB and CMY color models in brief. **8**

b) Explain MP3 encoder in detail. **8**

11. a) What is compression ? What is its need ? With the help of a suitable example explain LZW compression. **10**

b) Explain HSV color model in detail. **8**

OR

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

a) Huffman Coding.

b) NTSC video standard.

c) Segmentation in Animation.

d) GIF File format.

e) Run-Length Encoding.

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T.E. (IT) (2003 Course) (Semester – I) Examination, 2009
DATA COMMUNICATION AND NETWORKING

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Assume suitable data, if **necessary**.*

SECTION – I

1. A) Explain the following modulation techniques.
   1) ASK 2) FSK 3) PSK 4) QAM. **8**

   B) Calculate maximum bit rate of channel having bandwidth of 1.5 KHzs if
   1) S/N ratio is 0 dB
   2) S/N ratio is 20 dB. **6**

   C) Explain the difference between data and information. **4**

OR

2. A) What is hamming code ? Discuss the hamming code technique if data to be sent is 1001101. **8**

   B) State and explain Shannon's channel capacity theorem. **6**

   C) What is forward error correction ? Give an example of 1 bit error correcting code. **4**

3. A) Describe T1 frame structure. Also discuss the capacities of E1, E2, E3 and E4 lines. **8**

   B) Explain SONET technology with respect to
   1) SONET frames
   2) SONET devices
   3) Synchronous transport signal. **8**

OR

4. A) Explain DMT used in ADSL. Discuss on VDSL, HDSL. **8**

   B) Write short notes on :
      1) Circuit switching
      2) Packet switching. **8**

5. A) Derive an expression for the ‘angle of acceptance’ and ‘numerical aperture’ in fiber optic communication. **8**

   B) Explain various multiple access methods used in satellite communication. **8**

OR

6. A) Explain the operation of cellular telephony. **8**

   B) Explain the three Kepler’s laws. **8**

SECTION – II

7. A) Explain briefly electrical, mechanical and functional specifications of EIA -232. **8**

   B) Explain the functions of repeater, switch and rooter. **6**

   C) Explain the concept of null-modem. **4**

OR

8. A) Explain OSI reference model in detail. **8**

   B) Explain Star and Mesh topologies in brief along with its merits and demerits. **6**

   C) Explain PCI in brief. **4**

9. A) Explain the need of Random Access technique. Explain in brief ALOHA, slotted ALOHA and CSMA/CD mentioning the efficiency of each. **8**

   B) Explain ARQ. Also explain stop and wait ARQ, Go-back-n ARQ, selective repeat ARQ. **8**

OR

10. A) Explain point-to-point protocol stack in brief. **8**

    B) Discuss CSMA/CA random access technique. How collision avoidance is achieved in this technique ? **8**

11. A) What is VLAN ? State the advantages of VLAN. Explain how to setup VLAN using Layer-2 switches. **8**

B) Discuss the token passing access method used in FDDI with appropriate example. Also define :

1) Target Token Rotation Time (TTRT)

2) Token Rotation Timer (TRT)

3) Token Holding Timer (THT). **8**

OR

12. A) Explain 100 Base Tx fast ethernet specification. **6**

B) Write short notes on :

1) DQDB

2) Gigabit Ethernet. **10**

T.E. (Information Technology) (Semester – I) Examination, 2009
(2003 Course)
THEORY OF COMPUTATION

Time: 3 Hours   Max. Marks: 100

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

SECTION – I

1. a) Design a FA that accepts all words concating triple letter either 'aaa' or 'bbb'. **6**

b) Convert NFA $(\{q_0, q_1, q_2, q_3,\}, \{a, b\}, \delta, q_0, \{q_3\})$ to its equivalent DFA. Clearly show the state table before minimization and after minimization. **12**

OR

2. a) Design a Moore Machine for generating output 1 if input of binary sequence 1 is preceded with exactly two zeroes. **6**

b) Design a FSM to check for Divisibility of a Decimal Number by 2. **6**

c) Design a finite automaton that reads strings made of letter in the word "UNIVERSITY" and recognize these strings that contain the word UNITY as substring. **6**

3. a) Represent the following using regular expressions.

i) Σ = {a, b, c} the language such that "any number of a's followed by any number of c's".

ii) If L(r) = {0, 2, 01, 21, 011, 211, 0111, ...} then what is r ?

iii) If L(r) = {00, 010, 0110, 01110, ...} then what is r ?

iv) Language defined over Σ = {a, b,} has to have the strings beginning with 'a' and not to have two consecutive a's that is the regular expression for the same. **4**

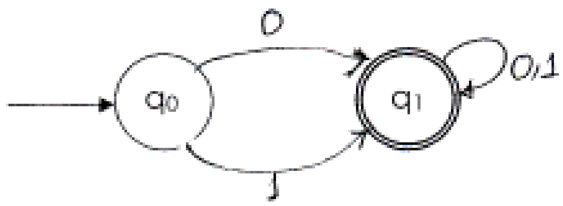
b) Show that (0*1*)* = (0+1)*. **4**

c) Construct a NFA to accept the language represented by a*b*c*. Construct this NFA to its equivalent DFA. **8**

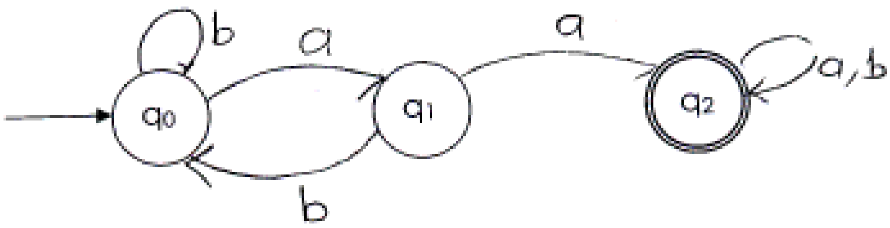
OR

4. a) Find the regular expression for the following DFA.

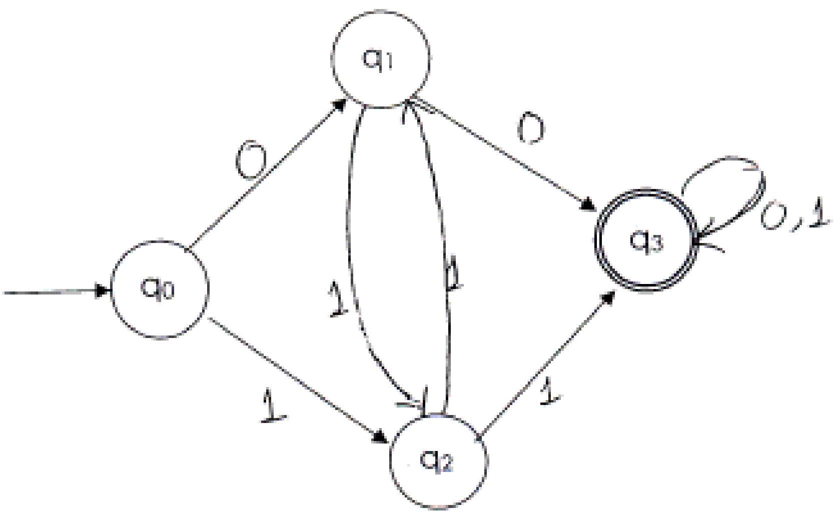
i) **1**



ii) **1**



iii) **2**



b) Construct a NFA with ϵ moves for the regular expression (b(aa)*.b+ab*a)*) convert this NFA to its equivalent DFA. **12**

5. a) Define the term “Phrase structured grammar”. **2**

b) Write a CFG which defines the language containing strings of the form 0^n1^n for $n \geq 1$. **4**

c) Find the CFL associated with the CFG. **4**

$S \rightarrow 0Q/1/P$

$P \rightarrow 0/0S/1PP$

$Q \rightarrow 1/1S/0QQ$

d) Eliminate the $\in$ productions from the grammar G consisting of

$S \rightarrow PQP$

$P \rightarrow OP/\in$

$Q \rightarrow 1Q/\in$ **6**

OR

6. a) Write a CFG which generates the language L defined by the regular expression $(a + b)^* \, bbb(a + b)^*$ **4**

b) Convert the grammar given below to its equivalent CNF :

$S \rightarrow PQP$

$P \rightarrow OP/\in$

$Q \rightarrow 1Q/\in$ **6**

c) Eliminate the $\in$ productions from the grammar G consisting of

$S \rightarrow ABA$

$P \rightarrow a\,A/\in$

$Q \rightarrow bB/\in$ **6**

SECTION – II

7. a) Design a PDF to recognize the language generated by the following grammar :

$S \rightarrow S+S/S*S/4/2$ ·

Show the acceptance of the input string 2 + 2*4 by this PDA. **10**

b) Construct PDA accepting language consisting of even palindrome strings of a's and b's. **8**

OR

8. a) Draw a PDA accepting language L = {WCW^T/W€{a, b}*} **10**

b) Design a POST machine to check well formed ness of parenthesis. **8**

9. a) Design TM to find 2's complement of a given binary number. **8**

b) Explain halting problem with an example. **8**

OR

10. a) Design TM which compares two unary numbers a and b if a < b writes 'X' at the end if a = b writes' at the end and 'Z' otherwise. **8**

b) Design TM which will recognize stings containing equal no of 0's and 1's. **8**

11. a) Write a note on "Universal Turing Machine". **8**

b) Explain Chomsky Hierarchy and describe the machine that you have learnt in this course that accept each type of grammar of Chomsky Hierarchy. **8**

OR

12. a) Write a note on applications of CFG. **8**

b) Compare FSM, PDM, PM and TM. **8**

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T.E. (Information Technology) (Semester – II) Examination, 2009
(2003 Course)
COMPUTER NETWORK TECHNOLOGY

Time : 3 Hours | Max. Marks : 100

Instructions**: 1) Answer **3** questions from Section **I** and **3** questions from Section **II.
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Assume suitable data, if **necessary.***

SECTION – I

1. A) What is fragmentation ? Explain how it is supported in IPv4 and IPv6. **8**
   B) Differentiate between distance vector routing and link state routing. **8**

OR

2. A) What is NAT ? Where and why it is used ? Explain its operation with suitable example. **8**
   B) Consider any class - C network with default subnet mask. How many actual hosts can be connected in that network ? Divide that network into 4 equal subnets. What is the new subnet mask ? How many hosts can be connected in each subnet ? **8**

3. A) How packet switching makes more bandwidth utilization over circuit switching ? Illustrate with example. **8**
   B) Compare and contrast between RPC and UDP. **8**

OR

4. A) Explain what is Silly Window Syndrom Problem ? Explain atleast 2 methods to overcome it. **8**
   B) List and discuss performance issues of the transport layer. **8**

5. A) What is CGI ? Where and how it is used ? **8**
   B) Compare between FTP and TFTP. **4**
   C) Explain how DNS works. **6**

OR

6. A) What is a cookie ? Where and how it is used ? **6**
   B) Differentiate between POP3 and IMAP. **6**
   C) Write a note on MIME. **6**

SECTION – II

7. A) Differentiate between SIP and H.323 protocol. **8**

   B) Explain any two policy methods used in multimedia communication. **8**

OR

8. A) What is the need of RTCP bandwidth scaling ? **8**

   B) What is RSVP ? Why it is required ? **8**

9. A) Explain and compare DHCP and BOOTP. **8**

   B) What is MIB ? Explain its structure. **8**

OR

10. A) Discuss the role of SMI in SNMP. Give the data types supported by SMI. **8**

    B) How SNMP messages are used to monitor and control the network elements ? **8**

11. A) Describe the architecture of broadband ISDN. **8**

    B) Write short notes on a) SMDS b) Frame relay. **10**

OR

12. A) Explain the WLAN architecture. **8**

    B) Write short notes on a) Bluetooth protocol stack b) ATM. **10**

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T.E. (Information Technology) (Sem. – II) Examination, 2009
MANAGEMENT INFORMATION SYSTEMS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answers to the* ***two*** *Sections should be written in* ***separate*** *sheet.*
2) ***Use*** *of logarithmic tables, slide rules and electronic pocket calculator is* ***allowed.***
3) ***Neat*** *diagram must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) Assume suitable data, ***if necessary****.*

SECTION – A

1. a) Explain the functions of the manager in an organisation. **6**

b) State the factors to be considered for designing an effective Management Information System in an organisation. **6**

c) Managers at the highest, or strategic, levels of an organisation have particular requirements from an information system. **6**

i) Give one example of an information system that would be useful to managers at this level, and explain how they would use it.

ii) State the two other levels of task and/or personnel within an organisation.

OR

2. a) Define and classify information system. **6**

b) The structure of an organisation can influence the flow of information through it. Explain two effects that the structure of an organisation could have on the flow of information. **6**

c) Explain the planning function of the manager. Also write the steps in planning. **6**

3. a) What is production system ? Explain the information systems supporting to detail working of the operation, allocation and planning of production management. **8**

   b) Explain role and application of MIS in Banking sector. **8**

OR

4. a) Enumerate various Information Systems which are required for sales and sales analysis. **8**

   b) Explain material management. What information systems are required for material management ? **8**

5. a) What is Information Technology Architecture ? Explain with suitable example. **8**

   b) Inbound call centers specialize in offering effective and accurate answering services that considerably saves the time and money of callers. Justify with suitable example. **8**

OR

6. a) What is ERP ? Explain basic features of ERP. **8**

   b) What are the benefits of outsourcing Credit Card Processing offers to Companies/ Individuals ? **8**

SECTION – B

7. a) What is electronic commerce ? Explain various models used in e-commerce ? Also explain various resources required for setting e-commerce firm. **10**

   b) What is customer relationship management ? Explain various phases involved in CRM. **8**

OR

8. a) Write the challenges and trends in Customer Relationship Management. **10**

   b) Write short note on :

      i) Electronic payment process

      ii) Implementing IT. **8**

9. a) What is data warehouse and how it is useful in managerial decision making ? **8**

   b) Explain Herbert A. Simon model for decision making called as Simon's model of decisions making. Also explain main features and types of DSS. **8**

OR

10. a) What is Intelligent agent ? Explain how Artificial Intelligent techniques help in business decisions making process ? **8**

    b) Describe benefits of Executive information systems. Also write how different it is from MIS ? **8**

11. a) There are a number of social, moral and ethical issues associated with the introduction, and use, of IT systems. Explain. **8**

    b) What are hacking ? How encryption is used as a tool for security management. **8**

OR

12. a) Explain the following terms which rose due to use of information technology in the workplace. **8**

       a) Repetitive Stress injuries (RSI).

       b) Musculoskeletal pain.

    b) Describe several instances where the Internet is raising ethical issues. Clearly state the ethical issue or responsibility of business professionals. **8**

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T.E. (Information Technology) (Semester – II) Examination, 2009
(2003 Course)
HUMAN COMPUTER INTERFACE

Time: 3 Hours Max. Marks: 100

Instructions : *1) 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**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain following terms related to the human short-term memory. **8**
   i) Digit span ii) Chunking
   iii) Recency effect iv) Closure.

   b) Explain different Human factors that should be considered while designing the user interface. **8**

OR

2. a) Explain the effect of cultural background and international diversity on the interface design. **8**

   b) Enumerate different user categories and explain how to design an interface to attract user's attention. **8**

3. a) Explain key stroke-level model (KLM) with the help of suitable example. **8**

   b) You need to develop an interface for 'Banking Application'. Find out task hierarchies of objects and actions and interface hierarchies. **8**

OR

4. a) Explain the linguistic model and Task Action Grammer in brief. **8**

   b) How can we use 8 golden rules of interface design to design a good interface ? **8**

P.T.O.

5. a) Explain three pillars of interface design process. **8**

   b) Compare ethnography and participatory design. What are the drawbacks of partcipatory design ? **10**

OR

6. Write short notes on **any three** : **18**

   i) LUCID
   ii) User Centred Design
   iii) Participatory Design
   iv) WIMP interface.

SECTION – II

7. a) List and explain the steps of usability testing. What are some of the limitations of such testing ? **8**

   b) Frequent menu users may become annoyed if they must make several menu selections to complete a simple task. How can an interface designer solve this issue ? **8**

OR

8. a) What are important issues while designing a multiple window interface ? **8**

   b) Why is item presentation sequence important in designing menus ? **8**

9. a) Explain applications of asynchronous interactions and synchronous distributed interactions in cooperative work. **8**

   b) Enumerate at least five error message encountered by you. Suggest important guidelines for presenting these error message in an effective style. **8**

OR

10. a) Some of the favourite techniques of web pages these days include automatic scrolling text boxes, moving marquees and constantly running animations. Discuss these features in terms of web design guidelines. **8**

    b) Compare and contrast online help with offline help. **8**

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

    i) Multimedia Document Searches
    ii) Information visualization
    iii) Shared Editors
    iv) Hypertext Document Design.

OR

12. a) Give four benefits and three problems of touch screens and voice recognition input. **8**

    b) Explain various diagrammatic notations for Human Computer Dialoque. **10**

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T.E. (IT) (Semester – II) Examination, 2009
SOFTWARE ENGINEERING
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer to the* ***two*** *sections should be written in* ***separate*** *books.*
2) Black figures to the ***right*** *indicate* ***full*** *marks.*
3) From Section ***I,*** *answer (Q.* ***1*** *or Q.* ***2****) and (Q.* ***3*** *or Q.* ***4****) and (Q.* ***5*** *or Q.* ***6****).*
4) From Section ***II,*** *answer (Q.* ***7*** *or Q.* ***8****) and (Q.* ***9*** *or Q.* ***10****) and (Q.* ***11*** *or Q.* ***12****).*
5) Neat diagrams must be drawn ***wherever*** *necessary.*

SECTION – I

1. A) Explain Unified Process Model with the help of diagram. **8**
B) Explain CMMI Model. State any three process areas of 'Defined' level. **8**

OR

2. A) Explain Spiral Process Model with the help of diagram. **8**
B) Explain with the help of diagram failure curve for software. **8**

3. A) List and explain the software engineering planning principles. **10**
B) State and explain system elements of a computer based system. **8**

OR

4. A) What are the objectives of software testing ? What is a successful test ? State and explain testing principles. **10**
B) Explain with the help of diagram Product Engineering Hierarchy. **8**

5. A) Draw Data Flow diagram (Level 0, 1, 2) for Multiplex Theatre. **8**
B) State and explain steps for initiating requirement engineering process. **8**

OR

6. A) Draw and explain Class diagram for "Book Shop". **10**
B) Draw and explain the traceability table for requirement management. **6**

P.T.O.

SECTION – II

7. A) Explain design quality guidelines and quality attributes. What is Abstraction ? **8**

   B) What are the different elements of Design model ? Explain Interface design elements in detail. **8**

OR

8. A) What are direct and indirect measures of software processes ? Explain Size-oriented-metrics and Function oriented metrics. **8**

   B) Explain Object oriented Metrics. How Software metrics collection process is carried out ? **8**

9. A) List the four P's of Software Project Management spectrum. Explain how "The People" factor contributes towards the success of the software Project. **8**

   B) Explain W5HH principles. What is the significance of COCOMOII model ? **8**

OR

10. A) What are objectives of Measurements ? Explain in detail Object Oriented Metrics. **8**

    B) Explain metrics for Web Engineering Projects. What is outsourcing ? **8**

11. A) What is the need for Software Configuration Management ? Explain different elements of configuration management system. What is the role of SCM repository ? **9**

    B) What is software reengineering ? Explain in details software reengineering process model. **9**

OR

12. A) Write short notes on :

    i) Configuration Audit

    ii) Status Reporting

    iii) Version Control **9**

    B) Draw and explain Business Process Reengineering Model. **9**

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T.E. (Biotechnology) (Semester – I) Examination, 2009
BIOCHEMISTRY – II
(2003 Course)

Time : 3 Hours Max. 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) 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 rule, electronic pocket calculator is* ***allowed.***

SECTION – I

1. Explain the catalytic mechanism of any enzyme with reference to specific examples. **18**

OR

2. Explain in detail (**6** mark **each**) : **18**
   1) Reversible inhibition of enzyme.
   2) Enzymatic activity of molecule other than protein.
   3) Multienzyme complex.

3. Explain the role of coenzyme A as acyl group carrier. **16**

OR

4. Describe in detail the reaction mechanism of pyruvate dehydrogenase and the role of TPP as catalytic cofactor. **16**

5. Explain the four main types of receptors with one example. **16**

OR

6. Describe the following terms with suitable example.
   1) G-protein coupled receptors.
   2) Nuclear receptors. **16**

P.T.O.

SECTION – II

7. Illustrate the structure function correlation of proteins α – keratin, collagen, and silk fibroin. **18**

OR

8. Answer the following (**9** marks **each**) : **18**
   1) Tertiary structure of protein with one example.
   2) Structure and function of nucleic acids.

9. Depict the different signaling pathways and describe any one in detail. **16**

OR

10. Answer the following (**8** marks **each**): **16**
    1) Role of myosin in muscle contraction.
    2) Role of Cyt p450 reductase in drug metabolism.

11. Write in brief (**8** marks **each**) : **16**
    1) Role of iron, potassium and calcium in the body and its dietary sources.
    2) Metabolism of branched amino acids.

OR

12. Answer the following (**4** marks **each**) : **16**
    1) Tests used for monitoring cardiac dysfunction.
    2) State the role of any two fat soluble vitamins.
    3) Functions and deficiency of vit C.
    4) Functions of sodium.

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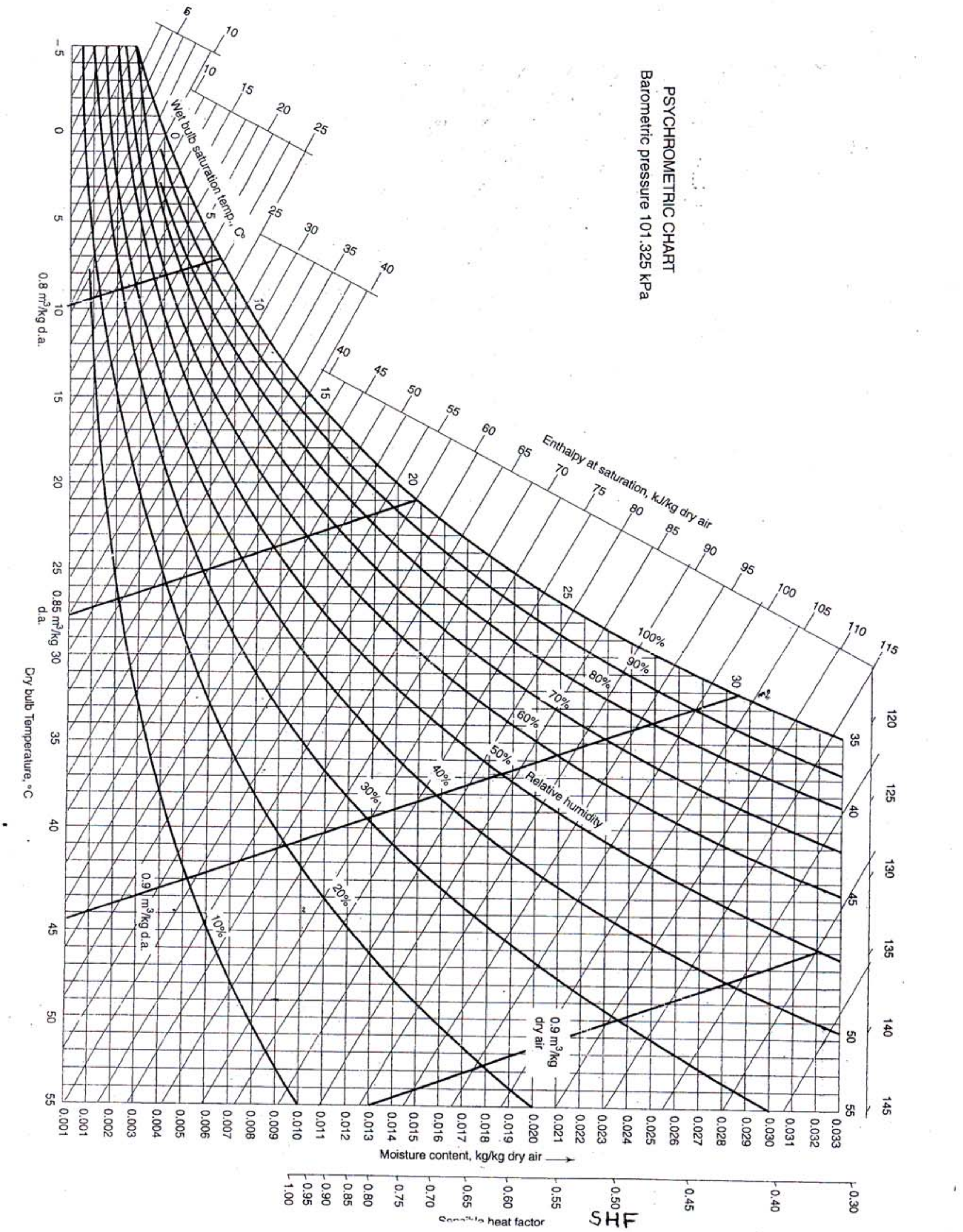

Sensible heat factor

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T.E. (Biotechnology Engineering) (Semester – I) Examination, 2009
BIOSEPARATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

*N.B. : 1) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**, from Section **I**, and Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section **II**.*
*2) Answer to **both** Sections should be written on **separate** answer sheets.*
*3) Draw **neat** diagrams **wherever** necessary.*
*4) Figures to **right** indicate **full** marks.*

SECTION – I

1. Enumerate in detail various non-mechanical methods of cell disruption. **16**

OR

2. a) Use the Van't Hoff relationship to estimate the osmotic pressure drop across the membrane of a cell undergoing rupture in a 0.01 M salt solution assuming the internal salt concentration is 0.2 M and that all salts are fully dissociated. Would you call this a negligible, ordinary or large pressure drop ? Why ? **6**

b) Outline mechanical method of cell disruption. Discuss in detail working of "High pressure Homogenizer". **10**

3. What is ion exchange chromatography ? Explain the process in detail. **16**

OR

4. It is desired to scale up the throughput by a factor of 150 for a linear gradient ion exchange chromatography of a product protein from the laboratory to the plant. The conditions for the laboratory chromatography are the following :

1.0 cm bed diameter (ID)* 20 cm bed height, 20 μ m particle size and 30 cm/h superficial velocity. The particle size of the same type of ion exchange resin available in the plant ; one column 14.0 cm diameter (ID)*50 cm height, and another column 18.0 cm diameter (ID)*50 cm height. To keep the resolution for the chromatography constant in the plant, which column should be used ?

For this column ; what should be the resin be height and superficial velocity and what do you estimate pressure drop to be ? The viscosity of mobile phase is 1.0 cp, and void fraction for resin in the plant column is 0.33. **16**

5. a) What is membrane separation ? Explain in detail the process of “Membrane Preparation”. **10**

b) A protein solution at a concentration of 0.5 g/liter and volume of 1000 liter must be concentrated on a cross flow ultrafilter to a concentration of 10 g/liter. The ultrafilter has an area of 100 m^2 and operates at 5C with an inlet feed pressure of 16.0 bar, outlet feed pressure of 14.0 bar and back pressure on the permeate of 1.4 bar. The protein has a molecular weight of 20,000 Da and will not pass through ultrafiltration membranes. The feed has viscosity of 1.2 cp. The membrane resistance (Rm) of ultrafilter has been determined to be $2*10^{13}$ cm^{-1}. The Reynolds number for flow within ultrafilter is large enough to render concentration polarization negligible. Determine the time required to perform ultrafilteration. **8**

OR

6. Write short note on : **18**

1) Continuous Filtration
2) Centrifugal sedimentation
3) Centrifugal filtration.

SECTION – II

7. Explain in detail chemical, physical and biochemical aspects of separation. **16**

OR

8. What is importance of separation techniques in biotechnology ? Write a note on its scope from Research to industry. **16**

9. a) What is principle of solvent extraction ? Explain in detail various operational modes of extraction. **8**

b) You are preparing an industrial enzyme alcohol dehydrogenase from yeast using two phases Aqueous extraction. The crude clarified extract contains only proteins and has a specific activity of 200 units/g protein. After a single stage of affinity extraction using a cibacron dye-PEGComplex the extract contains 400,000 units of enzyme activity and 20 g of protein. What is the purification factor for this step ? **8**

OR

10. What is drying ? Explain in detail process of drying and freeze drying. **16**

11. Explain in detail with case study the importance of economics aspects in Bioseparation. **18**

OR

12. Write short notes on :

Bioseparation techniques used for purification of following products : **18**

1) Organic Acids

2) Enzymes.

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T.E. (Bio-Technology) (Semester – I) Examination, 2009
INDUSTRIAL MICROBIOLOGY
(2003 Course)

Time : 3 Hours — Max. Marks : 100

SECTION – I

1. Write short notes on : **18**

   A) Improvement of strain through mutagenesis

   B) Black Strap Molasses

   C) Inoculum preparation.

OR

1. An antibiotic producing microorganism is needed for production of Penicillin. Which screening procedures required ? Described in details. **18**

2. Discuss various steps involved in production of beer. **16**

OR

2. How Glycerol fermentation is different from Ethanol fermentation ? Specify differences. **16**

3. Write in brief : **16**

   i) Application of citric acid in food industry

   ii) Process flow for lactic acid production.

OR

3. Discuss in details role of acetic acid in food industry. **16**

P.T.O.

SECTION – II

4. Describe typical process for production of antibiotic. What precautions one should take ? Discuss a case study. **18**

OR

4. Describe Lysine Bio-synthetic pathway. How commercial production of lysine is carried ? What are the application of Lysine ? **18**

5. Write short notes on : **16**

A) Microbial enzymes in detergent industries

B) Role of microbes in metal recovery

OR

5. Define the terms single cell protein. What are their uses ? Discuss their production procedure. **16**

6. Describe in brief : **16**

a) Fermentation economics

b) Analytical procedure for determination of product purity.

OR

6. What criteria are considered while making a product economically viable ? Discuss a case study. **16**

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T.E. (Biotechnology) (Semester – II) Examination, 2009
IMMUNOLOGY
(2003 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

All questions **compulsory**.

1. Differentiate between Innate and Adaptive immunity. What are the characteristic features of adaptive immunity ? **18**

OR

1. Imagine that you got a splinter in your thumb and the area is inflamed. **18**

Answer the following questions :

i) List the symptoms that indicate the area is inflamed.

ii) What are the immunological changes at the site ?

iii) Which cells are involved in pus formation ?

2. Describe various types of antigen-antibody reaction. Discuss the advantages and applications of various methods. **16**

OR

2. Describe the structural and functional features of immunoglobulins. **16**

3. Write notes on **any 2** (**8** marks **each**) : **16**

a) GVH, b) T cell maturation, c) Graft rejection, d) MHC.

SECTION – II

All questions **compulsory**.

4. Answer the following (**any two**, **8** marks **each**) : **16**

a) Describe the process by which a CTL kills its target.

b) Briefly describe different classes of hypersensitivity reactions.

c) Describe the recognition of target cells by Natural Killer T cells.

d) Describe the activation of complement by the classical pathway, including the role of antibody in this process.

5. What is active and passive immunity ? Discuss advantages of different types of vaccines. **16**

OR

5. What are DNA vaccines ? How are they different from recombinant vaccines ? What are adjuvants ? **16**

6. Write notes on **any three** (**6** marks **each**) : **18**

   i) Cytokines and chemokines

   ii) Monoclonal antibodies

   iii) Immune system in TB

   iv) Autoimmunity

   v) Cancer antigens.

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T.E. (Bio-Technology) (Sem. – II) Examination, 2009
INSTRUMENTATION AND PROCESS CONTROL
(2003 Course)

Time : 3 Hours Total Marks : 100

Instructions : *1) Figures to the **right** indicate **full** marks.*
*2) Use of programmable calculator is **not allowed**.*
*3) Draw a neat sketch **wherever** necessary.*
*4) Make necessary assumptions **wherever** required.*
*5) Answer **any three** questions from Section – **I** and **any three** questions from Section – **II**.*

SECTION – I

1. a) Explain the construction, working of liquid filled thermometers. **4**

   b) Explain the need for measurement in the process industries. Define static and dynamic errors and state their root causes. **6**

   c) Describe the principal, working of the Optical Pyrometer and explain its advantages over the other temperature sensors. **6**

OR

2. a) Explain how pH control is achieved in case of fermentation process and other biological process. **6**

   b) Describe the composition analysis of gases by thermal conductivity measurement. **6**

   c) Explain the terms : **4**

   i) Bellow pressure Gauge

   ii) Diaphragm Pressure Gauge.

P.T.O.

3. a) A liquid tank system having time constant of 2.8 min. and resistance of $\frac{1}{8}$ m/(ccmhr) is undergoing steady state with inlet flow of 20 cc / hr for 30 seconds. The flow is increased to 85 ccm / hr for 0.8 min. Obtain the transfer function for the liquid tank system. A step change of magnitude 5.2 is introduced into the system having transfer function.

$$\frac{Y(s)}{X(s)} = \frac{5}{s^2 + 1.4s + 5}$$ **8**

b) A step change of magnitude 4 is introduced into a system having the transfer function $\frac{Y(S)}{X(S)} = \frac{10}{S2 + 1.6S + 4}$

Determine :

i) Percent overshoot

ii) Rise time

iii) Maximum value of Y(t)

iv) Ultimate value of Y(t)

v) Period of oscillation. **8**

OR

4. a) Define transportation lag. Determine the step response when the transport lag is $e^{-\tau s}$. Show it graphically. **4**

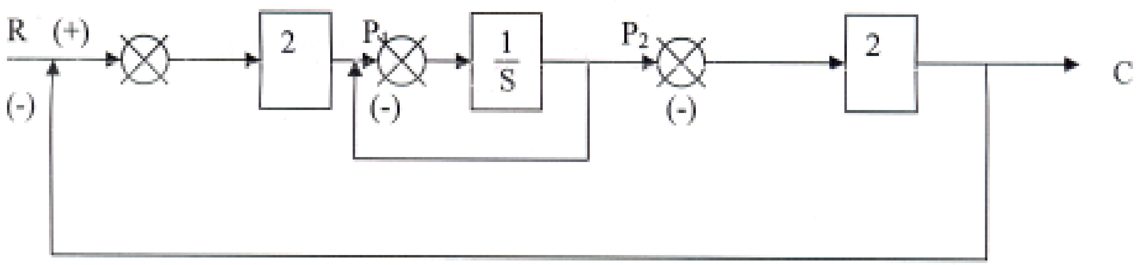
b) Consider the stirred tank reactor where the first order reaction is occurring and it proceeds at the rate $r = k_1 C_A$ where r = moles of A reacted/(volume) (time), k_1 is the reaction constant, CA0(t) is the concentration of A in the reactor, V is the volume of the reaction mixture, F is the constant feed rate in m^3/hr, C_{Ai}(t) is the concentration of A in feed stream. Assuming constant density and constant V. Derive the transfer function relating the C_{A0} in the reactor w_i the feed concentration. **6**

c) Obtain a Transfer function for a second order system when $\xi < 1$. **6**

5. a) A unit step change in error is occurred in PID controller if, $K_c = 18 \tau_I = 0.7, \tau_I = 0.4$. Plot the response of the this controller. **4**

b) A pneumatic controller is utilized to control temperature within range 75-190°C. The air pressure varies from 5 N/m^2 to 15 N/m^2. The temperature varies from 90-135°C. When the system operates under regulator problem. Calculate the gain and proportional band. **6**

c) For the control system shown in figure determine the Transfer function. **8**



OR

6. a) State the concept of stability. State whether following control system is stable or not

$$G_1 = 14\left(1 + 0.5s + \frac{1}{0.2s}\right) \cdots \text{(Controller)}$$

$$G_2 = \frac{1}{(4s+1)\,(5s+1)} \cdots \text{(Process)}$$

H = 1 ...(Measuring Element). **8**

b) For the control system shown in the Fig. Determine :

i) $\frac{C(S)}{R(S)}$

ii) $C(\alpha)$

iii) Offset

iv) Whether the closed loop response is oscillatory. **10**

SECTION – II

7. a) Plot the root locus diagram for the following open loop transfer function

$G = \dfrac{K}{(s+2)\,(s+3)\,(s+5)}$. **4**

b) Plot the Bode diagram for the following system whose overall transfer function is given by $G(s) = \dfrac{1}{(s+2)\,(s+8)}$ **6**

c) Using Ziegler-Nicholas method of tuning, determine the controller tuning for the following process. Transfer function for the process $G_{p1} = \dfrac{1}{(4s+1)\,(3s+1)}$;

Process $G_{p2} = \dfrac{1}{(6s+1)}$; the measuring element H = 4. **6**

OR

8. a) Describe the Bode plot for second order system with necessary graph.

$G_1(s) = \dfrac{1}{4s+1}$; $G_2(s) = \dfrac{2}{5s+1}$ **6**

b) Obtain the controller tuning for the following multi capacity process using Ziegler Nicholas technique. $G_p = \dfrac{1}{(4s+1)(6s+1)}$; $G_m = \dfrac{1}{(8s+1)}$; $H = 1$. **6**

c) Explain with neat sketch, Nyquist plot for the over damped and under damped second order system. **4**

9. a) Explain the dynamic characteristics of the cascade control system for the following control system having following transfer function for the primary and secondary process.

Primary Process : $G_{p1} = \dfrac{1}{(0.4s+1)\,(2s+1)}$; Secondary Process : $G_{p2} = \dfrac{1}{(0.5s+1)}$. **6**

b) Differentiate between feed forward and feed backward control system. **6**

c) Explain the Auctioneering control system for the plug folw reactor. **4**

OR

10. a) Explain the concept of ration control with example of Jacketed stirred tank reactor. **4**

b) Write short note on :

i) Override control

ii) Adaptive control

iii) Split range control. **6**

c) Explain how the override control is used for the steam distribution system in chemical plants. **6**

11. a) Explain the necessity of the inferential control and describe it with neat sketch. **4**

b) Explain how the Antifoam control is practiced in fermentation process. **10**

c) Describe how the temperature control is achieved in fermentation broths ? **4**

OR

12. a) Explain the construction and working of dissolved oxygen electrode used for measurement and control of dissolved gas. **6**

b) Describe the paramagnetic oxygen analyzer used for inlet and exit gas analysis. **6**

c) Explain the methods for the online analysis of factors affecting the fermentation process. **6**

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T.E. (Bio-technology) (2003 Course) (Semester – II) Examination, 2009
COMPUTATIONAL TECHNIQUES AND PROCESS MODELING

Time : 3 Hours | Total. Marks : 100

Instructions: *1) Figures to the* ***right*** *indicate* ***full*** *marks.*
2) Use of Programmable calculator is ***not allowed.***
3) Draw a neat sketch ***wherever*** *necessary.*
4) Make necessary assumptions ***wherever*** *required.*
5) Answer ***any three*** *questions from Section* ***I*** *and* ***any three*** *questions from Section –* ***II.***

SECTION – I

1. a) Find the Eigen values and Eigen vectors of **4**

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$$

b) Find the characteristic equation for **2**

$$\begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$$

c) Find the product of Eigen values of **4**

$$\begin{bmatrix} 7 & 2 & 2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}$$

d) Solve the following equations by using Gauss Siedal method **6**

$3x + y + 2z = 3,$

$2x – 3y – z = – 3,$

$x + 2y + z = 4.$

OR

2. a) Explain the properties of Eigen values. **4**

b) Find the roots by Guass Siedal method **8**

$10x_1 - 2x_2 - x_3 - x_4 = 3$
$-2x_1 + 10x_2 - x_3 - x_4 = 15$
$-x_1 - x_2 + 10x_3 - 2x_4 = 27$
$-x_1 - x_2 - 2x_3 + 10x_4 = -9$

c) Find the Eigen values of the given matrix and also find the Eigen values of the inverse of the given matrix. **4**

$$\begin{bmatrix} 2 & 3 & -2 \\ -2 & 1 & 1 \\ 1 & 0 & 2 \end{bmatrix}$$

3. a) R is the resistance to maintain a train at a speed V, find a law of the type $R = a + bV^2$ connecting R and V using the following data. **8**

V (miles/hr)	10	20	30	40	50
R(lb/ton)	8	10	15	21	30

b) Using Newton Raphson method find a root for $x^3 - 3x + 1 = 0$ correct to 3 decimal places. **4**

c) Using Euler method solve for y at x = 0.1 from dy/dx = x+y+xy taking y(0) = 1 and h = 0.025. **4**

OR

4. a) Using Runge Kutta method of fourth order, **8**
solve $dy/dx = (y^2 - x^2)/(y^2 + x^2)$ with y(0) = 1 at x = 0.2 and 0.4.

b) A solid of revolution is formed by rotating about x – axis, the area between the x – axis, the lines x = 0 and x = 1 and a curve through the points with the following coordinates. Estimate the volume of the solid formed using Simpson's rule. **8**

x	0.00	0.25	0.5	0.75	1.00
y	1.00	0.98	0.95	0.90	0.84

5. a) Express $y = 2x^3 - 3x^2 + 3x - 10$ in factorial notation and hence show that $\Delta^3 y = 12$. **4**

b) Construct a forward difference table for the following data and evaluate $\Delta^3 f(3)$: **6**

x	0	1	2	3	4
f(x)	1	4	9	16	25

c) Construct Newton's backward interpolation polynomial for the following data. **6**

x	4	6	8	10	12
y	2	3	4	5	6

d) Explain the terms **2**

i) Interpolation techniques

ii) Extrapolation techniques.

OR

6. a) Evaluate $\Delta^2 ((5x + 12)/(x^2 + 5x + 16))$ interval of differencing being unity. **4**

b) Find the missing values in the following table : **6**

x	45	50	55	60	65
y	3.0	---	2.0	---	-2.4

c) Form the table of forward differences of the function **4**
$f(x) = x^3 - 3x^2 - 5x - 7$ for $x = -1, 0, 1, 2, 3, 4, 5$.

d) The table gives the distances in nautical miles of the visible horizon for the given heights in feet above the earth's surface. Find the values of y when x = 218 Ft. where x is height and y being the distance **4**

x	100	150	200	250	300	350
y	10.63	13.03	15.04	16.81	18.42	19.9

SECTION – II

7. a) What is Process Modeling ? **2**

b) What are the uses of Mathematical modeling ? **4**

c) Explain in brief Phase equilibrium and Chemical equilibrium. **4**

d) Consider the tank of a perfectly mixed liquid. A chemical reaction takes place in the liquid. The system is a CSTR. Write total continuity equation for the system. **6**

OR

8. a) What are Transport equations ? Define Molecular and Overall transport equations. **6**

b) Write component continuity equations with 1st order reaction taking place in a CSTR for **10**

i) Consecutive reactions

ii) Irreversible reactions

iii) Simultaneous reactions taking necessary assumptions.

9. LPG is fed into a pressurized tank to hold the liquid level in the tank. Assume that LPG is a pure component i.e. propane. The liquid in the tank is assumed to be perfectly mixed. Heat is added at a rate **Q** to hold the desired pressure in the tank vaporizing the liquid at a rate $\mathbf{W}_v$ (mass /time). Heat losses and mass of the tank walls are assumed to be negligible. Model the above system such that the system has a unique solution. **16**

OR

10. Simulate a binary distillation column and prove that the degrees of freedom are zero. **16**

11. a) Explain in detail Activated sludge systems. **9**

b) Give a detailed explanation on Suspended growth reactors. **9**

OR

12. a) Give a short notes on : **8**

i) Tower anaerobic reactors

ii) Aerobic reactors

b) Define unlimited growth. Model a continuous culture for unlimited growth reactors. **10**

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T.E. (Mech. & MECH. S/W) (Sem. – II) Examination, 2009
APPLIED THERMODYNAMICS – II
(Old) (1997 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Explain the concept of available and unavailable energy. **4**

b) Explain the importance of irreversibility. **4**

c) Air at 1000 KPa and 200°C expands adiabetically in a closed system from 0.2 m^3 to 0.5 m^3 to the environment pressure and temperature of 100 kPa and 25°C, For this process determine. **8**

i) the maximum work

ii) the change in availability and

iii) irreversibility.

Assume $u = C_v T$ and $R = 0.286$ kJ/kg°k, $C_v = 0.714$ kJ/kg°k.

2. a) Explain the actual vapor compression system on P.h chart clearly showing the typical variation from theoretical system. **6**

b) Discuss the effect of subcooling on COP. would you desire large subcooling and why. **4**

c) A refrigerator unit working on Bell Coleman cycle takes air from cold chamber at 10°C and compresses it. From 1 bar to 6.6 bar with index of compression being 1.2. The compressed air is cooled to a temperature 5°C above ambient temperature of 25°C. before it is expanded in the expander where the index of expansion is 1.35. Determine : **6**

1) Refrigerating effect

2) COP .

Assume Cp = 1.0 kJ/kg°k

3. a) Describe briefly with the help of a diagram, the vapor absorption system of refrigeration. In what way this system is advantages over the vapor compression system. **6**

b) State the properties of good refrigerant. What are the normal refrigerants used ? **4**

c) An ammonia refrigerating machine filled with an expansion valve works between the temperature limit of –10°C and 30°C. The vapor is 95% dry at the end of isentropic compression and the fluid leaving the condenser is at 30°C. Assuming actual Cop as 60% of the theoretical. Calculate the kilograms of ice produced per kW at °C from water at 10°C latent heat of ice is 335 kJ/kg. Ammonia has following properties. **6**

Temp (0°C)	**liquid heat kJ/kg**	**latent heat kJ/kg**	**liquid entropy kJ/kjk**	**Total entropy of dry saturated vapor (kJ/kjk)**
30	323.08	1145.80	1.2037	4.842
–10	135.37	1297.68	0.5443	5.4770

4. a) Define air pollution and discuss its effect on human health. **5**

b) Explain exhaust gas recirculation system with sketch. **6**

c) Explain catalytic converter with neat sketch. **5**

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

1) Emission from SI engine.

2) Alternate fuel for IC engine-Alcohols.

3) Advantages and limitation of supercharging and turbocharging.

4) Ice plant.

SECTION – II

6. a) What is the difference between comfort air conditioning and industrial air-conditioning ? Give application of each. **6**

b) 5 grams of water vapour per kg of atmospheric air is removal and the temperature of air then becomes 25°C DBT. Find out the following : **6**

1) Relative humidity

2) Dew-point temperature

Assume condition of atmospheric air as 35°C DBT, and 60% RH at 1.013 bar pressure. Solve using first principle.

c) Explain the advantages of central air-conditioning system. **4**

7 a) Define ignition lag, knocking. **4**

b) What is octane rating ? Discuss the method of its measurement. **6**

c) What are the requirements fo C.I engine combustion chamber ? and draw neat figures of two combustion chambers. **6**

8. a) List at least five different applications of rotary air compressors. **5**

b) Compare reciprocating and rotary air compressor. **5**

c) What do you mean by stalling and surging in axial flow compressors. **6**

9. a) Discuss emissions from S.I. and C.I. engines and their harmful effects. **8**

   b) Explain construction and working of catalytic convertors. **8**

10. Write a short note on :

    a) Multi-point fuel injection system. **4**

    b) Air-washer. **6**

    c) Selection of compressors for various applications. **4**

    d) Stages of combustion in S.I. engine. **4**

T.E. (Mechanical) (Sem. – II) Examination, 2009
MECHANICAL MEASUREMENT & CONTROL
(Old) (1997 Course)

Time : 3 Hours | Max. Marks : 100

Instructions : *i) Attempt **any three** questions from **each** Section.*
*ii) Draw **neat** diagram wherever **necessary.***
*iii) **Figures** to **right** indicate **full** marks.*

SECTION – I

1. a) Discuss any two static and dynamic characteristics of measuring instruments. **8**

   b) State and explain the block diagram of automatic control system. **8**

2. a) Differentiate between random and systematic errors stating suitable examples. **8**

   b) Explain any two pressure transducers. **8**

3. a) State and explain the specifications of LVDT. **8**

   b) Compare feedback and feedforward control system. **8**

4. Write a short note on **any three** of the following : **18**

   i) Temp. measurement.

   ii) Pneumatic system.

   iii) PID controller.

   iv) Servo mechanism.

SECTION – II

5. a) Explain block diagram of PLC. **8**

   b) Compare between Hydraulic and Pneumatic actuators. **8**

6. a) Explain P+I control system. **8**

   b) Explain PLC ladder diagram with the help of suitable example. **8**

P.T.O.

7. a) Explain instrumentation used for boiler control. **8**

   b) Write a short note on microprocessor. **8**

8. Write short note on **any three** from the following : **18**

   i) I to P converter.

   ii) SCADA.

   iii) Control valves characteristics.

   iv) PLC specifications.

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T.E. (Mech./SW) (Sem. – II) (1997 Course) (Old) Examination, 2009
PRODUCTION ENGINEERING

Time : 3 Hours | Max. Marks : 100

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

SECTION – I

1. a) List the various types of chips produced during metal cutting. Describe the conditions in which these types of chips are produced. **6**

b) In an orthogonal cutting following observations are made :

Cutting speed = 100 m/min, Rake angle = 10°, Cut chip thickness = 0.228, Uncut chip thickness = 0.125, Cutting force = 550 N, Thrust force = 220 N

Calculate shear angle, friction angle, power consumed. **6**

c) Write short note on - Factors affecting the tool life. **4**

2. a) What is the function of cutting tool dynamometer ? Explain with suitable sketch any one cutting tool dynamometer of your choice. **8**

b) List the various types of Broaches and draw a keyway Broach and show its different elements. **8**

3. a) Classify the different thread cutting methods. Explain the process and principle of thread rolling with neat sketch. **8**

b) Explain with neat sketch the process of 'Gear Hobbing'. **8**

4. a) Explain the process of injection and blow moulding of plastics with one example of product of each type. **8**

   b) What is the objective of surface treatment ? Explain in brief Electroplating and metal spraying along with the application/example. **8**

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

   a) Gear finishing processes

   b) Thread chasers and dies

   c) Phosphating and anodising

   d) Compression and transfer moulding of plastics.

   e) Types of braching machines.

SECTION – II

6. a) Explain in detail with neat sketch the EDM process along with applications. **8**

   b) Compare EBM with LBM as following points. **8**

      i) Environment

      ii) Beam production

      iii) Beam focussing

      iv) Application

7. a) Discuss with the help of block diagram the CNC system. **8**

   b) Describe the meaning of any four G and M codes in NC programming. **8**

8. a) Explain with neat sketch the compound and the progressive die. **8**

   b) Discuss in brief clearance calculations, center of pressure press tonnage and blank size in sheet metal working. **8**

9. a) Discuss the principles of location and clamping in Jigs and Fixture. **8**

   b) What is an indexing Jig ? Describe the various indexing devices commonly used with suitable sketches. **8**

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

    a) Milling fixture

    b) Process planning

    c) Machining centers

    d) Strip layout and sheet utilisation ratio.

    e) AJM.

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B/II/09/100

[3663] – 6

[3663] – 6

T.E. (E&TC) (Electronics, Indl.Elex) (Semester – II) Examination, 2009
(1997 Course) (Old)
NETWORK ANALYSIS AND SYNTHESIS

Time : 3 Hours Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Use of electronic pocket calculator is **allowed**.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Find Laplace transform of the waveform shown in figure (1). **8**

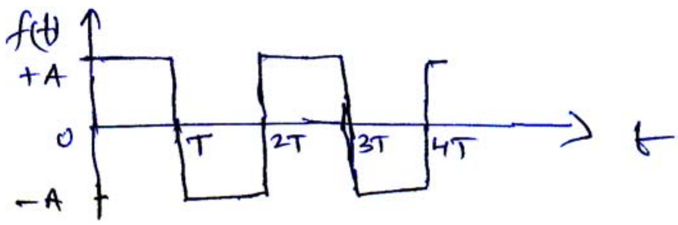

Fig. (1)

b) Resolve the wave forms in the figure (2) into its odd and even components. **8**

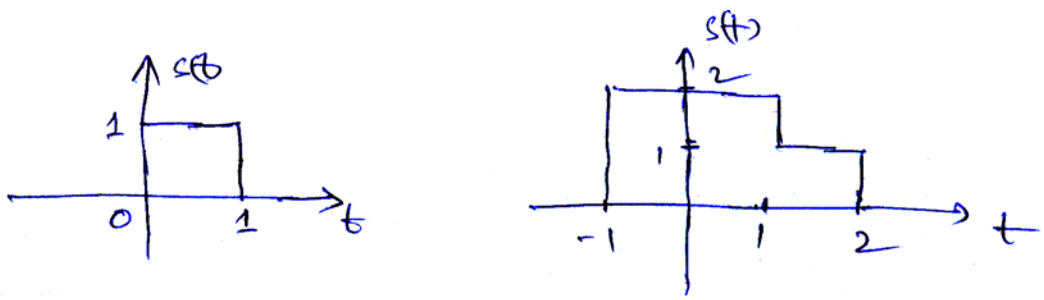

Fig. (2)

P.T.O.

2. a) For the circuit shown in figure (3), switch k closes at t = 0. Solve for the current i(t) using Laplace Transform. **8**

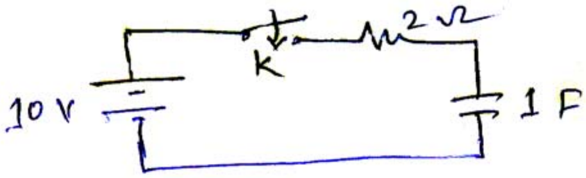

Fig. (3)

b) Find inverse Laplace transform for

i) $F(S) = \dfrac{S}{S^2 + 4S + 3}$ ii) $F(S) = \dfrac{2S+3}{(S+3)(S+4)}$ **8**

3. a) Explain the terms f-circuit and f-cut set in connection with graph theory. **6**

b) The f circuit matrix of graph is given as

Chord/Branch	3	4	5	1	2	6
3	1	0	0	0	–1	1
4	0	1	0	–1	0	–1
5	0	0	1	–1	–1	0

Form a corresponding graph, also find its f cutset matrix. **10**

4. a) Find driving point impedance function of the one port network shown in figure (4). Also plot poles and zeros of this driving point function. **8**

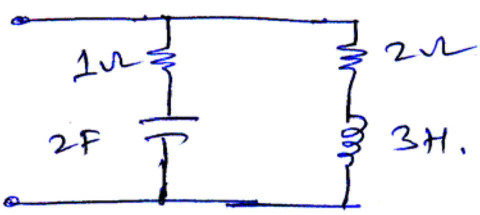

Fig. (4)

b) For a ladder network find Y_{12} (S) as a transfer function. **8**

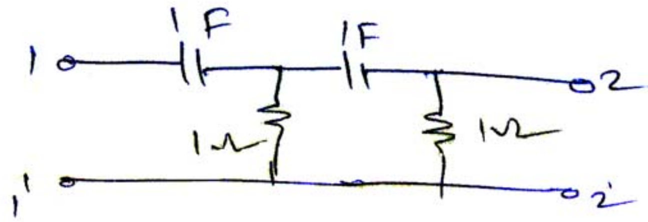

Fig. (5)

5. a) Test whether following functions are positive real. **8**

i) $\dfrac{S^2+6S+5}{S^2+9S+14}$ ii) $\dfrac{S^2+S+6}{S^2+S+1}$

b) Find first and second Cauer forms of network functions $Z(S)=\dfrac{S(S^2+4)}{(S^2+1)(S^2+9)}$. **10**

SECTION – II

6. a) Find first and second cauer forms of functions

1) $Z(S)=\dfrac{S(S+2)}{(S+1)(S+3)}$ 2) $Z(S)=\dfrac{(S+2)}{(S+1)(S+3)}$ **10**

b) Synthesize the following function as LC ladder network terminated in $1\,\Omega$ resistor.

$$Z(S)=\frac{S^2}{S^3+3S^2+2S+2}$$ **8**

7. a) Realize the following function as a symmetrical constant resistance lattice network terminated by $1\,\Omega$.

$$\frac{V_0}{V_s}=\frac{1}{2}\,\frac{S^2-3S+2}{S^2+3S+2}$$ **8**

b) Design a second order Butterworth active low pass filter with cut off frequency 2 kHz. Use Salton key configuration. **8**

8. a) Compare Butterworth and Che by shev approximations. **4**

b) Design Butterworth low pass filter with specifications.

– Pass band attenuation 0.7 dB for $\omega \leq 0.5 \frac{\text{rad}}{\text{sec}}$

– Stop band attenuation at least 20 dB for $\omega \geq 3 \frac{\text{rad}}{\text{sec}}$. **12**

9. a) Explain the effect of practical operational amplifier on active filter performance. **8**

b) Explain the elementary synthesis operations. **8**

i) Removal of a pole at origin

ii) Removal of a constant

10. Write short notes on **any three** : **16**

1) Zeros of transmission
2) Significance of complex frequencies in network analysis
3) All pass filter
4) Incidental dissipation
5) Frequency and impedance scaling.

[3663] – 8

T.E. (E & TC / Electronics, Indl. Elex) (Semester – II) Examination, 2009
(1997 Course) (Old)
NETWORK THEORY

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, if **necessary**.*

SECTION – I

1. a) State and explain shifting theorem in Laplace Transform. **4**

b) Using Laplace Transform compare time domain analysis with Frequency domain analysis. **4**

c) Find the Laplace Transform of following waveforms. **8**

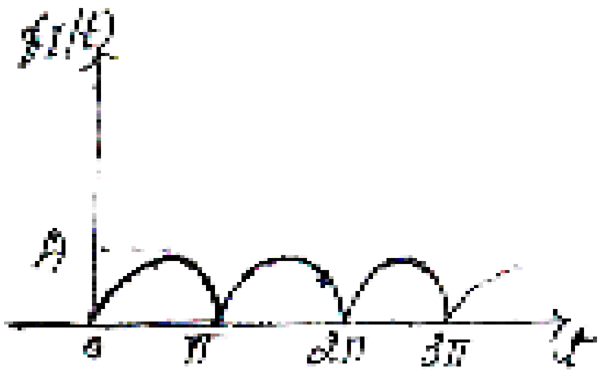

Fig. 1

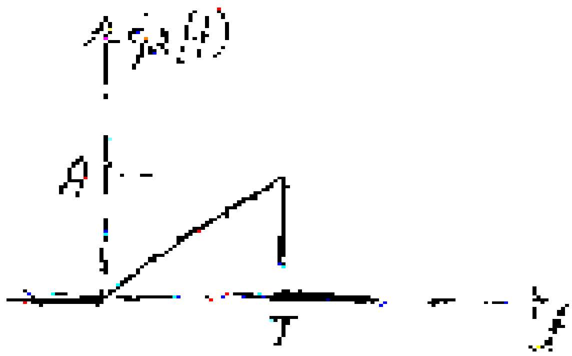

Fig. 2

P.T.O.

2. a) Find Inverse Laplace Transform of the function $F(s) = \frac{1+e^{-2s}}{s^2(s+2)}$. **4**

b) Define unit impulse, unit step and unit ramp waveform. Establish the mathematical relationship between them. **6**

c) Unit step response of a network is given as $(1 - e^{-at})$. Determine the impulse response h(t) of the network. **6**

3. a) Obtain ABCD parameters interms of γ-parameters. **4**

b) Define hybrid parameters. Obtain electrical equivalent circuit or a two-port network in terms of hybrid parameters. **4**

c) Obtain Z and Y parameters of the resistive network shown in Fig. 3. **8**

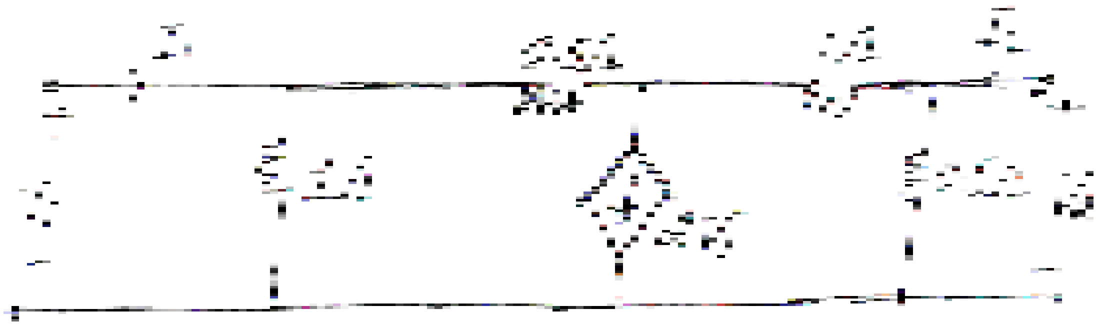

Fig. 3

4. a) Using pole-zero plot, find magnitude and phase of the following function at $s = J_0$ and $s = J_2$.

$$F(s) = \frac{4s}{s^2+2s+2}$$ **5**

b) Explain various types of network functions for a two-port network. **3**

c) Find voltage ratio transfer function $\frac{V_o}{V_i}$ for the circuit shown in Fig. 4. **8**

Fig. 4

5. a) Explain following terms in Graph theory. **8**

1) Co-tree 2) Tree 3) f-cutset matrix 4) f-circuit matrix

b) Write short note on Incidental dissipations. **4**

c) Prove that the condition for reciprocity of a two port network interms of T-parameters is -

$$AD - BC = 1$$ **6**

SECTION – II

6. a) Test whether following polynomial is Huswitz.

$$P(s) = s^5 + 4.5s^3 + 4.5s$$ **3**

b) What is a p.r. function ? Give necessary and sufficient conditions for a function to be prf. **5**

c) Test whether following functions are prf. **8**

1) $F_1(s) = \dfrac{2s^2+s+2}{s^2+s+2}$ 2) $F_2(s) = \dfrac{s^2+4}{s^3+3s^2+3s+1}$

7. a) What is the difference between a Network analysis and Network synthesis ? **4**

b) What are zeros of transmission ? Explain how they are important in two port synthesis. **4**

c) Obtain Foster – II and Cauer – II form of network for the impedance function given as-

$$Z(s) = \frac{s^4+10s^2+9}{s^3+4s}$$ **8**

8. a) Give properties of R-C impedance function. **3**

b) Realize following impedance function into a Cauer – I and Foster – I form of network.

$$Z(s) = \frac{2(s+1)(s+3)}{(s+2)(s+6)}$$ **8**

c) Synthesize following transfer function into a L-C ladder network with 1ohm termination.

$$Z_{21}(s) = \frac{s^3}{s^3+3s^2+4s+2}$$ **7**

9. a) Realize following function as a symmetrical lattice network. **6**

$$H(s) = \frac{V_o}{V_s} = \frac{s^2 - s + 1}{s^2 + s + 1}$$

b) Compare Butterworth's and chebyshev filters. **4**

c) Explain Frequency scaling and Magnitute scaling in filters. **6**

10. a) Compare performances of active filters with passive filters. **4**

b) Design first order B.W. low pass active filters with a passband gain of 10 dB and a cutoff frequency of 2kHz. **8**

c) Write short note on (**any one**) : **4**

1) Gyrator 2) Negative Impedance Converter (NIC)
