

Total No. of Questions : 10]

SEAT No. :

P2390

[Total No. of Pages : 2

[5253] - 101

T.E. (Civil)

**HYDROLOGY AND WATER RESOURCES ENGINEERING
(2012 Pattern)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10
- 2) Neat diagram must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) How hydrology is interdisciplinary science? [5]
b) Explain isohyetal method with neat sketch. [5]

OR

- Q2)** a) State the formula to calculate optimum number of raingauges. Explain the terms in the formula. [5]
b) State deltas for Gram, Maize , Sugarcane , Rice and cotton also explain methods to improve duty. [5]

- Q3)** a) differentiate between furrow irrigation and Drip irrigation system. [5]
b) Explain with neat sketch tipping bucket type gauge to determine the stage of river and also state the advantages of this gauge. [5]

OR

- Q4)** a) Derive the formula to calculate discharge of a well in a Unconfined aquifer. [6]
b) State various types of tube wells and explain construction of Slotted Type Tube well. [4]

- Q5)** a) What is hydrograph? Explain factors affecting run off. [8]
b) Maximum values of 24 hr precipitation (mm) at a Raingauge station are 140, 113, 132, 115, 130, 118, 127, 123, 121. Estimate maximum and minimum precipitation having a recurrence interval of 5 and 15 years. Use Hazen's Method. [10]

OR

P.T.O.

- Q6)** a) What is S- curve hydrograph? Explain its construction with sketch. [8]
 b) In a 10 hr storm rainfall depths occurred over a the catchment are

Hour	1	2	3	4	5	6	7	8	9	10
Depths (cm/hr)	1	1.5	5	6	10.5	8.5	9	7	1.5	1.5

Surface runoff resulting from the storm is equivalent to 20 cm of depth over the catchment. Determine (i) Average infiltration, and (ii) Average rate of infiltration. [10]

- Q7)** a) Explain how will you fix the capacity of reservoir using annual inflow and outflow. [8]
 b) Explain fixation of reservoir capacity using elevation capacity curve and dependable yield [8]

OR

- Q8)** a) What are various reservoir losses? What are various measures to control these losses [8]
 b) What is reservoir sedimentation? What is the significance of trap efficiency? Explain with neat sketch. [8]

- Q9)** a) Write a note on ancient system of water distribution which still exist in North Maharashtra [8]
 b) Explain Participatory Irrigation Management. (PIM) [8]

OR

- Q10)**a) What is water logging? Explain tile drain method and also state formula for spacing of tile drains [8]
 b) Draw a neat section for lift irrigation scheme and state various components of lift irrigation scheme. Explain various design steps in lift irrigation system [8]



Total No. of Questions : 12]

SEAT No. :

P2391

[Total No. of Pages : 2

[5253] - 102

T.E. (Civil)

Infrastructure Engineering

(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary.*

Q1) Comment on provisions made for infrastructure of energy and power sector with reference to five year plan. **[6]**

OR

Q2) Explain the necessity of PPP **[6]**

- Q3)** a) State the types of failure of rail. **[4]**
b) State the function of sleepers. **[4]**

OR

- Q4)** a) What are elastic fastenings? What is their necessity of importance. **[4]**
b) State the comparison between steel sleepers and prestressed concrete sleepers. **[4]**

Q5) Write short note on: Vacuum dewatering system. **[6]**

OR

Q6) Enlist methods of dredging and explain any one type of dredger. **[6]**

- Q7)** a) State various factors which determines size of tunnel. **[6]**
b) Explain in brief earth pressure balance method of tunneling. **[6]**
c) Explain the needle beam method of tunneling in soft soil. **[4]**

OR

- Q8)** a) Discuss the safety precautions should be taken in tunneling work. **[6]**
b) What is mean by the following term in tunneling? i) Mucking ii) Portal iii) Twin tunnel. **[6]**
c) Explain in detail pilot tunnel. **[4]**

P.T.O.

- Q9)** a) Define port. State the various requirements of ports. [6]
b) Write short note on: [6]
i) wharves
ii) dolphins
c) Define dock Differentiate between wet & dry dock. [4]

OR

- Q10)**a) Write short note on: [6]
i) Military harbours
ii) Commercial harbours
b) Explain with neat sketch following [6]
i) Tetrapod
ii) Fenders
iii) Jetties
c) Enlist various factors to be considered in design of breakwater. [4]

- Q11)**a) A construction equipment on a work site costs Rs.5,00,000 and has expected life of 5 years and salvage value of Rs.50,000 at the end of useful life .Calculate yearly depreciation of the machine using. [6]
i) straight line method
ii) sum of years method.
b) Enlist various earth moving equipments with their suitability as per type of work [6]
c) Write short note on repair cost and investment cost. [6]

OR

- Q12)**a) What is mean by depreciation of equipment? State the various methods of depreciation and explain any one in brief. Explain any one method of depreciation. [6]
b) What are the types of scraper? Explain the working of scraper. [6]
c) Discuss in detail classification of earth moving equipments. [6]



Total No. of Questions : 10]

SEAT No. :

P2392

[Total No. of Pages : 2

[5253] - 103
T.E. (Civil)
STRUCTURAL DESIGN - I
(2012 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer 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.*
- 2) *Neat sketches must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Take Fe 410 grade of steel*
- 5) *Take ultimate stress in bolt, $f_{ub} = 400 \text{ N/mm}^2$.*
- 6) *Assume suitable data, if necessary.*
- 7) *Use of electronic pocket calculator IS: 800-2007 and steel table allowed.*
- 8) *Use of cell phone is prohibited in the examination hall.*

- Q1)** a) Explain modes of failure in tension member with sketch. [5]
b) Determine design compressive strength of an ISA 125 x 95 x 10 @ 16.5 kg/m in which longer leg connected to the gusset plate by 3 number of M20 black bolts of 4.6 grade. [5]

OR

- Q2)** a) Why Limit state method is more rational than working stress method.[5]
b) Check the adequacy of an ISA 90 x 60 x 6 @ 6.8 kg/m to carry factored axial tensile load of 150 kN for yielding and rupture only. Assume angle is connected to 8 mm thick gusset plate by 4 numbers of M20 bolts.[5]
- Q3)** a) A 6 m long column is effectively held in position at both ends and restrained against rotation at one end. If an ISHB 350 @ 67.4 Kg/m is used, calculate design compressive strength of the column. [5]
b) Define a beam—column member and give examples with suitable sketches. [5]

OR

- Q4)** Design the gusseted base for a column ISHB 350 @ 66.1 kg/m supporting a factored axial compression of 1700 kN. Consider grade of concrete as M20 and gusset angle ISA 150 x 115 x 15mm. [10]
- Q5)** Calculate the uniformly distributed load over a laterally unsupported beam ISMB 400 @ 61.6 kg/m for an effective length of 5 m. Also check for serviceability. [16]

P.T.O.

OR

- Q6)** a) Explain modes of failure in beams. [6]
b) Design a laterally supported beam of effective span 6 m for the following data: (i) Maximum bending moment $M= 150$ kNm (ii) Maximum shear force $V= 210$ kN. [10]

- Q7)** a) Explain types of beam to beam and beam to column connections with suitable sketches. [7]
b) Design a bolted seat connection for the factored beam end reaction 120 kN. The beam section is ISMB 250 @ 37.3 kg/m connected to the flange of the column section ISHB 200 @ 37.3 kg/m. [10]

OR

- Q8)** A simply supported welded plate girder of an effective span of 24 m subjected to uniformly distributed load 35 kN/m throughout the span excluding the self weight of plate girder. Assume compression flange laterally supported throughout the span and yield stress of steel is 250 MPa. Design cross section of plate girder, end bearing stiffeners. Draw sectional plan and elevation. [17]

- Q9)** Determine the maximum wheel load, shear force and bending moment for the gantry girder as per the following data. Design the section and check for moment capacity of the section.

Weight of crane girder: 150 kN, crane capacity: 180 kN, weight of crab and motor: 50 kN, span of crane girder: 15 m, minimum hook approach: 1.2 m, center/center distance between gantry column: 5 m, Weight of rail: 0.25 kN/m [17]

OR

- Q10)** A truss shown in Fig. 10 is used for an industrial building and spaced at 3m situated at Pune. The truss is covered with AC sheets calculate the panel point dead, live, and wind load. Design the members $L_0 L_1$, $U_1 L_1$ and $L_0 U_1$. Assuming $k_1 = 1$, $k_2=0.98$ and $k_3=1$ and $(C_{pe} - C_{pi}) = \pm 0.8$, $f_y = 250$ MPa. Draw the design sketches. [17]

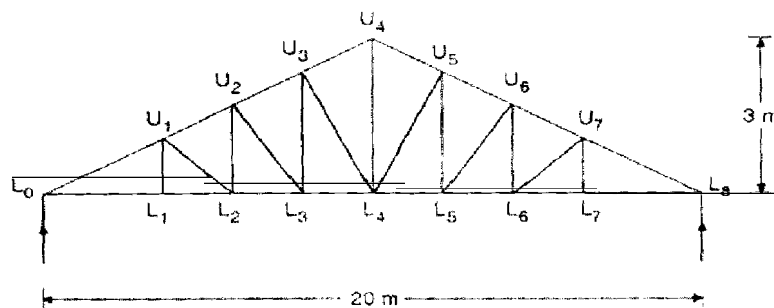


Fig. 10



[5253]-104

T.E. (Civil Engineering)

STRUCTURAL ANALYSIS - II

(2012 Pattern) (End Semester)

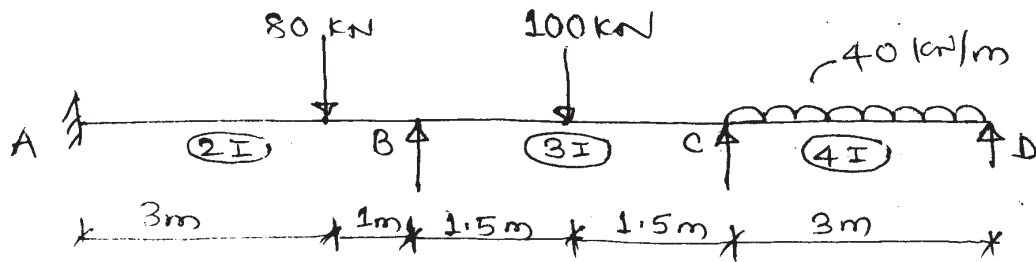
Time : 2½ Hours]

[Max. Marks : 70

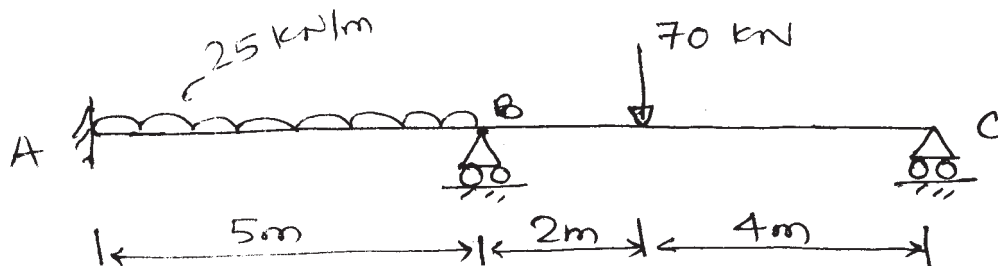
Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary and indicate clearly.
- 4) Use of electronic, non-programmable calculator is allowed.

Q1) a) Analyse the beam by slope deflection method. Draw BMD. [10]



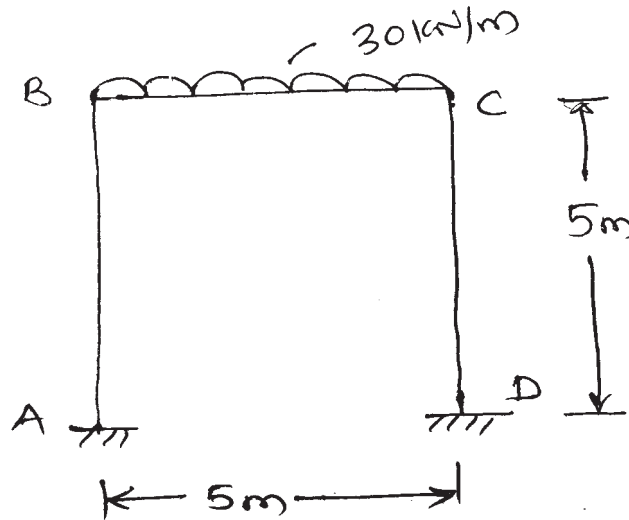
b) Analyse the beam by Flexibility Matrix method. Support 'B' sinks by 15 mm. Draw BMD. [10]



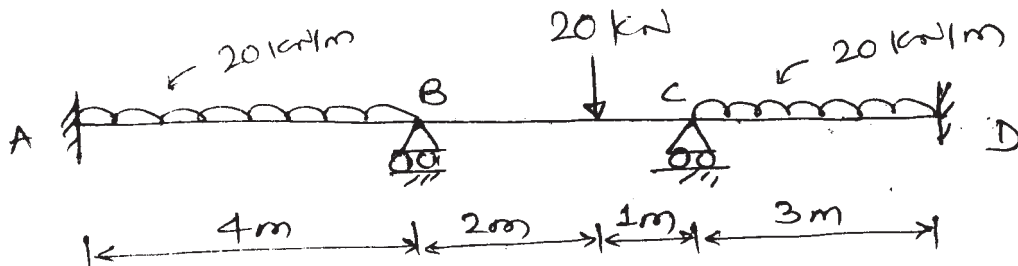
P.T.O.

OR

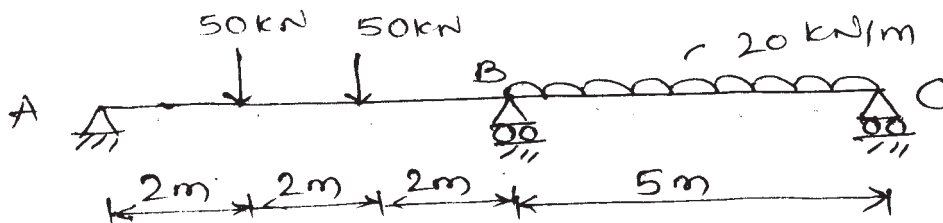
Q2) a) Analyse the frame by Slope Deflection method. Draw BMD. [10]



b) Determine the support moments for continuous beam by Moment Distribution method. Draw BMD. [10]

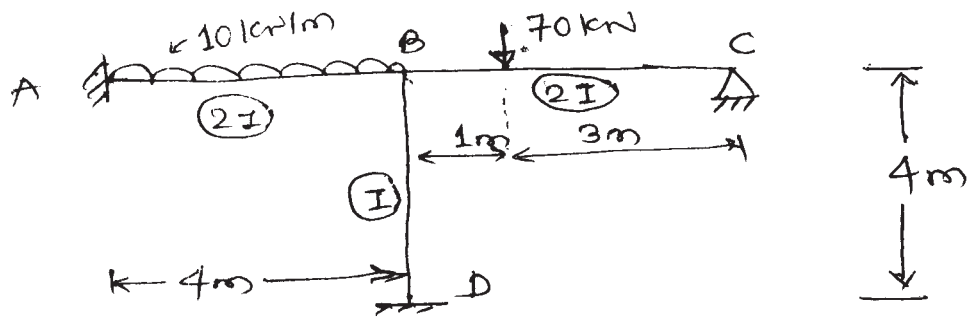


Q3) Analyse the beam by 'Stiffness Matrix method. Draw SFD & BMD. Take $EI = \text{constant}$. [16]

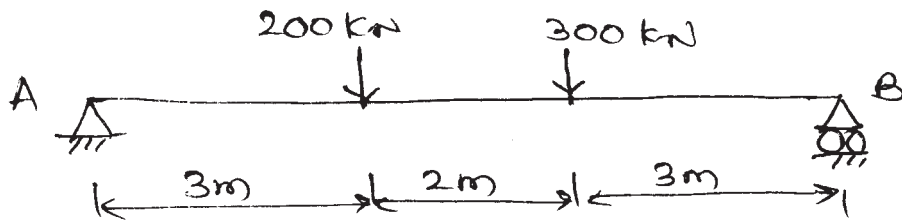


OR

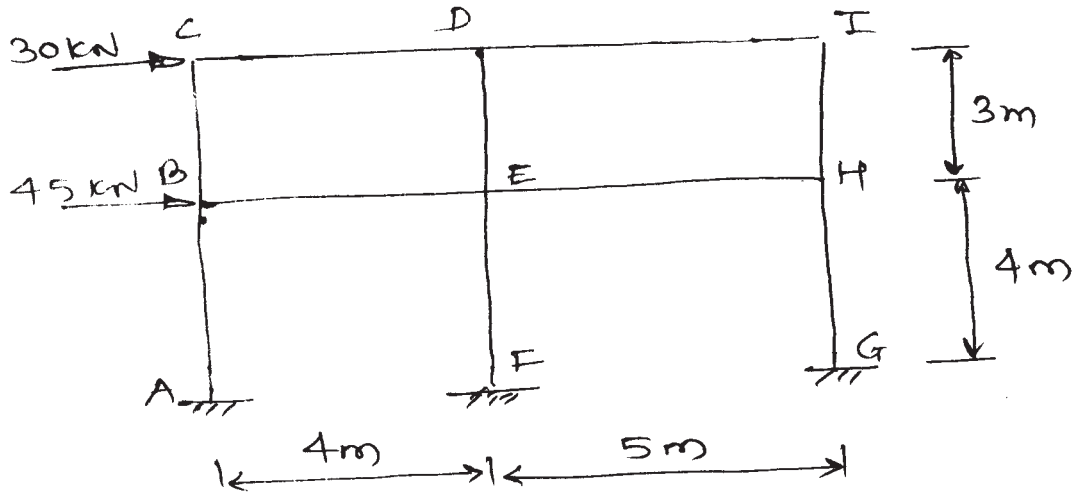
- Q4) a) Analyse Portal Frame by Stiffness Matrix. Draw BMD. Take EI constant. [16]



- Q5) a) Determine deflection under the loads using Finite Difference method. [8]



- b) Analyse the Portal Frame by cantilever method. Consider cross-sectional area of all columns equal. Draw BMD. [10]



OR

- Q6) a) Determine maximum deflection for the cantilever beam of span 1.5m carrying udl of 35 kN/m on entire span. Take 3 nodes. [8]
- b) Analyse portal frame of Q5 (b) by using Portal method. Draw BMD. [10]

- Q7)** a) Discuss in detail. [8]
i) Axisymmetric elements
ii) Isoparametric elements
- b) Derive shape function for 2 noded Bar element, using natural co-ordinate system. [8]

OR

- Q8)** a) Discuss plain stress and plain strain problem. [8]
b) Explain convergence requirements for FEM. [8]



Total No. of Questions : 12]

SEAT No. :

P2394

[Total No. of Pages : 4

[5253]-105

T.E. (Civil) (End Semester)
FLUID MECHANICS - II
(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) What do meant by Drag? Explain in brief any one type of drag with neat sketch. **[2]**

b) The following data is related to the experiments conducted in a wind tunnel: **[6]**

- i) Wind speed = 51 km/h
- ii) Flat plate of size = (2 × 1) m
- iii) Specific weight of air = 11.285 N/m³
- iv) Coefficient of lift = 0.76
- v) Coefficient of drag = 0.16

Determine:

- i) Lift,
- ii) Drag,
- iii) resultant force, and
- iv) power exerted by the air stream on the plate.

OR

P.T.O.

- Q2)** a) Define unsteady flow. Give any two practical examples of it. [2]
- b) Water flows through a 2.91 km long pipeline at velocity of 2.16 m/s when the valve at the end of the pipe is fully open and the head acting there is 29.7 m. The valve is desired to be closed fully in 16 seconds in such a manner that the velocity of water in the pipe is decelerated uniformly. Calculate the required area of the valve opening at 5 and 10 seconds from start, if the initial opening area is equal to the pipe cross sectional area. [6]

- Q3)** Discuss with neat sketches the following terms: [6]
- a) Velocity distribution in open channel flow.
- b) Classification of Flow in Channels.

OR

- Q4)** Explain in brief with neat sketches the following terms: [6]
- a) Channel Transitions.
- b) Specific Energy Curve.

- Q5)** An irrigation channel of trapezoidal section, having side slopes 3 horizontal to 2 vertical, is to carry a flow of 11 m³/s on a longitudinal slope of 1 in 5000. The channel is to be lined for which the value of friction coefficient in Manning's formula is $n = 0.012$. Find the most economic section of the channel. [6]

OR

- Q6)** A horizontal rectangular channel 4 wide carries a discharge of 15 m³/s. [6]
- a) Determine whether a jump may occur at an initial depth of 0.5m or not.
- b) If a jump occurs, determine the sequent depth to this initial depth.
- c) Also determine the energy loss in the jump.

- Q7) a)** A jet of water 80 mm diameter having a velocity of 20 m/s, strikes normally a flat smooth plate.

Determine the thrust on the plate

- i) if the plate at rest,
- ii) if the plate is moving in the same direction as jet with a velocity of 6 m/s.

Also find the work done per second in each case and efficiency of the jet when the plate is moving. [6]

- b) Explain the working of a Centrifugal pump with neat and labeled sketch. [6]
- c) A centrifugal pump with 1.25m diameter runs at 210 rpm and pumps 1890 lit/sec, the average lift being 6.1m. The angle which the vane makes at exit with the tangent to the impeller is 27° and the radial velocity of flow is 2.6 m/s. Determine the manometric efficiency and the least speed to start the pumping against the head of 6.1m, the inner diameter of the impeller being 0.6m. [6]

OR

- Q8) a)** Explain the following terms : [6]

- i) Reciprocating pump
- ii) Submersible pump

- b) Explain in brief : [6]

- i) Cavitation in centrifugal pump
- ii) Various Efficiencies of centrifugal pump

- c) Derive expression for the “work done by the jet” in case of flat plate inclined and moving in the direction of jet. [6]

- Q9) a)** Explain in brief various elements of hydroelectric power plant with the neat sketch. [8]

- b) Draw the neat and labeled sketch of Francis turbine and explain the working of it. [8]

OR

Q10)a) Explain the following terms : **[8]**

- i) “Performance Characteristic curves” of turbine.
- ii) “Cavitations in turbines”.

b) A Pelton wheel has to be designed for the following data : **[8]**

Power to be developed = 6000 kW,

Net head available = 310 m;

Speed = 560 r.p.m. ;

Ratio of jet diameter to wheel diameter = 1/10;

and overall efficiency = 85%.

Find the number of jets;

diameter of the jet;

diameter of the wheel;

and the quantity of water required.

Q11) a) Derive the following form of GVF equation. **[6]**

$$\frac{dy}{dx} = \frac{S_o - S_f}{1 - \frac{Q^2 T}{gA^3}}$$

- b)** A Rectangular channel 18 m wide carries water with a normal depth of 3.40m, bed slope 1 in 3700. A weir downstream rise the water depth to 4.90 m. Determine how far upstream of this section the depth of flow will be within 10% of normal depth. Use step method and take 2 steps, sketch and classify flow profile. Take Manning’s N = 0.017. **[10]**

OR

Q12)a) Explain in detail the various types of water surface profiles. **[8]**

- b)** Describe the “Standard step method” related with GVF computation. **[8]**



Total No. of Questions : 10]

SEAT No. :

P2395

[Total No. of Pages : 4

[5253]-106

T.E. (Civil)

ADVANCE SURVEYING

(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) What are the different types of errors in GPS observations and explain anyone of them. [5]
- b) Define Hydrographic surveying and enlist various objectives of hydrographic surveying. [5]

OR

- Q2)** a) Describe briefly how the soundings are located by Two Angles from the shore. [5]
- b) Elevations of two triangulation stations A and B, 108 Km apart are 135 m and 430 m respectively. A peak C, 82 Km from station A, has an elevation of 220 m. A is a ground station. Ascertain if it is visible from B or not. Also find the minimum height of scaffolding at B, so that the line of sight has a minimum 3 m clearance anywhere. [5]

- Q3)** a) Write short note on correction for curvature and refraction observation. [5]
- b) The following reciprocal observations were made from points A and B

P.T.O.

Horizontal distance between A and B = 5580 m

Angle of Elevation of B at A = $1^{\circ} 06' 22''$

Angle of depression of A at B = $1^{\circ} 01' 25''$

Height of instrument at A = 1.50 m

Height of instrument at B = 1.55m

Height of signal at A = 7.00 m

Height of signal at B = 6.50 m

Find the difference of level between A and B. Take $R \sin 1'' = 30.88\text{m}$. [5]

OR

Q4) a) Describe briefly how the soundings are located by Two Angles from the shore. [5]

b) What is mean by Sounding? Enumerate different instruments required for sounding and Explain Echo Sounding. [5]

Q5) a) Define the term any four : [8]

i) MPV.

ii) True Value.

iii) Residual error.

iv) Weight of an observation.

v) Independent quantity.

b) The angles from triangle ABC were recorded as follows. Calculate the corrected values of angles. Use method of Correlates [8]

A = $70^{\circ} 14' 12''$ Weight – 2

B = $53^{\circ} 40' 40''$ Weight – 1

C = $56^{\circ} 04' 52''$ Weight – 3

OR

Q6) a) Find the most probable values of the angles A , B and C from the following observations : [8]

A = $76^{\circ} 42' 44''$ with weight 4;

B = $57^{\circ} 53' 46''$ with weight 3;

C = $127^{\circ} 41' 35''$ with weight 2;

A + B = $134^{\circ} 36' 34''$ with weight 3;

B + C = $185^{\circ} 35' 27''$ with weight 2;

A + B + C = $262^{\circ} 18' 10''$;with weight 1;

Use method of correction.

b) Describe laws of weights of an observation with help of suitable example. [8]

Q7) a) Explain the principal of stereoscopy in details with sketch and give conditions for aerial Photography for stereoscopy. [9]

b) An area of $120\text{km} \times 60\text{ km}$ is to be covered by aerial photographs. The size of photograph $23\text{ cm} \times 23\text{ cm}$. The height of aeroplane above MSL is 3600m and longitudinal and side lap are 60% and 30% respectively and focal length of camera lense is 18 cm . Calculate [9]

i) Minimum number of photographs to cover the area

ii) The required interval between successive exposure assuming the speed of aeroplane as 120 km/hr

OR

Q8) a) A section line AB appears to be 11.16 cm on a photograph for which the focal length is 17 cm . The corresponding line measures 2.64 cm on a map which is to a scale $1:50000$.The terrain has an avg. elevation of 200 m above Mean Sea Level. Calculate flying height of aircraft, above Mean Sea Level, when the photograph was taken. [9]

b) What are the various methods of determining scale of Vertical photograph? [9]

Q9) a) Explain use of remote sensing in Civil Engg. Also Compare Arial photograph with satellite images. **[8]**

b) What is GIS? Explain in detail the component parts of GIS. **[8]**

OR

Q10)a) Write a note on : **[8]**

i) Atmospheric windows.

ii) Active and Passive remote sensing.

b) Explain in detail applications and limitations of GIS. **[8]**



Total No. of Questions : 10]

SEAT No. :

P2396

[Total No. of Pages : 4

[5253]-107

T.E. (Civil)

**PROJECT MANAGEMENT AND ENGINEERING ECONOMICS
(2012 Pattern) (Semester - II)**

Time : 2½ Hours]

[Max. Marks : 70

Instruction to the candidates:

1) Answer 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.

- Q1)** a) Enlist the objectives and importance of Project management. [6]
b) Define delegation of Authority and comment on Authority and responsibility should go hand in hand. [4]

OR

- Q2)** a) Explain importance of Work break down structures with help of construction related example. [5]
b) Construct network diag. find expected project duration and variance of each activity for the data as follows. [5]

Activity	Duration (Months) (a, m, b)	Activity	Duration (Months) (a, m, b)
1-2	3,4,5	3-5	3,5,8
2-3	1,2,4	4-5	4,6,9
2-4	5,8,10	5-6	5,9,11

P.T.O.

- Q3) a)** A project takes 30 days along the critical path and has standard deviation of six days. What is the probability of completion the project within [6]
- i) 40 days
 - ii) 30 days
 - iii) 35 days

(Take for $Z = 1.6$ value of Pr. = 94.5% and for $Z = 1.7$ value of Pr. = 95.5%)
 (Take for $Z = 0.8$ value of Pr. = 78.8% and for $Z = 0.9$ value of Pr. = 81.6%)

- b) Differentiate between AOA and AON networking methods. [4]

OR

- Q4) a)** What are the methods of manpower planning? Explain in brief. [4]

- b) Following data related to small construction work, Draw time grid diagram and manpower requirement per day. [6]

Activity	Duration (Days)	Men
1-2	3	2
1-3	4	5
1-4	7	3
2-3	0	0
3-5	6	4
4-5	4	3

- Q5) a)** Explain the following laws with suitable diagram. [8]

- i) Law of demand and supply
- ii) Law of diminishing marginal utility

- b) Discuss importance of economics in construction industry. [4]

- c) What do you understand by debt capital and equity capital. [4]

OR

Q6) a) Write a short note on : **[8]**
 i) Time value of money.
 ii) Types of capital.

b) What are the factors affecting on price determination? **[4]**

c) Explain the factors affecting on demand and supply. **[4]**

Q7) a) What are the objectives of material management and functions of purchase dept.? **[6]**

b) Define EOQ and Derive the expression for it. **[6]**

c) The annual demand for the product is 20,000 units. The unit cost is Rs. 10/-. The annual inventory carrying cost per unit per annum is 20% of avg. inventory cost. If the cost of procurement is Rs. 75/- **[6]**

Determine

i) EOQ

ii) No. of orders per annum

iii) Total cost of purchasing.

OR

Q8) a) Write a note on material procurement process in any organization. **[6]**

b) What points should you consider while making safety programme on site of highway construction? **[4]**

c) “Surya enterprise” carries the following items. Segregate the items based on their annual usage and plot ABC curve. **[8]**

Sr. No.	Item	Annual Consumption	Cost in Rs. per unit
1	Journal pages	1,000 rim	100/-
2	Note book 100 pgs.	4,000 nos.	30/-
3	Note book 200 pgs.	2,000 nos.	40/-
4	Pens	20,000 nos.	3/-
5	Pencil	30,000 nos.	5/-
6	Chocolates	5,000 pkts.	50/-
7	Soap	4,000 nos.	10/-

- Q9)** a) What are the different types of appraisals required to undertake any Project? Explain any one in detail. [6]
- b) Write a note on break even analysis and find out BEQ and break even sales If fixed cost is 60 lakh. Variable cost per unit is Rs. 70/- and selling price per Unit is 150/- [6]
- c) Write a short note on any one : [4]
- i) Payback period.
 - ii) Annuity.

OR

- Q10)**a) What do you understand by NPV and B/C ratio method? Compare the project by both method and state its feasibility if project cost is Rs.2,50,000 has net cash flow of Rs.25,000 for a period 5 years. Firm expects returns at 10 % per annum. [8]
- b) Write a short note on any two : [8]
- i) IRR method.
 - ii) Break even analysis.
 - iii) Detailed project report (DPR).



Total No. of Questions : 12]

SEAT No. :

P2397

[Total No. of Pages : 2

[5253] - 108

T.E. (Civil) (Semester - II)

FOUNDATION ENGINEERING

(2012 Pattern)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer 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 and Q.11 or Q.12.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary and mention it clearly.

SECTION - I

Q1) Explain electrical resistivity method with respect to **[6]**

- a) Principle
- b) Procedure
- c) Sketch
- d) Limitations

OR

Q2) Discuss how you will determine the depth and number of boreholes for important projects. **[6]**

Q3) Explain plate load test with respect to **[7]**

- a) Procedure
- b) Sketch
- c) Limitations

OR

Q4) Using Terzaghi's theory, compute the safe bearing capacity of a footing of size 5m × 3m located at a depth of 1.5m below the ground level in a loose sand of average density of 16 kN/m³. Take $\phi = 35^\circ$, $N_c = 46.13$, $N_q = 33.3$, $N_\gamma = 40.71$. Assume factor of safety = 3 and water table very deep. **[7]**

Q5) a) Define contact pressure. Draw a diagram showing the variation of contact pressure for a rigid footing on clay and sand. **[3]**

- b) Explain with a neat sketch spring analogy for demonstrating consolidation process. **[4]**

OR

P.T.O.

- Q6)** In a consolidation test, the void ratio of the specimen, which was 1.068 under the effective stress of 214 KN/m², changed to 0.994 when the pressure was increased to 429 KN/m². Calculate the coefficient of compressibility, compression index and coefficient of volume compressibility. [7]

SECTION - II

- Q7)** a) Explain 'cyclic pile load' test. [6]
b) What is the effect of negative skin friction on pile? How it can be reduced? [5]
c) Enlist the types of piles according to function. [5]

OR

- Q8)** a) What is caisson? Enlist its uses. [4]
b) Enlist the advantages and disadvantages of drilled piers. [6]
c) A circular pile section with 0.35 m diameter and length of 10 m penetrates into a clay having $c = 50$ kN/m² and mobilization factor = 0.8. Calculate the safe load with factor of safety = 2.5. Neglect the bearing resistance. [6]

- Q9)** a) Explain the terms with sketches [6]
i) free earth support and
ii) fixed earth support in sheet piles.
b) What is anchored sheet pile? Enlist and draw any four types of anchors. [5]
c) Discuss any three types of cofferdams. [6]

OR

- Q10)** a) Explain any three engineering problems associated with black cotton soil. [6]
b) Write a note on 'stone column'. [6]
c) Draw a neat sketch of 'under reamed pile' and name all the parts. [5]

- Q11)** a) Explain with a neat sketch, the mechanism of reinforced soil. [6]
b) Explain any three types of geosynthetics. [6]
c) Explain the use of geosynthetics in bearing capacity improvement. [5]

OR

- Q12)** a) What do you mean by 'Liquefaction'? What are its effects on built environment? [6]
b) Explain different types of seismic waves. [6]
c) Explain how possibility of Liquefaction can be reduced? [5]



Total No. of Questions : 12]

SEAT No. :

P3950

[Total No. of Pages : 6

[5253]-109

T.E. (Civil Engineering)
STRUCTURAL DESIGN - II
(Semester - II) (2012 Pattern)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q,3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10 and Q11 or Q12.*
- 2) *Figures to the right Indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of IS 456-2000 and non programmable calculator is allowed.*
- 5) *Mere reproduction from IS code as answer; will not be given full credit.*
- 6) *Assume suitable data, if necessary.*

- Q1)** a) State the functions of longitudinal and transverse reinforcement in columns. **[3]**
- b) Explain with sketches, why does continuous T-beam at support have to be designed as rectangular section? **[3]**

OR

- Q2)** Draw strain and stress distribution diagrams with all parameters for the design of under reinforced section of flexural member using L.S.M. Also obtain the equations of **[6]**
- i) Depth of neutral axis.
 - ii) Ultimate moment of resistance from compression in concrete.
 - iii) Ultimate moment of resistance from tension in steel.

- Q3)** Calculate the moment of resistance safe imposed UDL (by LSM) that the simply supported beam can carry for flanged beam section detailed as below **[8]**
- i) Width of rib = 300mm
 - ii) Effective flange width = 1500mm
 - iii) Thickness of flange = 130mm
 - iv) Effective depth = 410mm
 - v) Tension steel = 2 – #20 through plus 2 – #16 curtail at midspan.
 - vi) Use M25 grade of concrete and Fe 500 grade of steel.

OR

P.T.O.

Q4) A rectangular, singly reinforced beam, 230mm wide and 567mm effective depth is used as a simply supported beam over an effective span of 7m. The reinforcement consists of 4 bars of 16mm diameter at tension face, If the beam carries a Load of 14kN/m. inclusive of its self weight. Determine, the stresses developed in concrete and steel using WSM. Use M20 concrete and Fe415 steel, [8]

Q5) Design continuous one way slab of four span - S1, S2, S3 and S4 with clear short spans 3.0m, 3.2m 3.4m and 3.1m in, respectively. The slabs are supported by beams of width 230mm along all the edges. The slab is subjected to floor finish of 2kN/m² and live load 4kN/m². Use Concrete of grade M25 and Fe 500 reinforcement for moderate exposure condition. Draw details of reinforcement. [12]

OR

Q6) Design flight I and II of open well staircase for following data:

Riser = 150mm, Tread = 250mm, Clear size of staircase hall is 3.5 × 4.25m.

No. of risers: Flight I : 8 nos; Flight II : 5 nos; Flight III : 8 nos.

Width of Stair and landing = 1500mm, Flights I and III are with landing only on one side, whereas Flight II is with landing on both sides.

Material M25 & Fe500, Width of all beams is 230mm.

Draw the reinforcement details in sectional elevation for both flights. [12]

Q7) Continuous RC beam ABCD of rectangular section is simply supported at A and D and continuous over support B and C. Span AB = 6.0m. BC = 4.0m and CD = 7.0m. The beam carries dead load of 20 kN/m (including its self weight) and live load of 17 kN/m. The beam supports 120mm slab on both sides. Calculate design moment for span BC after 22% redistribution of moments by considering proper load case. Design span BC for flexure and shear. Draw the reinforcement details.

Material- Concrete of grade M25, Fe 500 reinforcement. [12]

OR

Q8) Design a continuous beam ABCDE for flexure only using IS Code coefficients. AB=BC=CD=DE = 4.5m. The beam supports 120mm slab on both sides. The beam carries dead load of 24 kN/m (including its self-weight) and live load of 12 kN/m.

Take material M30 and Fe500. Show the reinforcement detail in longitudinal section and cross-section at continuous support and at mid span. [12]

Q9) A rectangular RC beam of span 6m. size 230 mm × 450 mm with effective cover 36mm is subjected to following actions:

I) Factored BM = 86 kN.m

II) Factored SF = 90 kN

III) Factored Torsional Moment = 36 kN.m

Design the beam for flexure and shear using M 20 & Fe 415 grade materials. [16]

OR

Q10) Design an axially loaded short column to carry a working load of 1000 kN. The unsupported length of column is 3.6m. The column is fixed at both the ends. Also design the footing for this column only for flexure and one way shear. Take SBC = 240 kN/m².

Material M 30 and Fe 500 used. Show detailed load and design calculations and reinforcement details in plan and sectional elevation. [16]

Q11) Design a bi-axial rectangular short column with material M25 and Fe 500 to carry a working load of 800 kN. Working moment of 100 kN-m about major axis bisecting the depth of column and 50 kN-m about minor axis bisecting the width of column. The unsupported length of column about major and minor axis is 3.4m and 3.1m. The column is fixed at one end and hinged at the other. Show detailed design calculations and reinforcement details. [16]

OR

Q12) Design an uniaxial square short column with material M25 and Fe 500 to carry ultimate load of 1000 kN and working moment of 120 kN-m about major axis bisecting the depth of column. The unsupported length of column is 4.2m, The column is fixed at one end and hinged at the other. Also design the footing for this column only for flexure and punching shear. Take SBC = 200 kN/m², Show detailed design calculations and reinforcement details in plan and sectional elevation. [16]

Chart - 13 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.

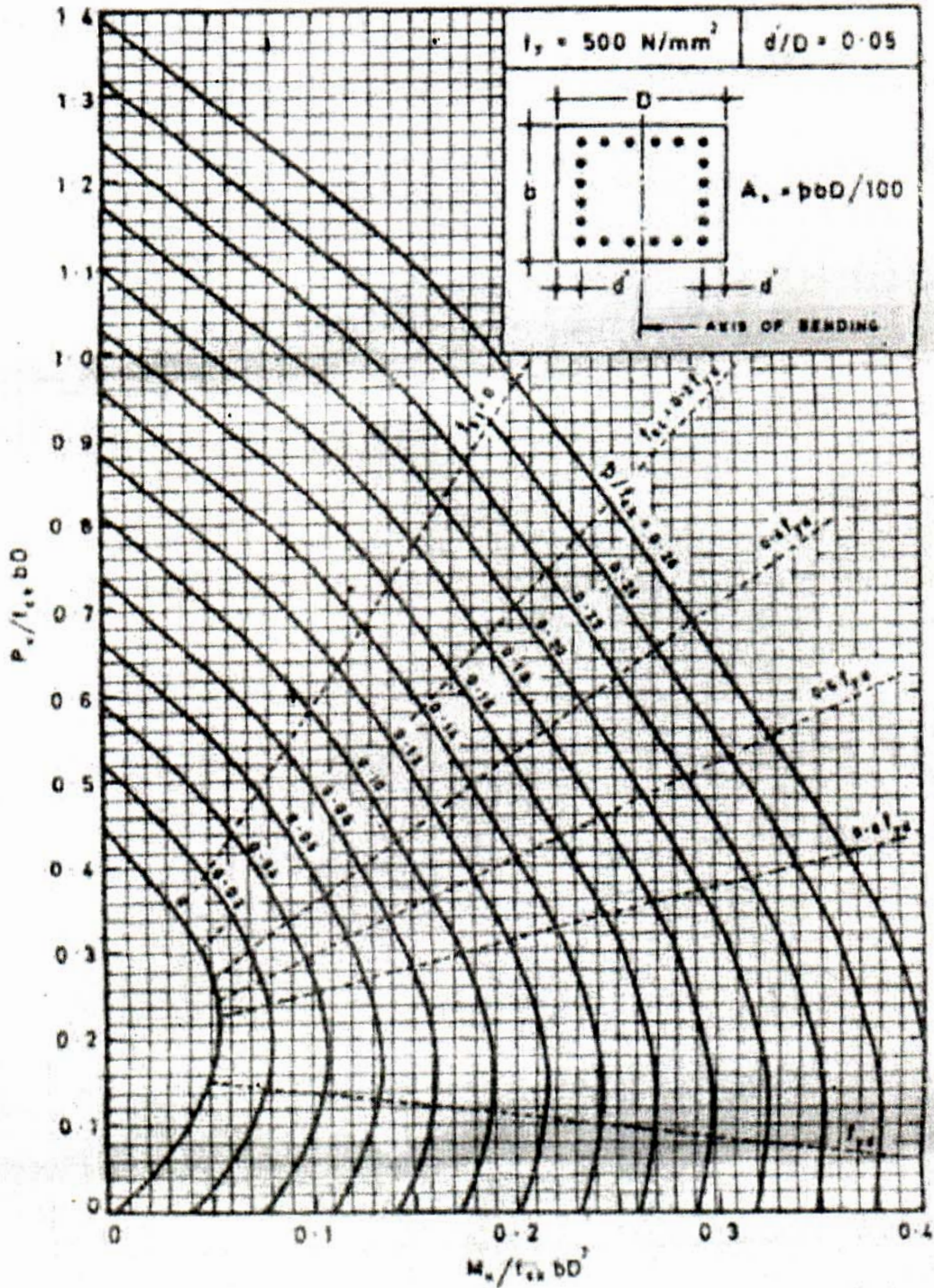


Chart - 14 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.

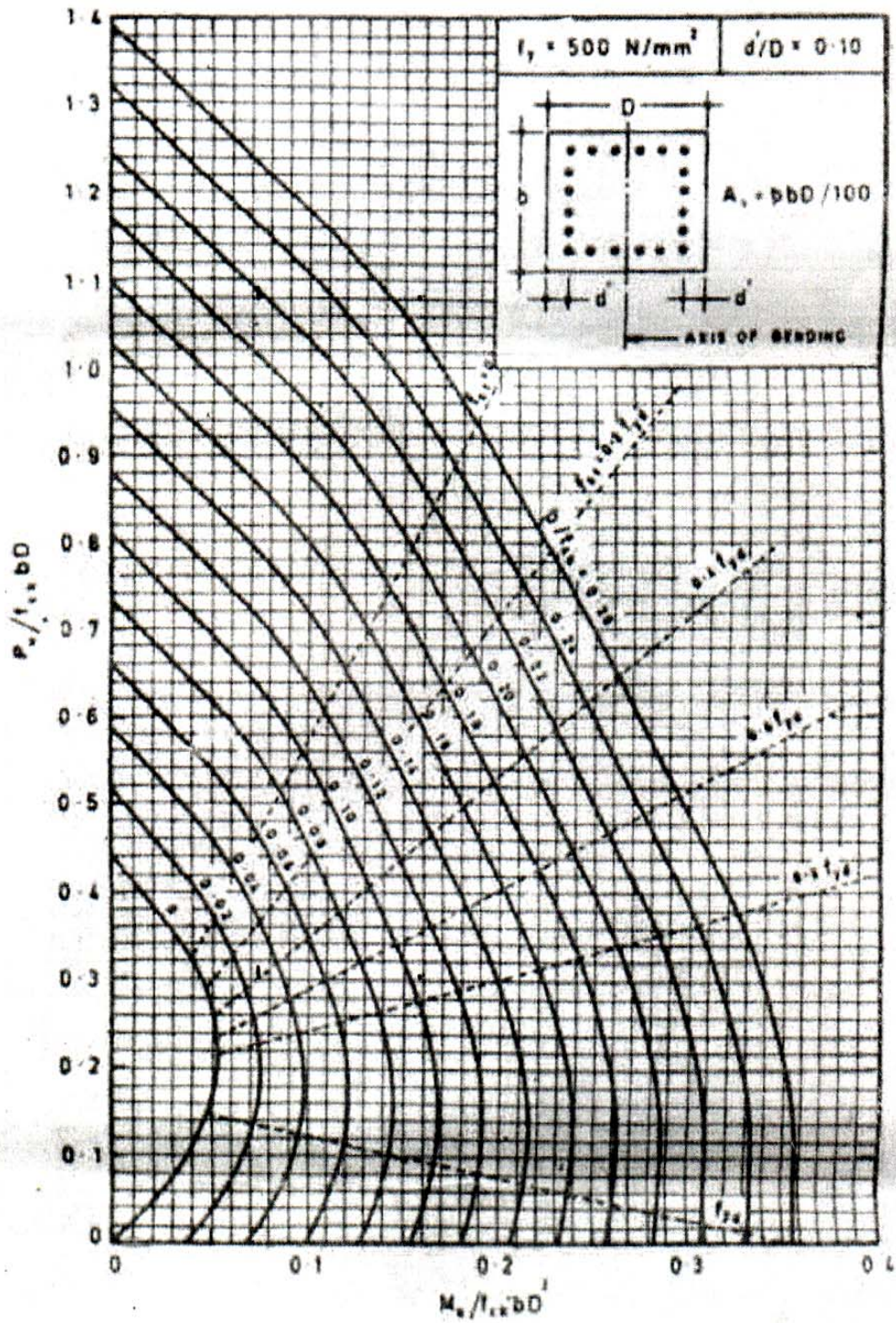
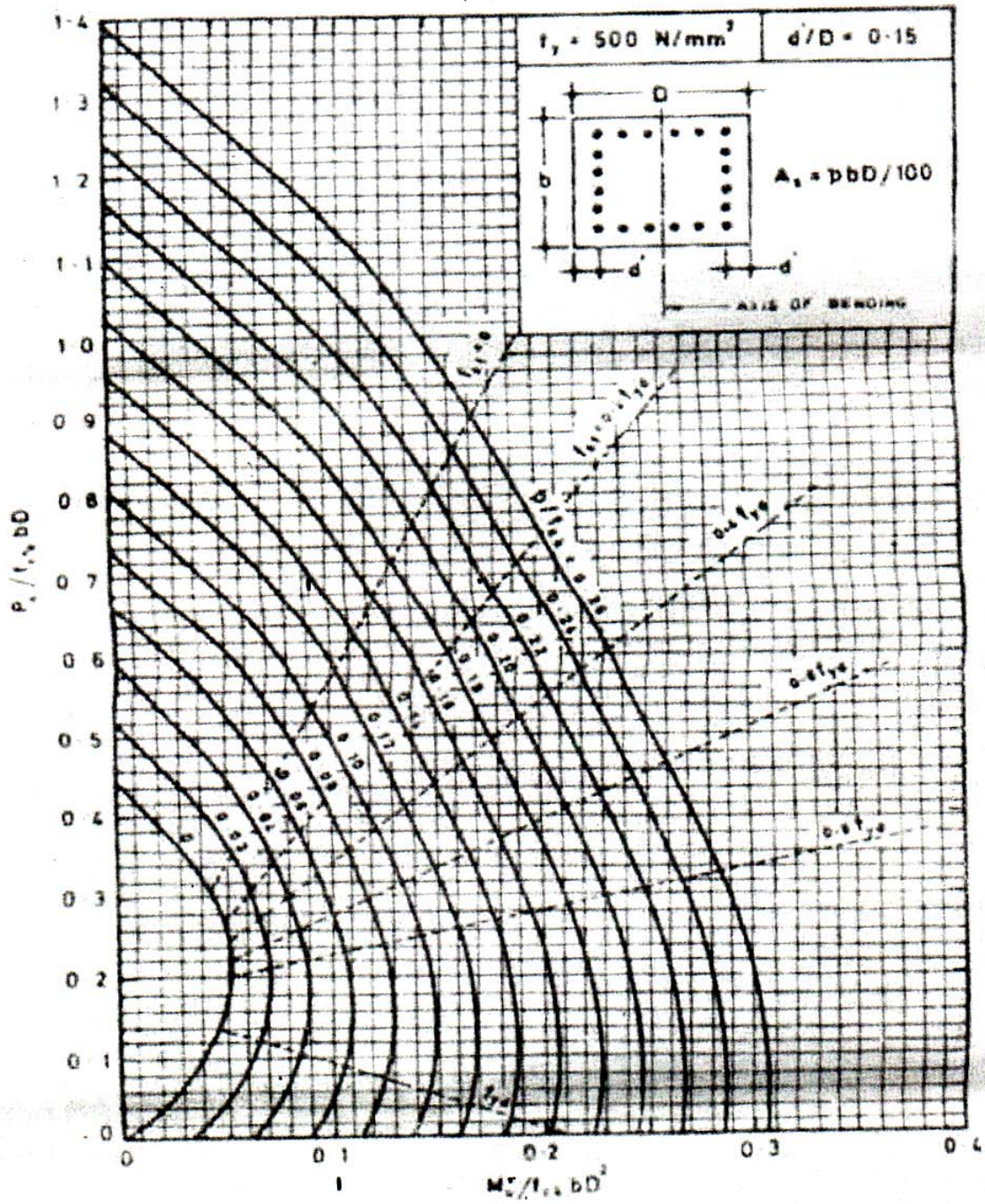


Chart - 15 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.



Total No. of Questions : 10]

SEAT No. :

P2398

[Total No. of Pages : 3

[5253]-110

T.E. (Civil)

ENVIRONMENTAL ENGINEERING - I
(2012 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Enlist various methods for control of gaseous pollutants. Explain anyone. **[6]**

- b) Explain the following terms : **[4]**
- i) Noise
 - ii) Wave length of sound
 - iii) Threshold of hearing
 - iv) Sound.

OR

Q2) a) River water supply is treated by the sequence of unit operations, draw flow sheet for the same and state the purpose or purposes of the each unit process. **[8]**

b) Discuss the factors affecting the design period. **[2]**

Q3) a) Explain with a neat sketch various types of settling observed during sedimentation. **[6]**

b) Mention the types of Aerators and also write down the objectives of aeration. **[4]**

OR

P.T.O.

- Q4)** a) Explain Tube settler with a neat sketch. [6]
 b) Discuss various physical characteristics of water. [4]

- Q5)** a) What is coagulation? Mention various factors affecting coagulation. Write chemical reactions of any three coagulants with water. [8]
 b) Calculate the dimensions of Rapid sand filter for one lakh population with 150 liter/capita/day of water supply. Filtration rate equal to 100 liter/min/m² and mean size of sand is 1.5 mm. Find the depth of sand bed for head loss of 2.0 m if break through index is 0 .002. [8]

OR

- Q6)** a) Enlist and explain various operational troubles in rapid sand gravity filter and also remedial measure for the same. [8]
 b) A water treatment plant is to treat a design discharge of 65.0 MLD. It has paddle flocculators 24m long, 15m wide and 4m deep. It is fitted with four horizontal shafts to which revolving paddles are attached which rotates at 1.5 rpm. Each shaft supports 4 paddles which are 14m long, 20cm wide and centered 1.5m from the shaft. Using mean velocity of flow of water as 30% of the paddle velocity, temperature of water = 20°C and Cd = 1.9. [8]

Determine :

- i) difference in velocity between paddle and water
 ii) mean velocity gradient
 iii) detention time.
- Q7)** a) Compare Lime soda process with Zeolite process by considering various points. [8]
 b) A raw water sample contains the following impurities [8]

CaCO ₃ = 200 mg/l	MgCl ₂ = 15 mg/l
Mg(HCO ₃) ₂ = 120 mg/l	MgSO ₄ = 100 mg/l
CaSO ₄ = 100 mg/l	NaCl = 25 mg/l
Fe ₂ O ₃ = 40 mg/l	SiO ₂ = 30 mg/l

Compute the annual requirement of slaked lime and soda, for treating the 80000 lit/day of water .The purity of slaked lime is 85%.

OR

- Q8)** a) Discuss various requirements of good disinfectant. Mention methods of disinfection and factors affecting the efficiency of disinfection. [8]
- b) Why fluoridation and de-fluoridation is essential? Discuss different methods. [8]

- Q9)** a) Mention requirements of good distribution system. Also discuss pressure in distribution mains. [8]

- b) A town with population of one million has a continuous water supply. Water is supplied at the rate of 250l pcd. Breakup of the water demand is as follows : [10]

Time	Liter/per Capita/day
4:30 am to 11:30 am	92
11:30 am to 4:30 pm	51
4:30 pm to 9:30 pm	76
9:30 pm to 12:30 am	21
12.30 a m to 4.30am	10

Water is supplied from the treatment plant at uniform rate for all 24 hours. Find the balancing capacity of the reservoir by mass curve method.

OR

- Q10)** Discuss the following : [18]

- a) Wastage of Water- Detection and Prevention.
- b) Methods of Rain water harvesting.
- c) Intermittent system and its drawbacks.



Total No. of Questions : 10]

SEAT No. :

P2399

[Total No. of Pages : 4

[5253]-111

T.E. (Mechanical) (Semester - I)

DESIGN OF MACHINE ELEMENTS - I

(2012 Pattern)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary, and mention it clearly.
- 5) Use of Electronic Pocket calculator is allowed.

Q1) a) Define “design of machine element”. Explain any four general considerations for design of machine elements. [6]

b) A factory line shaft is to transmit 75 kW at 200 rev/min. The maximum allowable twist is 1 degree in a length of 20 diameters. Determine the required shaft diameter. Take $G = 84 \text{ GPa}$. [4]

OR

Q2) a) Two rods are connected by means of a cotter joint. The inside diameter of socket and outside diameter of socket collar are 50 and 100 mm respectively. The rods are subjected to a tensile force of 50 kN. The cotter is made of steel 30C8 ($S_{yt} = 400\text{N/mm}^2$) and factor of safety is 4. The width of cotter is five times of thickness. Calculate: [6]

- i) Width and thickness of the cotter on the basis of shear failure; and
- ii) Width and thickness of the cotter on the basis of bending failure.

b) Explain design of shafts based on [4]

- i) Torsional rigidity
- ii) Lateral rigidity.

P.T.O.

- Q3) a)** Suggest suitable coupling in the following cases: [2]
- Precise alignment between two shafts.
 - Shafts having intersecting axes.
- b) A machine component is subjected to a flexural stress which fluctuates between $+300 \text{ MN/m}^2$ and -150 MN/m^2 . Determine the value of minimum ultimate strength according to [8]
- Geber relation
 - Soderberg relation
 - Modified Goodman relation
- Take yield strength = 0.55 Ultimate strength,
Endurance strength = 0.5 Ultimate strength and factor of safety = 2.

OR

- Q4) a)** What are the criteria to use splined shafts? Give any two applications of splined shaft. [2]
- b) A rotating bar made of steel 45C8 ($S_{ut} = 630 \text{ N/mm}^2$) is subjected to completely reversed bending stress. The corrected endurance limit of bar is 315 N/mm^2 . Calculate the fatigue strength of the bar for a life of 90,000 cycles. [8]
- Q5) a)** How does the helix angle and coefficient of friction influence on the efficiency of square threaded screw? [4]
- b) The lead screw of a lathe is of Acme threads with outside diameter 52 mm and pitch of 8 mm. In order to drive the tool carriage, the screw must exert an axial force of 2200 N. The axial thrust is carried on a collar with 30 mm inner and 60 mm outer diameter. The coefficient of friction between the lead screw and split nut is 0.15, and that for collar bearing is 0.12. [12]
- Determine the power required to drive screw at 40 rpm.
 - What is the efficiency of the lead screw?

OR

Q6) a) State what types of screw threads will you select for following applications giving reasons and also show the thread forms. [6]

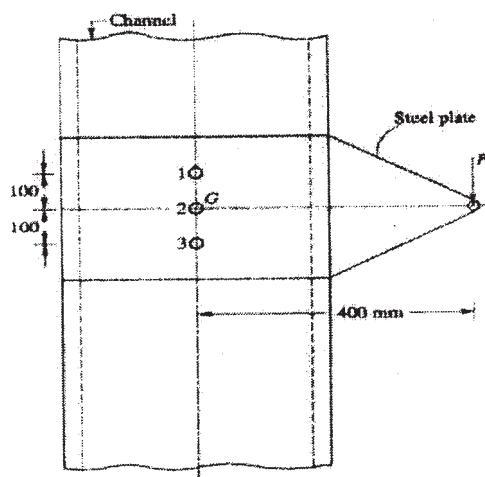
- i) Lathe lead screw
- ii) Screw jack
- iii) Machine vice

b) In a bench vice, the screw has a double start square thread of 25 mm nominal diameter in a coarse pitch series. The length of lever is 250 mm, and a force of 392.4 N is applied at the end of the lever. If the coefficient of friction between the screw and nut is 0.14, what is the force on job through jaws? State screw is overhauling or not? [10]

Q7) a) Derive the relation for [6]

- i) Strength of parallel fillet weld
- ii) Strength of single transverse fillet weld

b) Three M20 bolts are used to connect a steel plate with channel section structural member, as shown in figure. The material of the bolt is 50C4 with $S_{yt} = 530.80\text{MPa}$. Factor of safety is 2.0. How much eccentric load (P) can be carried by the steel plate? [10]



Figure

OR

- Q8) a)** Discuss the bolt of uniform strength with neat sketch. [6]
- b) A solid rectangular bar of cross-section 80 mm (horizontal) by 50 mm (vertical) is welded by a 5 mm fillet weld on all sides to a flat plate, with axis perpendicular to the plate surface. Find the maximum torque that can be applied to the bar, if the shear stress in the weld is not to exceed 85 N/mm². [10]

- Q9) a) i)** Under what conditions is the use of concentric springs recommended? Give two practical examples.
- ii) Under what conditions a leaf spring is preferred over a coil spring? Give two practical examples. [8]

- b) A bumper, consisting of two helical steel springs of circular section, brings to rest; a railway wagon of mass 1500 N, and moving at 1.2 m/s. While doing so, the springs are compressed by 150 mm. The mean diameter of coils is 6 times the wire diameter. The permissible shear stress is 400 MPa. Determine [10]
- i) Maximum force on each spring.
- ii) Wire diameter of the spring
- iii) Mean diameter of coils
- iv) Number of active coils
- Take $G = 0.84 \times 10^5$ MPa

OR

- Q10)a)** What are objectives of series and parallel connections of springs? Derive the relation for spring stiffness when springs in series and parallel. [8]
- b) A concentric spring is subjected to a load of 12.67 kN. Inner spring is 13 mm shorter than outer spring. Find the stress developed inside both the springs using following data : [10]

Description	Outer spring	Inner spring
Outside diameter of coil of spring (mm)	180	90
Number of active turns	8	14
Wire diameter (mm)	20	10
Modulus of rigidity (MPa)	81550	80335



Total No. of Questions : 10]

SEAT No. :

P2400

[Total No. of Pages : 4

[5253]-112

T.E. Mechanical

HEAT TRANSFER

(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve 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.
- 2) Draw neat diagrams wherever necessary.
- 3) Use of scientific calculator is allowed.
- 4) Assume suitable data wherever necessary.
- 5) Figures to the right indicate full marks.

Q1) a) Derive an expression for critical radius of insulation of cylinder. [6]

b) Explain physical significance of Biot number and Fourier number. [4]

OR

Q2) a) Explain Thermal Resistance and Thermal Conductance. [4]

b) A 1 meter long nichrome wire dissipates 10 kW neat to surrounding fluid at 80°C. Find the diameter of wire if the maximum permissible operating temperature is 1000°C. Take $k = 60\text{W/mK}$ and $h = 1000\text{W/m}^2\text{K}$. [4]

c) Write three dimensional heat conduction equation in cylindrical coordinates. [2]

Q3) a) Write a note on heat flux boundary condition and radiation boundary condition. [4]

b) Derive an expression for fin efficiency of fin with insulated tip. [6]

OR

P.T.O.

Q4) a) A thermo couple junction of spherical form is to be used to measure the temperature of a gas stream. The junction is initially at 20°C and is placed in gas stream which is at 200°C. Determine the junction diameter needed for the thermo couple to have time constant of 1 second. Also calculate the time required for the thermo couple to reach temperature of 197°C.

Assume thermophysical properties as : $k = 20 \text{ W/mK}$, $h = 350 \text{ W/m}^2\text{K}$, $c = 400 \text{ J/kgK}$, $\rho = 8000 \text{ kg/m}^3$. [6]

b) Hot water is to be cooled as it flows through the tubes exposed to atmospheric air. Fins are to be attached in order to enhance heat transfer. Would you recommend attaching the fins inside or outside the tubes? Why? [4]

Q5) a) Explain physical significance of Nusselt number and Grashof number. [4]

b) Explain Thermal Boundary Layer and Velocity Boundary Layer. [4]

c) CPU of a PC has dimensions of 10cm × 50cm × 40cm (height). Surface temperature of CPU is 39°C and is kept in still air at 15°C. Neglecting heat transfer from bottom surface, find rate of heat transfer from (i) all four vertical surfaces and (ii) top surface properties of air at 300k:

$$\rho = 1.1614 \text{ kg/m}^3,$$

$$C_p = 1.007 \text{ kJ/kgK}$$

$$\nu = 15.89 \times 10^{-6} \text{ m}^2/\text{s}$$

$$K = 0.0263 \text{ W/mK}$$

$$Pr = 0.707$$

Use following correlations : [8]

$$\left. \begin{aligned} N_u &= 0.59 Ra^{1/4} & 10^4 < Ra < 2 \times 10^9 \\ &= 0.1 Ra^{1/3} & 10^9 < Ra < 10^{13} \end{aligned} \right\} \text{ For vertical}$$

$$\left. \begin{aligned} N_u &= 0.54 Ra^{1/4} & 10^5 < Ra < 2 \times 10^7 \\ &= 0.14 Ra^{1/3} & 2 \times 10^7 < Ra < 2 \times 10^{10} \end{aligned} \right\} \text{ For horizontal}$$

OR

- Q6)** a) Define and give significance of any two dimensionless numbers used in forced convection. [6]
- b) Sketch development of velocity boundary layer for laminar flow in a tube. Label the sketch. [4]
- c) Water is heated while flowing through a rectangular duct $20\text{cm} \times 4\text{cm}$ at a velocity of 2 m/s . Temperature of water at inlet is 30°C . Duct walls are maintained at 110°C . Find length of duct required for raising water temperature by 45°C .

Use following properties & correlation. [6]

$$\rho = 986\text{ kg/m}^3$$

$$\nu = 0.518 \times 10^{-6}\text{ m}^2/\text{s}$$

$$k = 0.655\text{ W/mK}$$

$$N_u = 0.023 R_e^{0.8} Pr^{0.4}$$

$$C_p = 4180\text{ J/kgK}$$

$$Pr = 3.28$$

- Q7)** a) Write the statements and mathematical expressions for the following laws in radiation heat transfer : [6]
- Planck's law
 - Wien's law
 - Kirchoff's law
- b) Write a note on 'Radiation Shields'. [4]
- c) A black body emits radiation at 2000K . Calculate : [6]
- the monochromatic emissive power at $1\mu\text{m}$ wavelength
 - wavelength at which emission is maximum, and
 - the maximum emissive power

OR

- Q8)** a) What is shape factor? Explain its reciprocity theorem, summation theorem. [6]
- b) Find out heat transfer due to radiation between two infinitely long parallel planes. One plane has emissivity of 0.4 and is maintained at 200°C. Other plane has emissivity of 0.2 and is maintained at 30°C. If a radiation shield ($\epsilon = 0.5$) is introduced between the two planes, find percentage reduction in heat transfer rate and steady state temperature of shield. [6]
- c) What is gray body? How does it differ from black body? [4]

- Q9)** a) Explain different regimes in a pool boiling curve with a neat sketch. [6]
- b) Derive an expression for LMTD of counter flow heat exchanger. [6]
- c) Explain film wise and drop wise condensation. [6]

OR

- Q10)** a) Derive an expression for effectiveness of parallel flow heat exchanger. [8]
- b) Write a note on heat pipe. [4]
- c) Hot oil is used to keep water flowing at the rate of 0.1 kg/sec from 40°C to 80°C in a counter flow double pipe heat exchanger. For an overall heat transfer coefficient of 300 W/m²K, find heat transfer area if temperature of oil decreases from 105°C to 70°C. [6]



Total No. of Questions : 10]

SEAT No. :

P2401

[Total No. of Pages : 4

[5253]-113

T.E. (Mechanical/Automobile Engg./Mech. - S/W)

THEORY OF MACHINES - II

(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Compare the cycloidal and involute gear tooth profiles. **[6]**

b) Two involute gears of 20° pressure angle are in mesh. The speed of smaller gear is 1400 r.p.m. The number of teeth on pinion is 20 and gear ratio is 2.5. If the addendum of pinion and wheel is standard and equal to one module and module is 5 mm. find; **[6]**

- i) Length of path of contact.
- ii) Contact ratio.
- iii) Velocity of sliding at instant of contact ceases.

OR

Q2) a) A spiral gear drive, connecting two shafts, the approximate centre distance is 400 mm and the speed ratio = 2.5. The angle between the two shafts is 50° and the normal pitch is 20 mm. The spiral angle for the driving and driven wheels are equal. Find: **[6]**

- i) Number of teeth on each wheel.
- ii) Exact centre distance.
- iii) Efficiency of the drive, if friction angle = 6° .

P.T.O.

- b) A two start worm rotating at 950 rpm drives a 26 teeth worm gear. The worm has pitch diameter of 54 mm and a pitch of 20 mm. If the coefficient of friction is 0.06, find [6]
- The helix angle of the worm.
 - The centre distance.
 - The lead angle of maximum efficiency and maximum efficiency.

Q3) Fig.1 shows a gear train in which gear A is fixed. All the bevel gears of the system are identical. If the shaft I carrying the gear B on the arm as shown rotates at 1000 rpm in the counter clockwise direction as shown, determine the speed and direction of rotation of the shaft II. [8]

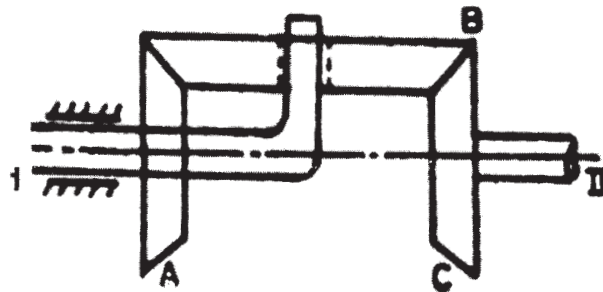


Figure 1

OR

Q4) Explain the following terms with the help of a neat sketch: [8]

- Compound and Reverted gear train.
- Differential gear box.

Q5) a) What are the various methods of speed regulation of speed and feed rate. Explain any one system with neat sketch. [6]

- b) An automobile car is travelling along a curved track of 200 m mean radius. Each of the four road wheels has a mass of 80 kg with a radius of gyration of 0.4 m. The rotating parts of the engine have a mass moment of inertia of 10 kg-m². The crank shaft rotates in the same direction as the road wheels. The gear ratio of the engine to the back wheels is 5:1.

The vehicle has a mass of 3000 kg and its C.G. is 0.5 m above the road level. The width of track of vehicle is 1.5 m. Calculate the limiting speed of the vehicle around the curve for all wheels to maintain contact with the road surface. The effective radius of wheels is 0.40 m. [10]

OR

Q6) a) Write short note on variators with axially displaceable cones. [6]

b) The turbine rotor of a ship has a mass of 2000 kg and rotates at a speed of 3000 r.p.m. clockwise when looking from a stern. The radius of gyration of the rotor is 0.5 m. [10]

Determine the gyroscopic couple and its effects upon the ship when the ship is steering to the right in a curve of 100 m radius at a speed of 16.1 knots. Calculate also the torque and its effects when the ship is pitching in simple harmonic motion, the bow falling with its maximum velocity. The period of pitching is 50 seconds and the total angular displacement between the two extreme positions of pitching is 12° . Find the maximum acceleration during pitching motion.

Q7) a) Explain the following terms related to kinematic synthesis [3]

- i) Type synthesis
- ii) Number synthesis and
- iii) Dimensional synthesis.

b) Synthesize a four-bar mechanism to generate a function $y = \sin x$ for $0 \leq x \leq 90^\circ$. The range of the output crank may be chosen as 60° while that of input crank be 120° . Assume three precision points which are to be obtained from Chebyshev spacing. Assume fixed link to be 52.5 mm long and $\theta_1 = 105^\circ$ and $\phi_1 = 66^\circ$. [13]

OR

Q8) a) Design a four bar mechanism to co-ordinate the input and output angles as follows: [6]

Input angles = 15° , 30° and 45° ;

Output angles = 30° , 40° and 55° .

Take the length of input link equal to one unit.

- b) Synthesis a slider crank mechanism by the method of inversion for its three positions $\theta_{12} = 20^\circ$, $\theta_{13} = 50^\circ$ of crank and corresponding three positions of slider $S_{12} = 18$ mm, $S_{13} = 48$, eccentricity is 15 mm and horizontal distance between fixed point and initial position of slider is 70 mm, when crank rotates in anticlockwise direction, find length of crank and connecting rod. [10]

Q9) It is required to set out the profile of a cam with oscillating follower for the following motion: [18]

- Follower to move outward through an angular displacement of 20° during 90° of cam rotation ;
- Follower to dwell for 45° of cam rotation;
- Follower to return to its original position of zero displacement in 75° of cam rotation
- Follower to dwell for the remaining period of the revolution of the cam.

The distance between the pivot centre and the follower roller centre is 70 mm and the roller diameter is 20 mm. The minimum radius of the cam corresponds to the starting position of the follower. The location of the pivot point is 70 mm to the left and 60 mm above the axis of rotation of the cam. The motion of the follower is to take place with S.H.M. during out stroke and with uniform acceleration and retardation during return stroke.

OR

- Q10)a)** Write short note on Jump phenomenon in cam system and obtain an expression for jump speed for eccentric cam operating a flat face follower. [8]
- What do you mean by Advanced Cam Curves? Explain 3-4-5 polynomial curve. [4]
 - Derive expressions for displacement for circular arc cam operating a flat faced follower, When the contact is on the flank. [6]



Total No. of Questions : 9]

SEAT No. :

P2402

[Total No. of Pages : 2

[5253] - 114
T.E. (Mechanical)
METROLOGY & QUALITY CONTROL
(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Draw a neat sketch of Vernier caliper and How to calculate least count of Vernier caliper give one example. **[4]**

- b) Write short notes on- **[6]**
- i) Types of standards.
 - ii) Electrical comparator (LVDT)

OR

Q2) a) write short notes on universal measuring machine **[5]**

b) Explain Angle Dekker with neat sketch. **[5]**

Q3) a) Explain Interferometry applied to flatness testing by using optical flat. **[5]**

b) Determine the dimensions and tolerances of shaft and hole having size of 30H 7f8 fit. (IT7=16i, IT8=25i, D is in a step 18-30mm, Fundamental deviation for f = $-5.5D^{0.41}$) **[5]**

OR

Q4) a) Derive an expression for best wire size for measuring effective diameter. **[6]**
Calculate Effective diameter and best wire diameter for M22×2.5 screw plug gauge by using Floating carriage Micrometer for which reading were taken as

Diameter of standard cylinder 20 mm

Micrometer reading over standard cylinder with two wire is = 15.9334mm

Micrometer reading over pulg screw gauge with two wire is=15.2245mm

- b) Write short notes on Gear tooth vernier caliper. **[4]**

Q5) a) Explain Deming's cycle and 14 point towards quality improvement. **[8]**

- b) Explain seven old quality tools. **[8]**

OR

P.T.O.

- Q6)** a) List Seven Quality Tools and explain with example Parato chart and Cause and effect diagram. [8]
 b) Discuss cost of quality and value of quality? Explain its types. [8]

- Q7)** a) The table given below shows the number of defectives found in inspection of 10 lots of 100 items each. [8]

Lot number	1	2	3	4	5	6	7	8	9	10
Number of defectives	6	3	1	4	3	0	11	5	2	3
Fraction defective	0.06	0.03	0.01	0.04	0.03	0.00	0.11	0.05	0.02	0.03

- i) Determine the control limits for P chart and state whether the process is in control.
 ii) If the point which goes outside the control limits is analyzed and eliminated, what will be the value of new control limits and revised fraction defective
 Total number of defectives = 38.
- b) Explain the following OC curve characteristics [8]
 i) Changing of lot size
 ii) Changing of sample size
 iii) Changing of acceptance number
 iv) Changing of sample size and acceptance number

OR

- Q8)** a) Compare Single and double sampling plan. [8]
 b) Define producer risk; consumer risk and AOQL and AOQ for the given data calculate sample size and AOQ for single sampling plan. [8]
 i) Probability of acceptance for 0.4% defective in a lot is 0.558
 ii) Lot size $N = 10000$
 iii) $np = 1.6$
 iv) Defectives found in the sample are not to be replaced

- Q9)** Explain the following terms (ANY THREE) [18]
 a) KAIZEN
 b) Six Sigma,
 c) FMECA,
 d) TQM,
 e) FIVE 'S'



Total No. of Questions : 8]

SEAT No. :

P2403

[Total No. of Pages : 4

[5253]-115

T.E. (Mechanical)

HYDRAULICS AND PNEUMATICS

(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 OR Q.2,Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Draw ISO symbols for the following components: **[6]**

- i) 4×2 pneumatically pilot operated spring offset DCV
- ii) Spring loaded accumulator
- iii) Pressure reducing valve
- iv) Unidirectional hydraulic motor
- v) Pressure and Temperature compensated flow control valve
- vi) Quick Exhaust valve

b) With a neat diagram, discuss Gear Pump as a Positive Displacement Pump. **[6]**

c) An 8 cm diameter hydraulic cylinder has a 4 cm diameter rod. If the cylinder receives flow at 100 LPM and 12 MPa, find the actuator speed and load carrying capacity in: **[8]**

- i) Extension stroke,
- ii) Retraction stroke.

P.T.O.

OR

- Q2)** a) Write in brief on sources of contamination and contamination control. [6]
b) What are the functions of reservoirs? Draw a neat sketch of standard reservoir showing its Internal and external features. [6]
c) Explain the applications of Double rod end and Telescopic cylinders. [8]

- Q3)** a) Classify different types of Pressure control valves used in the hydraulic circuits. Draw ISO symbol for each. [6]
b) Draw a hydraulic circuit for cylinder synchronization with two cylinders connected in parallel. State if it will give perfect synchronization. [6]
c) Draw regenerative circuit with a neat sketch. State its advantages. [6]

OR

- Q4)** a) With neat sketches, explain any three methods of DCV actuation. [6]
b) Draw actuator locking circuit with pilot operated check valves. State the function of pilot operated check valves. [6]
c) Draw a neat sketch of Pump unloading circuit. State function of unloading valve. [6]

- Q5)** a) Draw and explain throttle-out circuit used in pneumatics. [6]
b) Compare characteristics of hydraulic and pneumatic systems. [6]
c) Explain in short any two applications in industry requiring vacuum for their operation. [4]

OR

- Q6)** a) State the application of Twin-pressure Valve with a typical circuit. [6]
b) Can we use atmospheric air directly in pneumatic systems? If no, why? What should be done to make use of it? [6]
c) State any four applications of pneumatics in low-cost automation. [4]

Q7) Sequential operations of two pneumatic cylinders are required as follows:[16]

- a) Cylinder A extends
- b) Cylinder B extends
- c) Cylinder B retracts
- d) Cylinder A retracts

Develop a pneumatic circuit using pilot operated 4/2 DCV and roller operated valves. (Do not use sequence valves)

OR

Q8) a) A hydraulic cylinder is used to push an object in the forward stroke. The total load on the hydraulic cylinder during forward stroke is 15 kN. The forward speed is approx. 3.0 m/min. Total stroke of the cylinder is 300 mm. The load during the retraction stroke is negligible, and it is to be retracted as fast as possible. Provision is required to hold the cylinder anywhere in between the end positions. Draw a simple hydraulic circuit, using Meter-in speed control method, to fulfill the given objective. Select different components from the data given. Specify ratings of the components in case it is not available in the given data. [10]

b) Label the components and analyze the circuit shown in Figure 8b. [6]

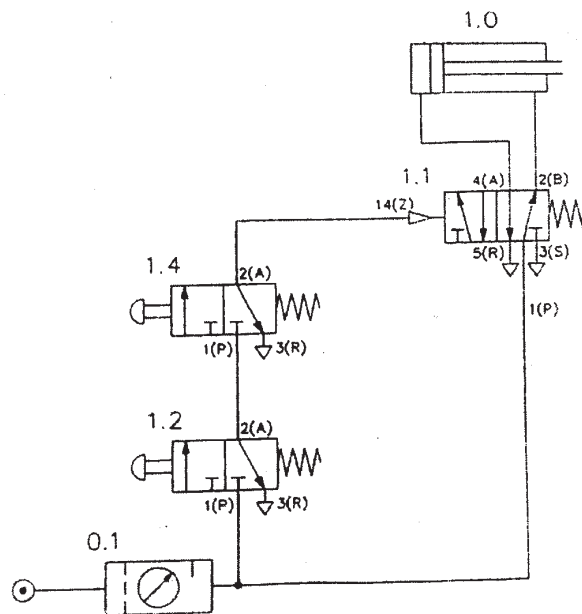


Figure 8b

DATA

1. Suction Strainer :

Model	Flow Capacity (/pm)
S ₁	38
S ₂	76
S ₃	152

2. Pressure Gauge :

Model	Range (bar)
PG ₁	0 - 25
PG ₂	0 - 40
PG ₃	0 - 100
PG ₄	0 - 160

3. Vane Pump :

Model	Delivery in / pm		
	at 0 bar	at 35 bar	at 70 bar
P ₁	8.5	7.1	5.3
P ₂	12.9	11.4	9.5
P ₃	17.6	16.1	14.3
P ₄	25.1	23.8	22.4
P ₅	39.0	37.5	35.6

4. Relief Valve :

Model	Flow capacity (/ pm)	Max Working Pressure & bar
R ₁	11.4	70
R ₂	19	210
R ₃	30.4	70
R ₄	57	105

5. Flow control Valve :

Model	Working Pressure (bar)	Flow Range (/pm)
F ₁	70	0-4.1
F ₂	105	0-4.9
F ₃	105	0-16.3
F ₄	70	0-24.6

6. Directional Control Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
D ₁	350	19
D ₂	210	38
D ₃	210	76

7. Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
C ₁	210	15.2
C ₂	210	30.4
C ₃	210	76

8. Pilot Operated Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
PO ₁	210	19
PO ₂	210	38
PO ₃	210	76

9. Cylinder-(Max Working Pressure-210 bar)

Model	Bore dia. (mm)	Rod dia (mm)
A ₁	25	12.5
A ₂	40	16
A ₃	50	35
A ₄	75	45
A ₅	100	50

10. Oil Reservoirs :

Model	Capacity (litres)
T ₁	40
T ₂	100
T ₃	250
T ₄	400
T ₅	600



Total No. of Questions : 12]

SEAT No. :

P2404

[Total No. of Pages : 3

[5253] -116

T.E. (Mechanical/Automobile) (Semester - II)
NUMERICAL METHODS AND OPTIMIZATION
(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve 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) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of programmable calculator is not permitted.*
- 5) *Assume suitable data if necessary.*

Q1) An approximate value of π is given by $x_1 = \frac{22}{7} = 3.1428571$ & its true value is $x = 3.1415926$. Find the absolute & relative errors and define. [6]

OR

Q2) Find the root of equation $\log_{10} x - x^2 + 2 = 0$ by regula - falsi method correct to two decimal places. [6]

Q3) Draw the flowchart for Gauss elimination method. [6]

OR

Q4) Solve the following equations with Thomas algorithm. [6]

$$\begin{aligned}x_1 + 2x_2 &= 4 \\-x_1 + x_2 + 2x_3 &= 1 \\x_2 + 3x_3 + x_4 &= 7 \\2x_3 + 2x_4 &= 8\end{aligned}$$

P.T.O.

Q5) a) Minimize $Z = 80x_1 + 120x_2$ [5]
 Subject to $x_1 + x_2 \leq 9$

$$x_1 \geq 2$$

$$x_2 \geq 3$$

$$20x_1 + 50x_2 \leq 300$$

$$x_1, x_2 \geq 0$$

(use graphical method)

b) Using Newton's method calculate the maximum value of the equation $2\sin x - 0.1x^2$. Take initial guess 2.5 and do 3 iterations. [3]

OR

Q6) Maximize $z = 1600x + 1500y$ [8]

Subject to $5x + 4y \leq 500$

$$15x + 16y \leq 1800$$

$$x \geq 0, y \geq 0$$

(use simplex method)

Q7) a) Using the method of least square, fit the curve $y = ax^2 + \frac{b}{x}$ to the following data. [8]

x	1	2	3	4
y	-1.51	0.99	8.88	7.66

b) Find the value of y for $x = 0.5$ for the following table of x, y values using Newton's forward difference formula. [8]

x	0	1	2	3	4
y	1	5	25	100	250

OR

Q8) a) For the data given in following table find the equation to best fitting curve of the form $xy^a = b$. [8]

x	200	150	100	60	40	10
y	1	1.5	1.8	2.4	4.1	6.5

b) Draw the flow chart for Lagrange's interpolation. [8]

Q9) a) Use Simpson's 1/3rd rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking seven ordinates. [8]

b) Using Trapezoidal rule, evaluate $I = \int_1^2 \int_1^2 \frac{dx dy}{x+y}$ taking four sub-intervals. [8]

OR

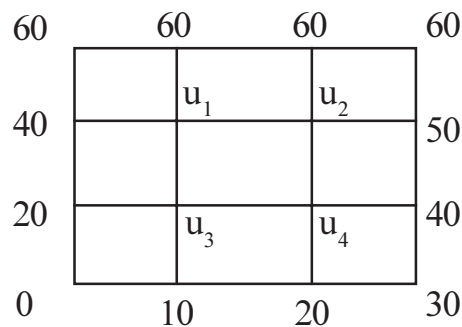
Q10) a) Draw flowchart for Gauss Legendre 2 point and 3 point method. [8]

b) Use Trapezoidal rule with four steps to estimate the value of integral

$$\int_0^2 \frac{x}{\sqrt{2+x^2}} dx \quad [8]$$

Q11) a) Draw flow chart for Euler method. [8]

b) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the square mesh as shown in diagram below. [10]



Q12) a) Write down step by step procedure for solution of PDE of Laplace equation and develop a flowchart to write a program. [8]

b) A second order ODE is transformed into first order ODE as,

$$\frac{dy}{dx} = z, y(0) = 2 \text{ and } \frac{dz}{dx} = 0.5x - y, z(0) = 0. \text{ Estimate the value of } y \text{ and } z \text{ at } x = 0.2 \text{ take } h = 0.1. \quad [10]$$



Total No. of Questions : 10]

SEAT No. :

P2405

[Total No. of Pages : 7

[5253]-117

T.E. (Mechanical) (Semester - II)

DESIGN OF MACHINE ELEMENTS - II

(2012 Pattern)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer 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.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Discuss why "tangential" component of gear tooth forces is called "useful" component & "radial" component is called " separating" component. **[4]**

b) The following data given for spur gear pair with 20° full depth involute system teeth. **[6]**

No. of teeth on pinion = 24

No. of teeth on gear = 56

Speed of pinion = 1200 rpm

Module = 3 mm

Service factor = 1.5, face width = 30 mm.

Both gears are made of steel with ultimate tensile strength of 600 N/mm². using velocity factor for Dynamic load calculate.

- i) Beam strength
- ii) Velocity factor

P.T.O

iii) Rated power without bending failure.

Factor of safety is 1.25

$$\text{Lewis factor } Y = \pi \left[0.154 - \frac{0.912}{Z} \right]$$

Where, Z = no. of teeth.

OR

Q2) a) What is the virtual No. of teeth on helical gear. **[4]**

b) A pair of parallel helical gear consist of 20 teeth pinion meshing with 100 teeth gear. The pinion rotates 720rpm. Normal pressure angle is 20° while helix angle is 25° . Face width is 40mm & normal module 4mm. The pinion made of plain carbon steel 55C8 ($S_{ut} - 580 \text{ N/mm}^2$) mesh with gear made of plain carbon steel 40C8 ($S_{ut} - 580 \text{ N/mm}^2$) & heat treated surface hardness is 300 BHN & 350 BHN resp. The service factor & factor of safety is 1.5 & 2.0 resp. Assume velocity factor for dynamic load & calculate power transmitting capacity of gear use following data: **[6]**

$$\text{Lewis factor } Y' = 0.484 - \frac{2.87}{Z'}$$

$$\text{Loud stress factor } K = 0.16 (\text{BHN}/100)^2$$

$$\text{Velocity factor } C_v = \frac{5.6}{5.6 + \sqrt{v}}$$

Q3) a) A pair of straight bevel gear consists of 28 teeth pinion meshing with 42 teeth gear. If the shaft angle is 90° determine following: **[4]**

- i) PCD of pinion & gear.
- ii) Pitch cone distance.
- iii) Pitch cone Angle of pinion & gear.

iv) Mean radii of pinion & gear.

Assume module $m = 5\text{mm}$ & $b = 40\text{ mm}$.

- b) A pair of straight bevel gear with 20° pressure Angle consists of 20 teeth pinion meshing with 30 teeth gear. The module is 4mm while the face width is 20mm. The pinion & gear material has surface hardness of 400 BHN. The pinion rotates 720 rpm & receives 3kW power from a motor. Taking service factor of 1.5 & factor for dynamic loading determine factor of safety in pitting. [6]

OR

Q4) a) What is L_{10} & L_{50} life of Rolling contact bearing. [4]

- b) A ball bearing is operating on a work cycle consisting of three parts - a radial load of 3000 N at 1440 rpm for one quarter cycle, a radial load of 2500 N at 1440 rpm for the remaining cycle. The expected life of bearing is 10,000 h. Calculate the dynamic load carrying capacity of the bearing. [6]

Q5) a) Explain the Efficiency of worm & worm gear drive. [6]

- b) A worm transmit 3kW power at 1440 rpm & drives a gear having 60 teeth. The pitch circle diameter of worm is 90 mm & triple threaded. The module of worm gear is 4mm the worm is right handed & rotates in clockwise direction when seen from left. Assume worm is above the worm wheel. Calculate, [6]

i) Component of tooth forces.

ii) Efficiency of drive.

- c) Derive an expression for components of force acting on worm & worm gear. [6]

OR

Q6) a) Explain the following. **[6]**

- i) Lead
- ii) Diametral quotient
- iii) No. of starts of worm.
- iv) Lead Angle.

b) A pair of worm & worm wheel is designated as 2/72/10/6. the worm is transmitted 8 kW at 1800 rpm to worm wheel. The permissible bending stress is 110 N/mm². The wear load factor is 0.83N/mm². The coefficient of friction is 0.05 & Normal pressure angle is 20°, find: **[12]**

- i) Factor of safety in bending
- ii) Factor of safety in wearing.
- iii) Factor of safety in heat dissipation.

Use following data:

$$\text{Lewis factor } Y = 0.484 - \frac{2.85}{Z_G}$$

Z_G – No. of teeth on gear.

$$C_v = \frac{6}{6 + v}$$

$$\text{Input, kW} = \frac{a^{1.7}}{34.5(i + 5)}$$

Where, i = gear ratio

a = centre distance

Q7) a) Discuss stresses developed in wire ropes. **[4]**

b) Explain the procedure of selection of flat belt from manufacturing catalogue. [4]

c) It is required to select a flat belt drive to connect two transmission shaft rotating at 800 r.p.m. & 400 r.p.m. resp. The centre to centre distance between the shaft approximately 3.5 m & belt drive is open-type. The power transmitting by belt is 30 kW & load correction factor is 1.3. The belt should be operate at velocity between 17.8 to 22.9 m/s. The power transmitting capacity of belt per mm width per ply at 180° arc of contact & belt velocity of 5.08 m/s is 0.0147 kW. Select preferred pulley diameter & specify the belt. Use following data: [8]

- Standard pulley diameters: 90,100, 112, 125, 140 160, 180, 200, 224, 250, 280, 315, 355, 400, 450, 500, 560, 630, 710, 800, 900 mm

Arc of contact (θ)	120°	130°	140°	150°	160°	170°	180°
F_d	1.33	1.26	1.19	1.13	1.08	1.04	1.00

- No. of plies & standard belt width:

No. of ply	Std. belt width 'b'mm
4	40,44, 50, 63, 76, 90, 100, 125, 152
5	76,100,125,152

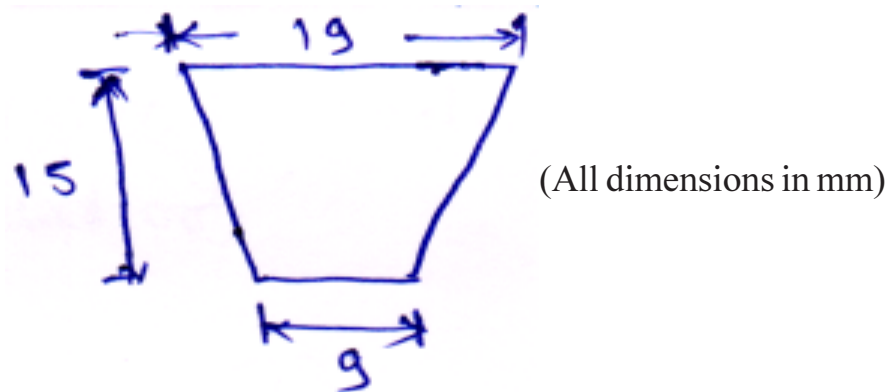
OR

Q8) a) Give the classification of chain drive, explain polygonal effect of chain. [4]

b) A V-belt drive is used to transmit 38 kW power from three phase induction motor to a centrifugal pump. Speed of motor is 1440 r.p.m. & centrifugal pump is required to operate at 360 rpm. For motor pulley pitch diameter is 225 mm & groove angle 32°. Centre distance between two pulley 1.5m. Coefficient of friction for the belt pulley combination is 0.2 & density of belt material is 970 kg/m³. Allowable tension in belt is 800 N. Determine. [8]

- No. of belt required
- Pitch length of belt.

Assume cross - section for belt As shown in fig.



- c) What are the different belt tensioning methods, explain any one with neat sketch. [4]

Q9) a) The following data is given for a 360° hydrodynamic bearing: [12]

Radial load = 3.2 KN, Journal speed = 1490 rpm. Journal diameter = 50 mm, Bearing length = 50 mm. Radial clearance = 0.05 mm, viscosity of lubricant = 25 cp Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing,

Calculate:

- i) Coefficient of friction
- ii) Power lost in friction
- iii) Minimum oil film thickness
- iv) Flow required in lit /min
- v) Temperature rise.

Refer table:

S	(l/d)	E	ho/c	ϕ	$\left(\frac{r}{c}\right) \cdot f$	$\left(\frac{Q}{r.c.n_s.l}\right)$	$\frac{Q_s}{Q}$	$\frac{P}{P_{max}}$
0.1212	1	0.6	0.4	50.38	3.22	4.33	0.680	2.409

- b) State assumptions made in deriving the 'Reynolds equation'. [4]

OR

- Q10)a)** Derive Petroff's equation for hydrodynamic bearing. **[8]**
- b) Explain significance of the following variable in connection with hydrodynamic bearing. **[8]**
- i) l/d ratio.
 - ii) Unit bearing pressure.
 - iii) Radial clearance.
 - iv) Minimum oil film thickness



Total No. of Questions : 10]

SEAT No. :

P2406

[Total No. of Pages : 4

[5253]-118

T.E. (Mechanical) (Semester - II)

TURBO MACHINES

(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve 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.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Assume suitable data if necessary.*

Q1) a) What is degree of reaction? Explain its significance. **[4]**

b) A Pelton turbine is to be designed for the following specifications: **[6]**

Power to be developed = 120 MW,

Net head available = 500 m,

Speed = 200 rpm,

Ratio of jet diameter to wheel diameter = 1/10,

Hydraulic efficiency = 86%,

Velocity coefficient = 0.98,

Speed ratio = 0.46.

Calculate

- i) Volume flow rate of water required
- ii) Number of jets
- iii) Diameter of each jet

OR

P.T.O.

- Q2) a)** What is draft tube? Define efficiency of draft tube. [4]
- b) A 7.5 cm diameter jet having velocity of 12 m/s impinges in a smooth Plate at an angle of 60° to the normal to the plate. What will be the force when [6]
- The plate is stationery
 - When the plate is moving in the direction of jet at 6 m/s
 - Work done per sec in each case

- Q3) a)** The quantity of water available for hydroelectric station is $250 \text{ m}^3/\text{s}$ under a head of 2 meter. Assuming the speed of the turbine to be 50 rev/min and efficiency of 85%. Determine the number of turbine required. Assume specific speed of 800. [4]
- b) Explain with suitable sketch different methods compounding of steam turbines. [6]

OR

- Q4) a)** The following particulars refer to a stage of Parson's turbine comprising one ring of fixed blade and one blade of moving blades; Mean diameter of the blade ring = 70 cm, RPM = 3000, steam velocity at exit from blade = 160 m/s, blade outlet angle = 20° , steam flow through blades = 7 Kg/s. Draw the velocity diagram and find the following. [6]
- Blade inlet angle,
 - Tangential force on the ring of a moving blade,
 - Power developed in a stage
- b) What is cavitation ? On what factors does the cavitation in reaction turbines depend? [4]

- Q5) a)** Explain manometric head, manometric efficiency, mechanical efficiency and overall efficiency of a centrifugal pump? [8]
- b) A three stage centrifugal pump has impellers 30 cm diameter and 1.5 cm width at outlet. The velocity of water at inlet is radial, the vanes are curved back at an angle of 30° to the tangent at outlet and occupy 8% of

the outlet area. While running at 1000 rpm , the pump delivers 40 lit/sec with 85% manometric efficiency and 75% overall efficiency. Calculate the head generated by the pump and the input power. [10]

OR

Q6) a) A centrifugal pump with a discharge 1565 lit/sec against a mean lift of 6.1 m when the impeller rotates at 200 rpm. The impeller diameter is 12 cm and area of the outlet periphery is 6450 cm². If the vanes are set back at an angle of 26° at the outlet. Find :

- (i) Hydraulic efficiency
- (ii) Power required to drive the pump.

If the ratio of external to internal diameter is 2, find the maximum speed to start pumping. [12]

b) What is multistaging in a centrifugal pump ? Describe the methods used for multi staging. [6]

Q7) a) A centrifugal blower compresses 4.8 m³/s of air from 1 bar and 20°C to 1.5 bar. The index of compression is 1.5. The flow velocity at inlet and outlet of the machine is the same and equal to 65 m/s . The inlet and outlet diameter are 0.32 m and 0.62 m. The blower rotates at 8000 rpm. Calculate :

- i) The blade angle at outlet and inlet of the impeller
- ii) Absolute angle at the tip of the impeller
- iii) Breadth of the blade at inlet and outlet

Assume that no diffuser is employed and pressure increase take place in the impeller and blades have negligible thickness. [10]

b) Explain slip and prewhirl in connection to centrifugal compressors. [6]

OR

Q8) a) Explain the working of a centrifugal compressor with a neat sketch. [8]

b) A rotary compressor working between 1 bar and 15°C and 2.5 bar has internal and external diameter of impeller as 300 mm and 600 mm

respectively. The vane angle at inlet and outlet are 30° and 45° respectively. If air enters the impeller at 15 m/s, find [8]

- i) Speed of impeller in rpm
- ii) Work done by the compressor per kg of air

Q9) a) What is surging in axial-flow compressors? What are its effects? Describe briefly. [8]

- b) An axial flow compressor with a pressure ratio of 5 draws air at 20°C and delivers it at 55°C . Determine the velocity of flow if the blade velocity is 100 m/s and number of stages. Assume 50% degree of reaction and work done factor of 0.87. Take $\alpha_1 = 10^\circ$, $\beta_1 = 40^\circ$. Assume specific heat of air = 1 kJ/kg. [8]

OR

Q10)a) An axial flow compressor having 10 stages and with 50% reaction compresses air with a pressure ratio 5:1. Air enters the compressor at 25°C and flows at a constant velocity of 100 m/s. The blades rotate with a mean speed of 200 m/s. Assuming isentropic efficiency of compressor as 85%. Calculate the blade angles and work required by the machine per kg of air. [10]

- b) Compare axial flow compressor and centrifugal compressor on the following points [6]
 - i) range of operation within surging and choking limits
 - ii) effect on performance when working with contaminated fluids
 - iii) isentropic efficiency
 - iv) pressure ratio per stage
 - v) delivery pressure possible
 - vi) multistaging limits



Total No. of Questions : 10]

SEAT No. :

P2407

[Total No. of Pages : 4

[5253]-119
T.E. (Mechanical)
MECHATRONICS
(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 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.*

- Q1)** a) What is a load cell? Draw the Schematic diagram of a strain gauge based load cell. Discuss the principle of operation. **[6]**
- b) Explain advantages and disadvantages of block diagram representation. **[4]**

OR

- Q2)** a) The output of an LVDT is connected to a 10A ammeter through an amplifier whose amplification factor is 200. An output of 3mA appears across the terminal of LVDT when the core moves through a distance of 0.75 mm. Calculate the sensitivity of LVDT and that of the whole setup. The milliammeter scale has 100 divisions. The scale can be read to 1/10 of a division. Determine the resolution of the instrument in millimeters. **[4]**
- b) Explain with a neat sketch any one automotive application of mechatronics system. **[6]**

P.T.O.

Q3) a) Determine the transfer function of the system shown in fig.1 [6]

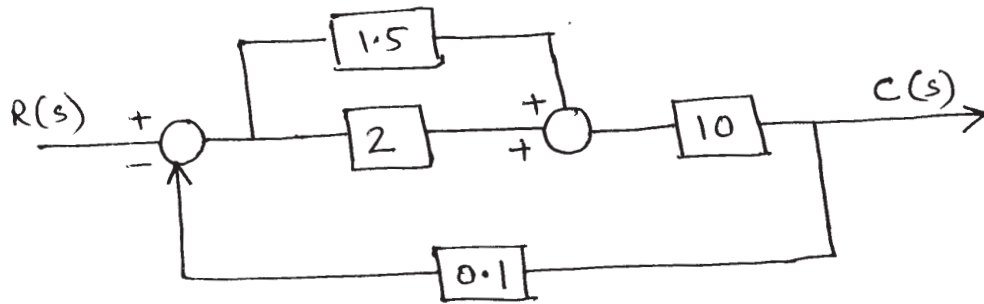


Fig. 1.

b) State and explain Nyquist sampling theorem and bit width. [4]

OR

Q4) a) Explain with a neat sketch any one household application of mechatronics system. [6]

b) Write a short note on : [4]

i) Current amplifier.

ii) Voltage amplifier.

Q5) a) Explain with a neat sketch the internal architecture and hardware components of PLC. [8]

b) Draw the ladder diagram for OR and NAND logic gate. [8]

OR

Q6) a) Discuss the various elements of SCADA system and state various applications of it. [8]

b) Draw the ladder diagram for NOR and NOT logic gate. [8]

Q7) a) Derive the modelling equation for rotational mechanical system. [6]

b) The transfer function of a system is $\frac{361}{(s^2 + 16s + 361)}$. Find the following for a unit step input : [10]

- i) Undamped natural frequency
- ii) Damping ratio
- iii) Damped natural frequency
- iv) Settling time
- v) Peak time
- vi) Rise time

OR

Q8) a) Explain basic building blocks of fluid system. [8]

b) What do you mean by overshoot, rise time, peak time and settling time? [8]

Q9) a) A PI controller has a gain $K_p = 2$ and an integral action rate $K_i = 0.02 \text{ s}^{-1}$. The initial output is assumed to be zero. The graph of the error signal is given in fig.2. Determine the value of the controller output at $t = 70\text{s}$. [6]

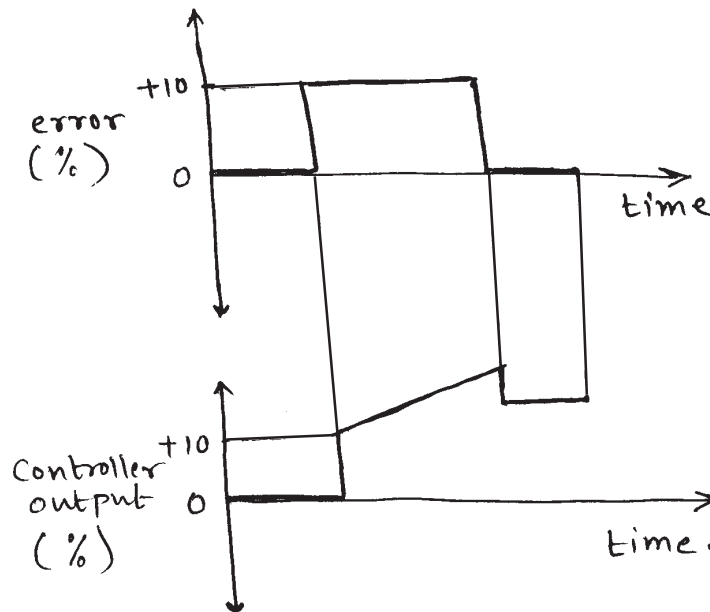


fig.2.

- b) Explain the manual procedure for PID controller tuning with suitable example. [6]
- c) Describe any application of proportional controller and their limitations. [6]

OR

- Q10)**a) Explain the features of the following : [6]
- i) Proportional Controller.
 - ii) PI Controller.
 - iii) PID Controller.
- b) In a proportional controller, the gain is 4%, the output voltage range is 0–10V, the input voltage span 4 – 12V. Determine the value of gain. [6]
- c) What are the advantages of a PID Controller. [6]



Total No. of Questions : 10]

SEAT No. :

P2408

[Total No. of Pages : 3

[5253]-120

T.E. (Mechanical Engg.) (Semester - II)
MANUFACTURING PROCESS - II
(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q7 or Q.8, Q.9 or Q.10*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of electronic pocket calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Draw a neat sketch of twist drill with its nomenclature and explain various terminologies of twist drill. **[6]**

b) A hole of 25mm diameter and 70mm depth is to be drilled. The suggested feed 1.3 mm/rev, and cutting speed 60m/min. assuming tool approach and tool overtravel as 6mm, Calculate: **[6]**

- i) Spindle speed
- ii) Feed Speed
- iii) Cutting Speed

OR

Q2) a) Write short notes on Burnishing Process. **[6]**

b) Describe the Tool and Cutter grinder with neat sketch. **[6]**

Q3) a) In orthogonal cutting of a 60mm diameter MS bar on lathe, the following data was obtained: **[4]**

Rake angle = 10°,
Cutting Speed = 100 m/min,
Cutting force = 200N,
Feed Force = 70N,

P.T.O.

Chip thickness = 0.3 mm,

Feed = 0.2 mm/rev.

Calculate:

- i) Shear angle,
- ii) coefficient of friction,
- iii) Chip flow Velocity,
- iv) Friction Angle

- b) Explain chip breakers with its function. [4]

OR

- Q4)** a) With the help of neat sketch explain the relation between shear velocity, cutting velocity and chip flow velocity. [4]

- b) What is Machinability? Explain different factors affecting Machinability. [4]

- Q5)** a) Compare the ECM and EDM with various process parameters. [8]

- b) Explain USM process with its adv., limitations and applications. [8]

OR

- Q6)** a) Draw a Schematic diagram of 'Laser Beam Machining' and explain its working principle and process parameters. [8]

- b) Explain AJM process with its adv., limitations and applications. [8]

- Q7)** a) Explain DNC machines with neat sketch. State its advantages and limitations. [6]

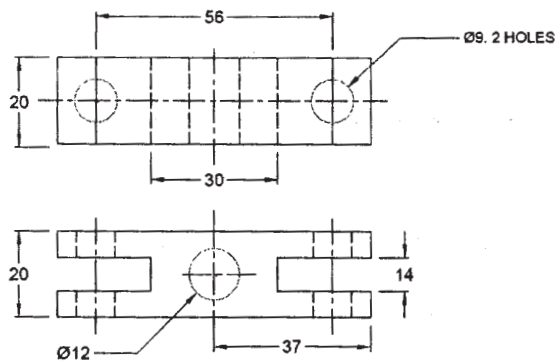
- b) Explain with neat sketch NC motion control system. [5]

- c) Explain the following codes
G02, G91, G98, M03, M02 [5]

OR

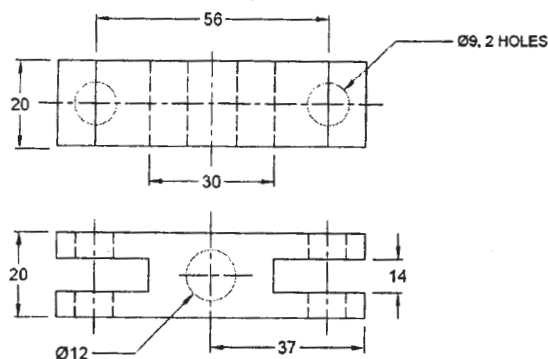
- Q8)** a) Explain machining center with neat sketch. State its advantages, disadvantages and applications. [6]
- b) Differentiate between open and close loop system with neat sketch. [6]
- c) Explain the following codes
G03, M00, G91, M08 [4]

- Q9)** a) What is 3-2-1 location principle? Explain with neat sketches. [6]
- b) Draw and explain diamond pin locator. [4]
- c) Design and draw drilling jig for drilling the $\phi 9$ mm TWO holes in the component shown in figure. [8]



OR

- Q10)** a) List various types of locating devices used in jig and fixtures. Explain any one in detail. [6]
- b) Write short notes on modular fixture. [4]
- c) Design and draw milling fixture for milling $74\text{mm} \times 20\text{mm}$ face. [8]



[5253]-123

T.E. (Mechanical S/W) (Semester - I)

MECHATRONICS

(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Temperature of a hot plate is to be measured using Resistive Temperature Detector. For this, draw the set-up and explain the principle of working. [6]
- b) From the block diagram in Figure 1, determine the transfer function: C/R. [4]

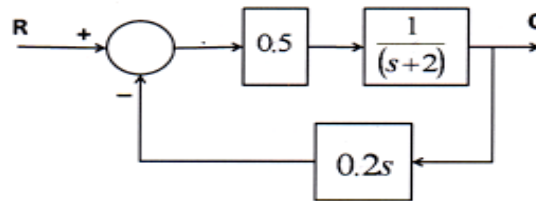


Figure 1

OR

- Q2)** a) A capacitive type proximity sensor is to be used for displacement measurement. Discuss the criterion for selection of this sensor. [6]
- b) Discuss the role played by following four elements in a Mechatronic system: [4]
- i) Actuator
 - ii) Sensor
 - iii) Signal Conditioner
 - iv) Digital Architecture
- Q3)** a) A 4-bit ADC has a V_s of 10 volts. If the ADC is supplied with an analog input of 7 volts, determine the equivalent digital output. [8]
- b) Draw a suitable block diagram to depict the principle of operation of feed-forward loop control. [2]

P.T.O

OR

- Q4)** a) Define as well as discuss the importance of Sampling Theorem as well as Aliasing with respect to signal conversion. [8]
b) Write two distinct points of comparison between open loop and closed loop control system. [2]

- Q5)** a) Using suitable example, draw a ladder diagram and explain how Latching is implemented. [8]
b) Write ladder logic for a simple traffic light controller for the following sequence of operations as below: [8]
Step 1: Turn Green ON for 35 seconds,
Step 2: Turn Yellow ON for 5 seconds,
Step 3: Turn Red ON for 40 seconds,
Step 4: Repeat the sequence i.e. Step 1-Step 2-Step 3.

OR

- Q6)** a) Using suitable example, draw a ladder diagram and explain how timer is implemented. [8]
b) Discuss the role played by following four elements in a PLC: [8]
i) Input Module
ii) Memory
iii) CPU
iv) Bus

- Q7)** a) For the system in Figure 2, assume m =mass=lkg, k =spring stiffness=2 N/m and b =damping=0.5 Ns/m. Also, x is the system output and y is the system input, which is motion of the base on which the system rests. [10]

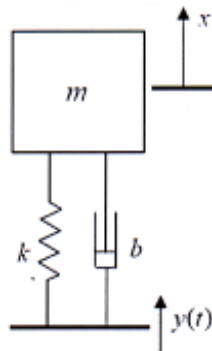


Figure 2

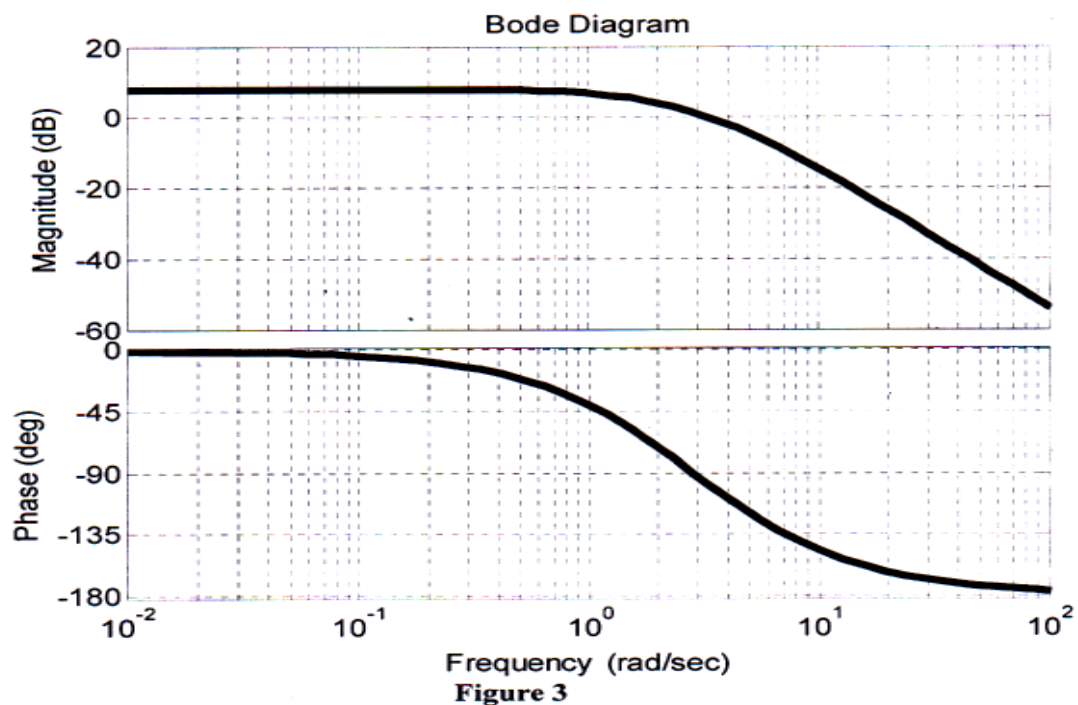
For this system:

- i) Determine the transfer function: $x(s)/y(s)$
 - ii) Identify the location of the Poles and zeros.
 - iii) Comment on the stability of the system
- b) Draw suitable sketch to depict the unit step response of a second order system when: [6]
- i) System poles are negative and real
 - ii) System poles are complex conjugate pair with negative real part
 - iii) System poles are a imaginary pair with no real part

OR

- Q8)** a) Define the following terms: [6]
- i) Steady State Error
 - ii) Gain Margin
 - iii) Phase Margin
 - iv) Rise Time
 - v) Damping Frequency
 - vi) % Overshoot

b)



Estimate the approximate transfer function of a system, of which the bode plot is shown in Figure 3. [10]

- Q9) a)** Figure 4 shows an error time graph. Sketch the PID controller (parallel form) output w.r.t. time. Assume $K_p = 10$, $K_i = 2$, $K_D = 0.5$ and $P_0 = 0$ i.e. the controller output is zero when the error is zero. **[10]**

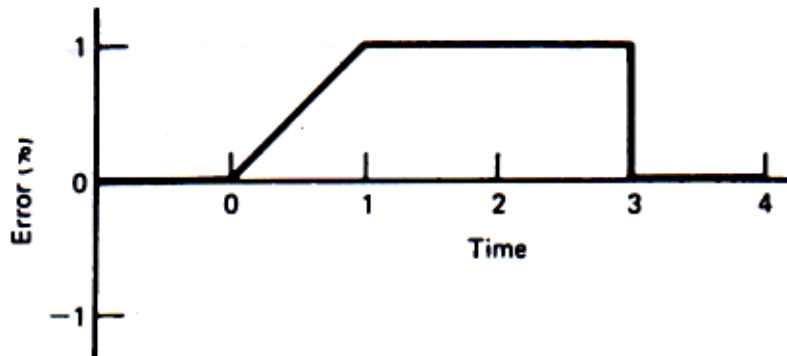


Figure 4

- b) A second order system is under damped, inherently. Discuss the step by step procedure for manual tuning of a PID controller so that the behavior of the system becomes that of a critically damped one. **[8]**

OR

- Q10)a)**

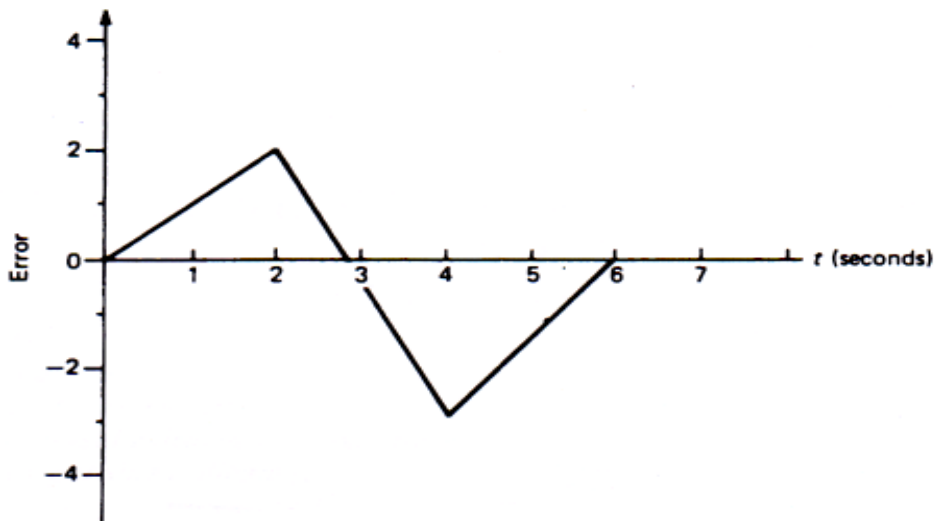


Figure 5

Figure 5 shows an error time graph. Sketch the PID controller (series form) output w.r.t. time. Assume $K_p = 10$, $K_i = 2$, $K_D = 0.5$ and $P_0 = 0$ i.e. the controller output is zero when the error is zero. **[10]**

- b) Using a suitable block diagram explain the working of PID control in Parallel form. **[8]**



Total No. of Questions : 12]

SEAT No. :

P2409

[Total No. of Pages : 3

[5253]-124

T.E. (Mechanical Sandwich)

NUMERICAL METHODS & COMPUTATIONAL TECHNIQUES
(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of calculators is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) Find a root of $y = x^4 - x - 10$ correct to four decimal places using Newton Raphson Method. **[6]**

OR

Q2) Evaluate $(\sin(x) + \cos(x))^{1/2}$ between the integration limit 0 to 1. Divide integration limit into 6 sub intervals. **[6]**

Q3) Find the polynomial of degree three which takes the values as shown below. **[6]**

x	0	1	2	4
$f(x)$	1	1	2	5

OR

Q4) From the following table, find the number of students who obtained less than 65 marks. **[6]**

Marks	30-40	40-50	50-60	60-70	70-80
Number of students	30	41	52	36	31

P.T.O.

Q5) Using Gauss Elimination method, solve the following set of simultaneous equations. [8]

$$2X + Y + Z = 10$$

$$3X + 2Y + 3Z = 18$$

$$X + 4Y + 9Z = 16$$

OR

Q6) Solve the following simultaneous equations by Gauss Seidal Method. Five iterations only. [8]

$$6x + 15y + 2z = 72$$

$$x + y + 54z = 110$$

$$27x + 6y - z = 85$$

Q7) a) Draw Flowchart to fit straight line through given set of points. [8]

b) Fit a power curve $y = ab^x$ to the given data: [8]

X	2	3	4	5	6
Y	8.3	15.4	33.1	65.2	127.4

OR

Q8) a) Explain errors in numerical computation with example. [8]

b) fit a straight line through the given data: [8]

X	0	5	10	15	20	25
Y	12	15	17	22	24	30

Q9) a) Using 'Taylor series Method', solve $dy/dx = 1 + xy$ where $y(0) = 2$
find y at $x = 0.1$ and 0.2 . [8]

b) Draw Flow Chart for 'Modified Euler's Method'. [8]

OR

Q10)a) Draw Flow Chart for ‘Runge Kutta method of 4th Order Method’. [8]

b) Using modified Euler’s method find y for following equation [8]

$$\frac{dy}{dx} = \frac{1}{x^2} - \frac{y}{x} \text{ for } x = 1.1, 1.2, \text{ when } y = 1 \text{ at } x = 1$$

Q11) a) Using crank Nicolson method solve $U_{xx} = u_p$, subject to $u(x,0) = 0$; $u(0,t) = 0$ and $u(1,t) = t$. taking $h = 1/4$ and $k = 1/8$, compute u for one time step. [10]

b) Draw flow chart to solve elliptic equation [8]

OR

Q12)a) Draw flow chart to solve Hyperbolic Equation. [8]

b) Describe the procedure to solve a partial differential equation by explicit method. State its limitations. [10]



Total No. of Questions : 10]

SEAT No. :

P2410

[Total No. of Pages : 3

[5253] - 125

T.E. (Mechanical Sandwich Engineering)

MACHINE DESIGN

(New 2012 Pattern)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer questions Q1 or Q2, Q3 or Q4 and Q5 or Q6, Q7 or Q8, Q9 or Q10*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed*
- 5) *Assume suitable data, if necessary.*

Q1) a) Write in detail design of cotter joint? **[6]**

b) Explain in detail Modified Goodman approach? **[4]**

OR

Q2) a) Explain in detail design process? **[6]**

b) What are the factors that affect the endurance limit of machine part? **[4]**

Q3) a) Write the torque analysis of Power Screw? **[4]**

b) Derive an expression for Springs in parallel? **[6]**

OR

Q4) a) What is the concept of collar friction loss? **[4]**

b) A vertical screw with a single start square thread of 50 mm mean diameter and 12 mm pitch is raised against load of 10KN by means of a hand wheel, the boss of which is threaded to act as a nut. The axial load is taken up a thrust collar which supports the wheel boss and has a mean diameter of 60 mm. The coefficient of friction is 0.15 for the screw and 0.17 for the collar. If the tangential force applied by each hand to the wheel is 10KN, find suitable diameter of the hand wheel. **[6]**

P.T.O.

Q5) a) The following data is given for a pair of spur gear with 20 degree of full depth involute teeth. Number of teeth on pinion = 22, Number of teeth on gear = 56, Speed of pinion = 1200rpm, Module = 4mm, Service factor 1.5, Face width = 15mm. Both the gears made up of steel with an Ultimate tensile strength 750N/mm² Using the velocity factor to account for the dynamic load calculate Beam strength, 2. Velocity Factor. [12]

b) Write classification of gears? [6]

OR

Q6) a) A helical pinion having 14 teeth made of alloy steel ($S_{ut} = 700 \text{ N/mm}^2$) is mesh gear made of plain carbon steel 55 C8 ($S_{ut} = 800 \text{ N/mm}^2$). The gear pair is required to transmit 50 kW power from an electric motor running at 700 rpm to machine at 220 rpm. The application factor and load concentration factor are 1.3 and 1.1 respectively while the factor of safety is 2. The face width is 10 x normal module ($10 m_n$) and tooth system is 20° full depth involute. Deformation factor for gear pair is 12000 e. N/mm. design the gear pair by using the velocity factor and Buckingham's equation for dynamic load. [12]

b) With neat sketch explain force analysis of Helical gear? [6]

Q7) a) Explain in design of bearing for cyclic loads and speed. [6]

b) A single row deep groove ball bearing has a dynamic load capacity of 50000N and operates on following work cycle.

i) Radial load 6000N at 600rpm for 25% of the time.

ii) Radial load 20000N at 700rpm for 50% of the time.

iii) Radial load 9000N at 500rpm for 25% of the time.

Determine life of bearing in hours. [10]

OR

Q8) a) Explain the selection of taper roller bearing.? [6]

b) Derive an expression for load life relationship? [10]

- Q9) a)** Explain in detail construction of wire rope? [4]
- b) Two shafts whose centers are 1 meter apart are connected by a V– belt drive. The driving pulley is supplied with 95 kW power and has an effective diameter of 300mm. it runs at 1000 rpm. while the driven pulley runs at 375 r.p.m. The angle of groove on the pulleys is 40°. Permissible tension in 400 mm² cross – sectional area belt is 2.1 MPa. The material of the belt has density of 1100 kg/mm³. The driven pulley is overhung, the distance of the centre from the nearest bearing being 200 mm. The coefficient of friction between belt and pulley rim is 0.28. Estimate the number of belts required. [12]

OR

- Q10)a)** Write difference between open and cross belt? [4]
- b) A pulley of 1800mm diameter is driven by an open belt from 20 KW , 1400rpm electric motor. The pulley on motor shaft is 200mm diameter and centre distance between two shaft is 2m. The allowable tensile stress for belt material is 3 N/mm² and coefficient of friction between belt and pulley is 0.25. The density of material is 1000Kg/m³. If width of belt is 100mm. Determine thickness of belt, length of belt, initial tension required in belt. [12]



Total No. of Questions : 12]

SEAT No. :

P2411

[Total No. of Pages : 2

[5253] - 126

T.E. (Mechanical Sandwich)

Materials and Manufacturing Engineering

(2012 Pattern) (End Semester) (Self Study - I)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

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

SECTION - I

- Q1)** a) Classify polymers. Discuss factors affecting on properties of polymers. [8]
b) Thermoplastic polymers can be recycled but and thermosetting polymers cannot be recycled. Why? Give minimum two examples of each type. [8]

OR

- Q2)** a) What is composite material? What unique properties they have over conventional material? [8]
b) On what factors the strength of fibrous composite material depends? [8]

- Q3)** a) Discuss some biomaterials used for implant of human joints. [8]
b) Write a note on "Nanotechnology". [8]

OR

- Q4)** a) What is carbon Nanotubes? Discuss the technological advantages of nano materials. [8]
b) Discuss the need of manufacturing advancement for processing modern materials. [8]

- Q5)** a) List some common inhibitors and their applications. [6]
b) What are the different methods of prevention of corrosion? Explain any two of them. [12]

OR

- Q6)** Differentiate between [18]
a) Dry corrosion and Wet corrosion
b) Anodic Inhibitors and Cathodic Inhibitors
c) Inter-granular corrosion and stress corrosion

P.T.O.

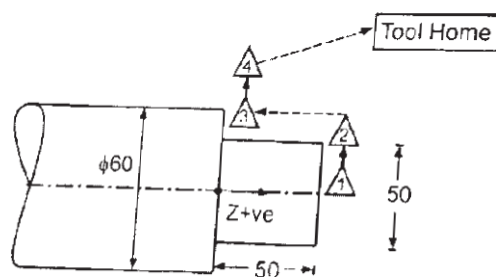
SECTION - II

- Q7) a)** Write notes on: [8]
i) Self Lubricated bearings
ii) Cermets
b) Describe the various methods used for the manufacture of metal powder. [8]

OR

- Q8) a)** Describe the various steps in Powder Metallurgy. [8]
b) Explain detailed process of manufacturing cemented carbide cutting tools. [8]

- Q9) a)** Write a part programme for component as shown in figure. [10]



- b) Discuss the advantages and limitations of automation. [6]

OR

- Q10) a)** Differentiate: [8]
i) NC and CNC
ii) CNC and DNC
b) What is absolute and incremental programming? Explain. [8]

- Q11) a)** Classify Gear Manufacturing Methods and explain any one. [8]
b) Describe Internal and External Broaching operations with sketch. [10]

OR

- Q12) a)** Explain with neat sketch a Gear Grinding process. [8]
b) Name the various methods of manufacturing threads and explain any two of them in detail. [10]



Total No. of Questions : 12]

SEAT No. :

P2412

[Total No. of Pages : 2

[5253] - 127

T.E. (Mechanical Sandwich)

Industrial Engineering and Production Management

(2012 Course) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates :

- 1) *Answer 3 questions from Section-I and 3 questions from Section-II.*
- 2) *Answers to the two sections should be written in separate books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Your answers will be valued as a whole*
- 6) *Assume suitable data if necessary.*

SECTION - I

Q1) a) Explain History & development of Industrial Engineering. [8]

b) Briefly mention contribution of F W Taylor to industrial engineering. [8]

OR

Q2) a) Explain significance of various approaches to management. [8]

b) Explain role of management & its basic concept. [8]

Q3) a) Mention 5W & 1 H approach in method study. [8]

b) Explain multiple activity chart in method study [8]

OR

Q4) a) Explain significance of allowances along with its types. [8]

b) Explain aim & objectives of work measurement. [8]

Q5) a) Explain Qualities of production manager which are beneficial for growth of industry. [10]

b) Explain concept of productivity. [8]

OR

Q6) a) Explain important factor which affect selection of plant layout for SUV.[10]

b) Explain types of plant layout along with applications [8]

P.T.O.

SECTION - II

- Q7)** a) List any 4 terminologies used in MRP and state their meaning [8]
b) Explain the moving average method. [8]

OR

- Q8)** a) Give comparison between Productions planning and Production control. [8]
b) Discuss objectives and benefits of inventory control. [8]

- Q9)** a) List 4 basic concepts in a network while doing network analysis and explain their meaning. [8]
b) Give the steps involved in numbering the events in a network analysis. [8]

OR

- Q10)** a) State the factors affecting the process design. [8]
b) Explain the steps in process planning. [8]

Q11) Write Short Note on any three of the following [18]

- a) TPM
- b) Concurrent Engineering
- c) JIT technique
- d) Kanban

OR

Q12) Write Short Note on any three of the following [18]

- a) Poka-Yoke technique.
- b) Computerized Production Management System.
- c) Continuous improvement technique in the industry.
- d) Uncertainty in the supply chain.



Total No. of Questions : 10]

SEAT No. :

P2413

[Total No. of Pages : 4

[5253]-134

T.E. (Automobile Engineering)
DESIGN OF MACHINE ELEMENTS
(2012 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *A figure to the right indicates full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Explain the general design procedure. **[6]**
b) Differentiate between transmission shafts and machine shafts. **[4]**

OR

- Q2)** a) A foot lever is 1m from the center of shaft to the point of application of 800 N load, find **[6]**
(i) diameter of shaft (ii) dimensions of the key (iii) dimensions of rectangular arm of the foot lever at 60 mm from the center of the shaft, assuming width of the arm as 3 times thickness. The allowable tensile strength may be taken as 73 Mpa and allowable shear stress as 70 Mpa, Width of key = 12 mm and thickness of key = 8 mm.
- b) Write a short note on preferred series. **[4]**

- Q3)** a) Differentiate between rigid and flexible coupling. **[2]**
b) Derive an expression for torque required to raise the load in power screws. **[8]**

OR

P.T.O.

- Q4) a)** Determine the required length of square key if key and shaft are made up of same material. Take diameter of shaft as 40 mm. [2]
- b) The lead screw of a lathe has single start ISO trapezoidal threads of 30 mm diameter and 6 mm pitch. It drives a tool carriage and exerts an axial load of 1.5 KN on a collar of 30 mm inside diameter and 50 mm outside diameter. If the lead screw rotates 40 rpm, find the power required to drive the screw and efficiency. Take the coefficient of friction for power screw as 0.14 and for collar as 0.09. [8]
- Q5) a)** A hot rolled steel rod is subjected to torsional load varying from -110 N-m to 440 N-m and axial load varying from 4500N to 13500N. Assume factor of safety as 8. Take ultimate stress = 550 Mpa, yield shear stress = 235 Mpa, yield stress = 470 Mpa, fatigue stress concentration factor = 1, load factor = 0.7 for axial and 1 for torsion, surface finish factor = 0.89, size factor =1. Calculate the diameter of rod. [10]
- b) Write a short note on S-N diagram. [6]

OR

- Q6) a)** A mass of 500 Kg is being lowered by means of steel wire rope having cross sectional area 250 mm². The velocity of weight is 0.5 m/sec. When the length of extended rope is 20 m, the sheave gets stuck up. Determine the stress induced in the rope due to sudden stoppage of sheave. Take $E = 0.8 \times 10^6$ Mpa. [6]
- b) Derive soderberg equation. [10]
- Q7) a)** Derive petroff's equation for bearing. [6]
- b) The following data is given for a 360° hydrodynamic bearing. Radial load = 3.2 KN, Journal speed = 1490 rpm, journal diameter = 50 mm, bearing length = 50 mm, radial clearance = 0.05 mm, viscosity of lubricant = 25 cP. Assuming that the total heat generated in the bearing is carried by the total flow in the bearing.

Calculate :

[10]

- i) Coefficient of friction
- ii) Power lost in friction
- iii) Minimum oil film thickness
- iv) Flow requirement in Lit/min
- v) Temperature rise.

l/d	S	(r/c)f	(ho/c)	Q/rcnl
1	0.121	3.22	0.4	4.33
1.5	0.134	3.49	0.6	4.89

OR

Q8) a) Explain the hydrodynamic theory of lubrication. [6]

- b) A 6306 radial ball bearing with inner ring rotation has a 10 seconds work cycle as follows. If basic dynamic capacity of the bearing is 24.25kN, determine the expected life of this bearing. Take radial factor $x = 0.56$, thrust factor $y = 1.43$ and rotating factor $v = 1$. [10]

	<u>For 2 seconds</u>	<u>For 8 seconds</u>
Radial load	4 KN	3 KN
Axial load	2 KN	0
Speed	900 rpm	1200 rpm

Q9) a) Design spur gear set to transmit 20 KW at 900 rpm of pinion. The transmission ratio is 3. [12]

Take 20° FDI,

$$Z_1 = 18, \sigma_d = 193.2 \text{ Mpa,}$$

$$\text{BHN} = 250 \text{ for pinion and } \sigma_d = 47.1 \text{ Mpa,}$$

$$\text{BHN} = 200 \text{ for gear.}$$

Check only tangential tooth load.

$$\text{Form factor } Y = \pi (0.154 - 0.912/Z),$$

$$C_v = 3.05/3.05 + V$$

- b) Derive Lewis equation for beam strength. [6]

OR

Q10)a) Design a pair of helical gears are to transmit 15KW at 10,000 rpm of the pinion with PCD 80 mm. The transmission ratio is 3:1. Assume $\alpha = 20^\circ$ FDI, $\beta = 45^\circ$, $\sigma_d = 193.2$ Mpa, BHN = 250 for pinion and gear. Check only tangential tooth load.

$$Y = \pi(0.154 - 0.912/Z_e), C_v = 5.55 / (5.55 + V^{0.5}) \quad [12]$$

b) Derive an expression for formative number of teeth in helical gear. [6]



Total No. of Questions : 10]

SEAT No. :

P2414

[Total No. of Pages : 2

[5253] - 135

T.E. (Automobile)

AUTOMOTIVE ELECTRICAL AND ELECTRONICS

(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of Logarithmic tables, slide rule, electronic pocket calculator is allowed*
- 5) *Assume suitable data if necessary.*

Q1) List Down Different Battery Tests. Explain Any Two of them in Detail? [10]

OR

Q2) List Down Different Drive Mechanisms & Explain each one in Detail? [10]

- Q3)** a) With the Help of Neat Sketch Explain Current & Voltage Regulator? [6]
b) Explain in Brief Single Unit Type Regulator? [4]

OR

Q4) Describe the Working of Following with neat Sketch [10]

- a) Fuel Gauge
- b) Temperature Gauge

Q5) a) List out Temperature Measurement Sensors and Explain Any Two in Detail. [8]

- b) Explain the Operation of Angular Position Sensor With its Application in a Vehicle. [8]

OR

Q6) a) Explain the Operation of MAP Sensor With its Neat Sketch. [8]

- b) Explain the Application of Solenoid Actuator in a Vehicle with Neat Sketch. [8]

P.T.O.

- Q7) a)** Write a Note on the Following Devices used in Vehicle: [9]
i) ECU
ii) Microcontroller
b) Explain Group and Sequential Injection Techniques used in Vehicle with Neat Sketch. [9]

OR

- Q8) a)** Discuss the Open Loop Control System with at least four examples. Also give the advantages and disadvantages of it. [12]
b) Explain Cold Starting and Warm Start Conditions. [6]

- Q9) a)** Write A Short Note on any Two: [8]
i) Vehicle Tracking System
ii) Collision Avoidance
iii) Radar Warning System
b) Explain Electric Power Steering with neat Sketch. [8]

OR

- Q10) a)** Explain Vehicle Security System And Vehicle Tracking System [8]
b) With Neat Sketch Explain Electronic Damping Control Suspension. [8]



Total No. of Questions : 10]

SEAT No. :

P2415

[Total No. of Pages : 4

[5253] -138

T.E. (Automobile) (Semester - II)
DESIGN OF ENGINE COMPONENTS
(2012 Pattern)

Time : 3 Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data if necessary.*

Q1) a) Write a note on Mist lubrication system. **[4]**

- b) Estimate - bore diameter, stroke length, swept volume, engine speed for a diesel engine which develops 90 KW power with mean effective pressure of 0.6N/mm^2 & mean piston speed is 600 m/min. **[6]**

OR

Q2) a) State the function of oil pump & explain any one type of oil pump. **[4]**

- b) The 4 stroke petrol engine develops 55 KW power with mean effective pressure of 0.8 N/mm^2 & mean piston speed 600 m/min. Find Bore diameter, stroke length, swept volume, engine speed. **[6]**

Q3) a) Write classification of Radiators. **[2]**

- b) Calculate the head thickness of cast iron piston for a 4 stroke diesel engine running at 600 rpm and design piston rings with following data.**[8]**

Explosion pressure = 4 MPa

Mean effective pressure = 0.75 MPa

Fuel consumption = 0.272 Kg/KW/Hr

Diameter of piston = 0.25 m

Stroke of piston = 0.3 m

Efficiency of engine = 80%

P.T.O.

HCV = 41800 KJ/Kg

Portion of heat absorbed by piston head (C) = 5%

Heat conductivity factor = 46 W/m/°C

Temperature at the centre of piston = 320°C

Temperature at the edge of piston = 150°C

Bending stress = 80 Mpa

OR

Q4) a) Explain need of lubrication. [2]

b) Determine the dimension of small end & big end bearing of the connecting rod for a diesel engine with the following data

Cylinder bore = 100 mm, maximum gas pressure = 4 MPa. (1/d) ratio for piston pin bearing = 2, (1/d) ratio for crank pin bearing = 1.3, allowable bearing pressure for piston pin bearing = 12MPa, allowable bearing pressure for crank pin bearing = 7.5MPa. [8]

Q5) a) Draw the Value gear mechanism for 4 - stroke. I.C engine & explain the function of each component. [4]

b) Design a cross - section of rocker arm for the exhaust valve of a four stroke engine using [12]

the following data :

Effective length of each arm = 180 mm

Angle between two arms = 135°

Diameter of valve head = 75 mm

Lift of valve = 25 mm

Mass of valve = 0.5 kg

Engine speed = 600 RPM

Back pressure when the exhaust valve opens = 0.4 Mpa

Max. Suction pressure = 0.02 Mpa below atmospheric

The valve opens 330 before the outer dead center and closes 10 after the inner dead center. The motion of the valve is SHM without dwell in the fully opened condition.

Assume : permissible bending stress is 70N/mm²; I = 37 t⁴; y = 3t.

OR

Q6) a) The Cylinder of a four stroke diesel engine has the following specifications: [8]

Brake power = 7.5 KW, speed = 1400 rpm, indicated mean effective pressure = 0.35 MPa, mechanical efficiency = 80%, maximum gas pressure = 3.5 MPa. The cylinder liner and head are made of grey cast iron FG 260 ($S_{ut} = 260 \text{ N/mm}^2$ and $\mu = 0.25$). The studs are made of plain carbon steel 40 C8 ($S_{yt} = 380 \text{ N/mm}^2$) the factor of safety for all parts is 6.

Calculate :

- Bore and length of the cylinder liner
- Thickness of the cylinder liner
- Thickness of the cylinder head

Re - boring allowance for I.C. engine cylinder is :

D	75	100	150	200	250	300	350	400	450	500
C	1.5	2.4	4.0	6.3	8.0	9.5	11.0	12.5	12.5	12.5

b) Design an exhaust valve for a horizontal diesel engine using the following data : Cylinder bore = 150 mm, length of stroke = 275 mm, engine speed = 500 rpm, maximum gas pressure = 3.5 MPa, seat angle = 45° . [8]
Calculate :

- Diameter of the valve port
- Thickness of the valve head
- Diameter of the valve stem
- Maximum lift of the valve

Assume mean velocity of the gas = 50 m/s, constant K for steel valve as 0.42 and permissible bending stress as 50 N/mm^2 .

Q7) a) Explain Cylinder leakage test with neat sketch. [8]

b) Explain working procedure of mechanical fuel pump with neat sketch. [8]

OR

Q8) Write a short note on **[16]**

- a) Exhaust gas CO and HC analyzer.
- b) Cylinder compression test
- c) Ignition Timing Setting
- d) Cylinder power balance

Q9) a) Explain the working of Wankel engine with neat sketch. **[9]**

b) Explain the Homogenous Charge Compression Ignition (HCCI) **[9]**

OR

Q10) a) Explain the working of Dual fuel engine with neat sketch. **[9]**

b) Explain the working of Stratified Charged Engine with neat sketch. **[9]**



Total No. of Questions : 10]

SEAT No. :

P2416

[Total No. of Pages : 2

[5253] - 139

T.E. (Automobile Engg.)

AUTOMOTIVE TRANSMISSION

(2012 Pattern) (Semester - VI)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Question 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain front engine front wheel drive layout with neat sketch. [5]
b) With neat sketch explain Electromagnetic Clutch. [5]

OR

- Q2)** a) Draw the neat sketch of four wheel drive. Also state the applications of the same. [6]
b) Discuss the construction and working of cone clutch. [4]

- Q3)** a) Explain the construction and working of the centrifugal clutch with neat sketch. Also discuss the advantages of centrifugal clutch. [6]
b) Differentiate in-between Sliding Mesh and Constant Mesh Gearbox. [4]

OR

- Q4)** a) Draw & explain diaphragm spring clutch in detail? Also give example. [6]
b) Discuss the following. [4]
Lubrication of Gearbox

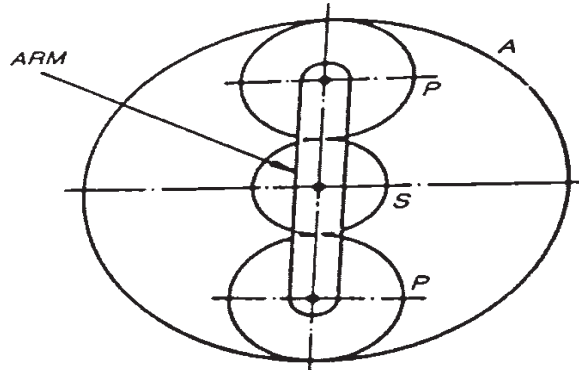
- Q5)** a) Write a note on [8]
i) Differential Lock/Locking Differential
ii) Non Slip/Limited Slip type of a Differential
b) Write a note on non-slip/limited slip type of differential. [8]

OR

- Q6)** a) Enlist the different types of rear axles? Explain any one of them with neat sketch stating the different loads carried by it. [8]
b) Write a short note on [8]
i) Propeller Shaft
ii) Constant Velocity Joint

P.T.O.

- Q7) a)** An epicyclic gear train as shown in fig. has a Sun wheel S of 30 teeth and two planet wheels P of 50 teeth each. The Planet wheels mesh with internal teeth of a fixed annulus A. The driving shaft is connected to the arm, which carries the planet wheels. The driving shaft carrying the sun wheel transmits 4 KW at 300 RPM. Determine the speed of the driven shaft and the torque transmitted if the overall efficiency is 95%. **[10]**



- b) Explain the performance characteristics of **[8]**
 i) Fluid Coupling
 ii) Torque Converter

OR

- Q8) a)** Draw and explain construction and working of simple epicyclic gear train and discuss gear ratio. **[9]**
 b) Explain construction and working Torque converter with its advantages and limitations. **[9]**

- Q9) a)** Describe in detail with an example Semiautomatic Transmission. **[8]**
 b) List down the advantages and disadvantages of the Continuous Variable Transmission (CVT). **[8]**

OR

- Q10) a)** Discuss the hydrodynamic transmission in detail. **[8]**
 b) Differentiate in-between Manual and Automatic Transmission. **[8]**



Total No. of Questions : 10]

SEAT No. :

P2417

[Total No. of Pages : 2

[5253] - 140

T.E. (Automobile Engineering)
Automotive Aerodynamics & Body Engineering
(2012 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Logarithmic tables, slide rule, electronic pocket calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

- Q1)** a) Explain development of lift on aerofoil. [4]
b) What is drag and explain in brief types of drag? [6]

OR

- Q2)** a) How performance of vehicle is affected by forces and moments of fluid flow? [6]
b) What are the optimization techniques of car bodies for low drag? [4]

- Q3)** a) Discuss the application of CFD technology for improvement of aerodynamics of vehicle? [6]
b) Discuss flow field around car? [4]

OR

- Q4)** a) Explain air flow around individual component of vehicle? [6]
b) The drag coefficient of a car at the design conditions of 1 atm, 70°F, and 60 mi/h is to be determined experimentally in a large wind tunnel in a full scale test. The frontal area of the car is 22.26 ft². If the force acting on the car in the flow direction is measured to be 68 lbf, determine the drag coefficient of this car., consider the following factors. (1 miles/hr = 1.4667 ft/sec), $\delta = 0.07489$ [4]

- Q5)** a) What are the various types of car bodies? [6]
b) Discuss the methods for improving visibility of vehicle? [6]
c) Sketch and explain in details any four types of bus body? [6]

OR

P.T.O.

- Q6)** a) Write a short note on types of metal section used for bus body construction. [6]
b) Sketch and explain typical car body with its nomenclature. [6]
c) Explain with a neat sketch hatch back and square back for dust flow pattern at rear? [6]

- Q7)** Explain the following with neat sketch. [16]
a) Flat platform
b) Tipper body
c) Tanker body
d) Fixed side

OR

- Q8)** a) Explain driver seat design in relation to control? [8]
b) Write any three energy absorbing systems used in vehicles in brief? [8]
- Q9)** a) Explain the ergonomic considerations in driver seat design for bus? [8]
b) Explain working of airbags and its type according to location? [8]

OR

- Q10)** a) Define and explain the working and non-working joints with neat sketch? [8]
b) Explain different types of seats and seat belts used in Automobiles? [8]



Total No. of Questions : 8]

SEAT No. :

P2418

[Total No. of Pages : 2

[5253] - 141

T.E. (Electronics)

Electrical Machines & Power Devices

(2012 Pattern) (End Sem.) (Theory)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) With the help of basic structure, explain the operation of power BJT.[6]
b) Write short note on TRIAC driver using MOC3010. [8]
c) With the help of circuit explain the thermal equivalent circuit of a semiconductor device. [6]

OR

- Q2)** a) Draw and explain switching characteristics of Power diode in detail. [6]
b) Write short note on any two [8]
i) With the help of circuit explain thermal equivalent of a semi conductor device
ii) Explain the use of MOV to suppress the transient voltages
iii) What are the different cooling methods of power device.
c) Compare SCR, TRIAC and GTO in detail. [6]

- Q3)** a) Explain the different methods of excitation for d.c. machines in detail.[6]
b) Explain with diagram four point stator for d.c. motor. [6]
c) Derive the expression for torque of a DC motor. [4]

OR

- Q4)** a) Distinguish between self excited and separately excited DC generator.[4]
b) Write a short note on: Three-point stator for d.c. motor. [6]
c) A 6 pole wave wound dc generator, running at a speed of 300 rpm generates an induced emf of 535 V. Calculate the flux/pole, if it has 650 conductors. [6]

P.T.O.

- Q5)** a) Compare Squirrel cage and Wound rotor in detail. [6]
b) Explain the principle of operation of a 3-phase induction motor in detail. [8]
c) Derive the condition for maximum torque in a three phase induction motor. [4]

OR

- Q6)** a) Explain the torque-slip characteristic of a three phase induction motor in detail. [8]
b) Explain the effect of slip on [10]
i) frequency
ii) Induced EMF
iii) Current
iv) Power factor
v) Reactance

- Q7)** a) Explain the construction and working of brushless DC motor. [8]
b) Explain the construction and working principle of SRM in detail. [8]

OR

- Q8)** a) Draw and explain the equivalent circuit diagram of a single phase induction motor. [8]
b) Explain the operation of a variable reluctance motor. [8]



Total No. of Questions : 8]

SEAT No. :

P2419

[Total No. of Pages : 3

[5253]-142

T.E. (Electronics)

DATA COMMUNICATION

(2012 Pattern) (Semester - I)

Time : 2 : 30 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Neat diagram must be drawn whenever necessary.
- 2) Figures to right indicate full marks.
- 3) Use of logarithmic table, slide rule, electronic calculator is allowed.
- 4) Assume suitable data, if necessary.

Q1) a) With suitable example explain following line codes. [8]

- i) AMI
- ii) 2B1Q

And also describe their applications.

b) For a (6, 3) LBC, a generator matrix is given below. [6]

$$G = \begin{bmatrix} 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 1 \end{bmatrix}$$

- i) Determine all code words.
- ii) Find out minimum distance between code vectors.

c) Compare PCM, DM and DPCM. [6]

OR

Q2) a) Write short note on : [8]

- i) MLT 3
- ii) ISI

P.T.O.

b) What is need of synchronization in communication. Explain in brief Bit synchronization. [6]

c) Explain in detail structure of optical fiber cable, along with different modes. [6]

Q3) a) What are the steps involved in Shannon Fano coding procedure. Apply Shannon Fano coding procedure for the following message ensemble:[8]

$$[X] = [x_1 \quad x_2 \quad x_3 \quad x_4 \quad x_5 \quad x_6 \quad x_7]$$

$$[P] = [0.4 \quad 0.2 \quad 0.12 \quad 0.08 \quad 0.08 \quad 0.08 \quad 0.04]$$

b) Define entropy. Show that the entropy is maximum when binary message has 50% probability of occurrence. [8]

OR

Q4) a) A binary symmetric channel, characterized by the channel matrix,

$$\begin{bmatrix} p & 1-p \\ 1-p & p \end{bmatrix}$$

Obtain channel capacity for [8]

i) $p = 0.2$

ii) $p = 0.5$

iii) $p = 0.9$

Comment on relation between probability and channel capacity.

b) Apply A Huffman coding procedure to find the coding efficiency for the following symbols,

$$S_1 = 1/3, S_2 = 1/27, S_3 = 1/3, S_4 = 1/9, S_5 = 1/9, S_6 = 1/27, S_7 = 1/27 [8]$$

Q5) a) Describe QAM system in detail. Compare its performance with that of QPSK. [8]

b) Derive an expression for error probability of PSK. [8]

OR

- Q6)** a) Draw modulated output waveforms and signal space diagrams for, [8]
i) QPSK
ii) OQPSK
- b) What are the advantages of QPSK over BPSK. Explain offset QPSK.[8]

Q7) Write short note on any three : [18]

- a) Pure and slotted ALOHA.
b) CSMA.
c) PN sequence.
d) CDMA.

OR

- Q8)** a) Compare TDMA and FDMA. [6]
b) Explain CDMA in detail. [6]
c) Explain FHSS transmitter and receiver in detail. [6]



Total No. of Questions : 8]

SEAT No. :

P2420

[Total No. of Pages : 2

[5253] - 143

T.E. (Electronics Engineering)
Microcontrollers and Applications
(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer the Q.1 OR Q.2 and Q.3 OR Q.4 and Q.5 OR Q.6 and Q.7 OR Q.8*
- 2) *Answer any four questions.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of Calculator is allowed.*
- 6) *Assume Suitable data if necessary*

- Q1)** a) Enlist the shortcomings of 8 bit microcontroller? [4]
b) Draw and explain the PORT0, PORT1 and PORT2 architecture. [6]
c) What are the different timer modes available in 8051 microcontroller?
Explain timer SFR. [8]

OR

- Q2)** a) Describe RS485 bus in detail. What are the advantage of RS485 bus over RS232 bus? [6]
b) Explain the need of different hardware and software tools used while developing embedded system. [6]
c) Explain the role of configuration bits in PIC 18FXXX controller. [6]

- Q3)** a) Draw an interfacing diagram of 8LED's interfaced to PORTD and 2 switches to PORTB also write an embedded C program for chasing LED left to right when switch one is ON and right to left when switch two is ON. [10]
b) Write a program to generate interrupt at every 10 msec using Timer0. Also calculate TMRCON0, TMR0H, TMR0L value for the same? Assume that XTAL = 12MHz [10]

OR

- Q4)** a) Write a program to generate a PWM waveform of 1KHz with 40% duty cycle. Assume XTAL = 8MHz. [10]
b) Draw an interfacing diagram of 16X2 LCD with PIC 18Fxxx and write embedded C program for displaying "SPPU MCA Exam" message on the first line of it. [10]

P.T.O.

- Q5)** a) Explain Interfacing of computer with PIC 18FXXX. Also write embedded c program exchange data between both. [8]
b) How device addressing is done in I2C bus protocol. What are the advantage of SPI over IIC bus. [8]

OR

- Q6)** a) Draw and explain Interfacing of temperature sensor with PIC18FXXX? Also write embedded C program to display temperature on LCD. [8]
b) Explain the MSSP structure with respect to SPI mode [8]

- Q7)** a) With the help of interfacing diagram explain how speed of motor can be calculated. Write algorithm for the same. [10]
b) Explain how the speed of the DC motor controlled by PWM [6]

OR

- Q8)** a) What are the different stages involved in designing of data acquisition system. [10]
b) Design a voltmeter to display range between 0v to 25v using internal ADC of PIC 18FXXX. [6]



[5253]-144

T.E. (Electronics Engg.)

ELECTROMAGNETIC AND WAVE PROPAGATION**(2012 Pattern) (End Semester)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

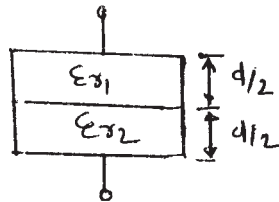
- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of calculator is allowed.

Q1) a) Derive expression for electric field intensity due to line charge using Gauss's law. [6]

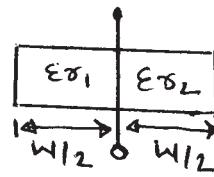
b) Determine the capacitance of each capacitor in fig.1 below.

Take $\epsilon_{r1} = 4$, $\epsilon_{r2} = 6$, $d = 5\text{mm}$, $s = 30\text{cm}^2$

[6]



(a)



(b)

Fig 1

c) State and prove Ampere's circuital law in integral and differential form. [8]

OR

Q2) a) State and prove divergence theorem? [6]

b) Derive the expression for the capacitance of spherical plate capacitor? [6]

c) Derive the boundary conditions at an interface between two magnetic media having permeability μ_1 and μ_2 respectively. [8]

P.T.O.

- Q3) a)** A parallel plate capacitor with plate area of 5cm^2 and plate separation of 3mm has a voltage $50 \sin 10^3 t$ applied to its plate. Calculate the displacement current assuming $\epsilon = 2\epsilon_0$. [6]
- b) State Faraday's law of electromagnetic induction? Derive an expression for emf induced in the conductor due to [10]
- Transformer action
 - Motional action
 - Both Transformer and Motional action

OR

- Q4) a)** Write the Maxwell's equation in point form and integral form for time varying fields. [8]
- b) In a charge free region the magnetic field intensity is given by
- $$\vec{H} = H_M \cos \beta z \cos \omega t \vec{a}_y$$
- by using Maxwell's equation, calculate electric field intensity. [8]

- Q5) a)** Explain and derive the plane wave equation in good conductor. [9]
- b) A uniform plane wave propagation in a medium has [9]

$$\vec{E} = 2e^{-\alpha z} \sin(10^8 t - \beta z) \vec{a}_y \text{ v/m}$$

if the medium is characterized by $\epsilon_r = 1$, $\mu_r = 20$ and $\sigma = 3 \text{ s/m}$ find α, β and \vec{H} .

OR

- Q6) a)** Explain the reflected wave, transmitted wave and incident wave. [8]
- b) An EM wave travels in free space with the electric field component
- $$E_s = 100e^{j(0.866y + 0.5z)} \vec{a}_x \text{ v/m}$$
- Determine [10]
- ω and λ
 - The magnetic field component
 - The time average power in the wave.

- Q7)** a) Write a short note on Ionospheric propagation. [8]
- b) Define the following term : [8]
- i) Virtual height.
 - ii) Maximum Usable Frequency (MUF).
 - iii) Critical frequency.
 - iv) Skip distance.

OR

- Q8)** a) Explain the characteristics of wireless channel in details. [8]
- b) Explain the different types of wave propagation in details. [8]



[5253]-145
T.E. (Electronics)
NETWORK SYNTHESIS
(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagram must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic table, slide rule, electronic calculator is allowed.
- 5) Assume suitable data, if necessary.

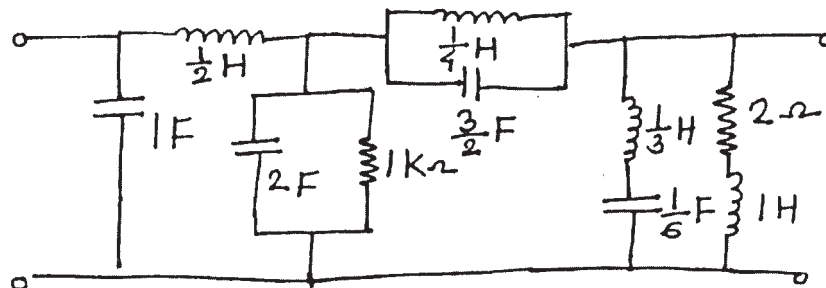
Q1) a) Test whether following function is positive Real function. **[6]**

$$F(s) = \frac{2s^2 + s + 2}{s^2 + s + 2}$$

b) Synthesize following using Foster I & Cauer I form. **[6]**

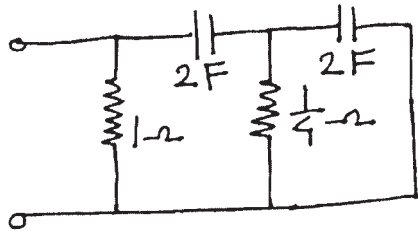
$$Z(s) = \frac{(s+1)(s+4)}{s(s+2)}$$

c) Explain the concept & significance of zeros of transmission in network synthesis. Identify the ZoT for the following network. **[8]**



OR

- Q2) a)** For the network shown below find driving point function $Z(s)$. Plot the zeros & poles of $Z(s)$ on s-plane. [6]



- b) Give the properties of LC driving point immittance function & explain reactance curve for it. [6]
- c) Synthesize the following voltage ratio using constant resistance bridged T circuit. [8]

$$\frac{V_2}{V_1} = \frac{(s+2)(s+4)}{(s+3)(3s+4)}$$

- Q3) a)** Write a short note on frequency & impedance scaling. [4]

- b) Obtain system function for Chebyshev low pass filter to meet the following specifications. [8]

i) Load resistance $R_L = 600\Omega$

ii) $\frac{1}{2}dB$ ripple with pass band

iii) Cut off frequency = 5×10^5 rad/sec

iv) At 1.5×10^6 rad/sec, magnitude must be down 30 dB

- c) The specifications of a butterworth low pass filter are : [4]

i) Pass band 0.2 M rad/sec

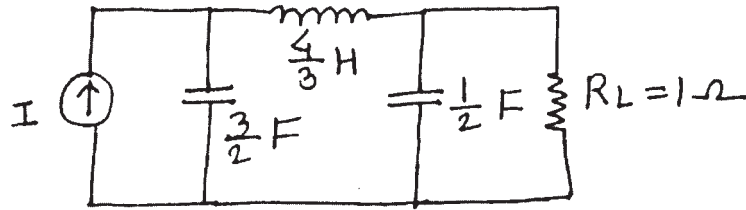
ii) Pass band loss ≤ 2 dB

iii) Stop band loss ≤ 60 dB at 6M rad/sec.

Find the minimum order for the filter.

OR

- Q4) a)** State the properties of butterworth approximation. [4]
- b) Consider the low pass filter, convert it into a band pass filter with 1Ω impedance level with bandwidth $(B) = 6 \times 10^4$ rad/sec & band pass is centered at $W_0 = 4 \times 10^4$ rad/sec. [4]



- c) Determine transfer function for design of butterworth filter that has $2dB$ pass band attenuation at a frequency of 20 rad/sec & at least $10 dB$ stop band attenuation at 30 rad/sec. [8]

- Q5) a)** Compare active & passive filters. [4]
- b) Synthesize second order LPF to have a pole frequency of 2 kHz & a pole 'Q' of 10 . Use sallen & key circuit based on +ve feedback topology. [8]
- c) Design 2^{nd} order butterworth active LPF with cut off frequency 1.8 kHz. [4]

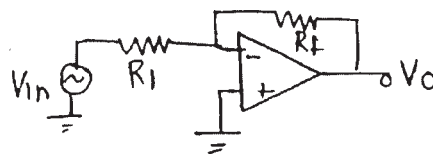
OR

- Q6) a)** Synthesize the following HPF function using RC–CR transformation [8]

$$T_{HP}(s) = K \left[\frac{s^2}{s^2 + s + 16} \right]$$

- b) Draw & explain negative feedback topology. Also derive an expression for the transfer function. [8]

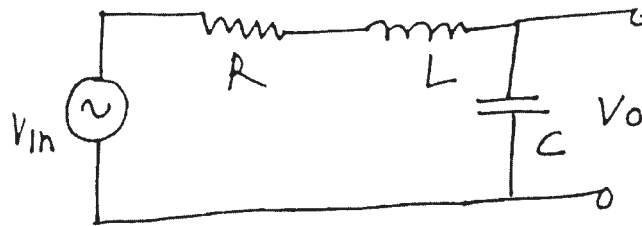
- Q7) a)** The input to the Opamp inverter is a sine wave of an amplifier $5V$. If the slew rate of Opamp is $|V|\mu\text{sec}$. Find the frequency at which the slew rate limiting occurs. [6]
- $R_1 = 5 \text{ k}\Omega$ & $R_f = 10 \text{ k}\Omega$.



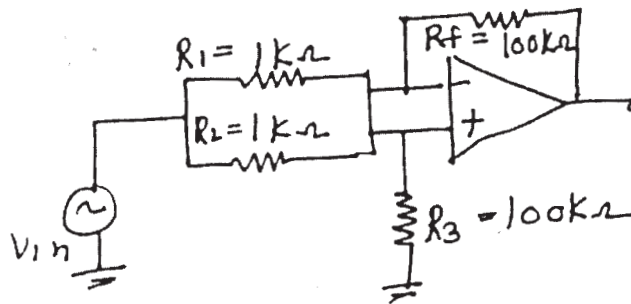
- b) Define Sensitivity. Give some of its important properties. [6]
- c) Discuss how the following parameters of Opamp affect the filter performance. [6]
- Dynamic rate
 - Slew rate
 - Input offset voltage

OR

- Q8) a) Synthesize a second order low pass filter to have a pole frequency of 2kHz & a pole Q of 10 using Saraga design of Sallen ϕ key circuit based on f/b topology, also compute component sensitivity for design 3 (Saraga design) [8]
- b) To find voltage transfer function for the following passive series RLC circuit as shown in fig below. Also compute the sensitivity of QP to network element R, L & C [6]



- c) The O/P voltage measured in the circuit of following figure is 10mV, when I/P voltage is 2V. Find the CMRR. [4]



* * *

Total No. of Questions : 10]

SEAT No. :

P2423

[Total No. of Pages : 2

[5253] - 146

T.E. (Electronics)

Instrumentation Systems
(2012 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8, and Q. No. 9 or Q. No. 10
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1) a)** Explain the following terms with respect to errors in measurement process.[5]
- i) Gross Error
 - ii) Instrumental Errors
- b) State the difference between active and passive transducers. Enlist three examples each of active and passive transducers. [5]

OR

- Q2) a)** Explain the following terms with suitable diagrams. [5]
- i) Linearity
 - ii) Hysteresis
- b) A process vessel contains hazardous and corrosive liquid. A nuclear level gauge is to be used for the level measurement. Explain the working principle of the gamma ray nuclear level gauge used for this application. [5]
- Q3) a)** Suggest a suitable non-contact type temperature sensor for measuring very high temperature in a metallurgical furnace. Also explain the working principle for the same. [5]
- b) Explain construction and working of incremental encoder. [5]

P.T.O.

OR

- Q4)** a) State the formulae for the following terms. [5]
i) Stress
ii) Strain
iii) Gauge Factor
iv) Poisson's Ratio
v) Young's Modulus
b) Explain the working principle of vortex shedding type flow meter. [5]

- Q5)** a) Explain the working of surface micro-machined accelerometer. [8]
b) Explain general architecture of SMART sensors. List its advantages. [8]

OR

- Q6)** a) Explain the working of LM75 semiconductor temperature sensor. [8]
b) Write a short note on surface micro-machined hot wire anemometer. [8]

- Q7)** a) Explain with neat circuit diagram current to voltage (I/V) converter. [8]
b) Write a short note on Foundation Field bus. State its specifications. [8]

OR

- Q8)** a) State the specifications of Profibus network. Explain Profibus architecture. [8]
b) Explain IEEE488 bus protocol. State its specifications. [8]

- Q9)** a) Draw a pneumatic circuit symbol and explain with neat diagram working of poppet valve. [6]
b) Explain principle of operation of DC motor. State various types of D.C. motor. [6]
c) Draw control valve characteristics and explain the terms. [6]
i) Quick Opening
ii) Linear and
iii) Equal Percentage.

OR

- Q10)** a) A 5V control signal is to be used to turn ON and OFF a solenoid valve operating on 230VAC. Explain a relay driver circuit which can be used for this application. [6]
b) Explain control of single acting cylinder using appropriate directional control valve. [6]
c) Explain the working of solenoid as an actuator. [6]



Total No. of Questions : 10]

SEAT No. :

P2424

[Total No. of Pages : 3

[5253]-147

T.E. (Electronics)

DISCRETE TIME SIGNAL PROCESSING

(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*

Q1) a) Compute 4 point DFT of sequence, $x(n) = \{1, 0, -1, 2\}$. **[6]**

b) An analog signal is given by the equations:

$$x(t) = 2 \sin 400\pi t + 10 \cos 1000 \pi t$$

Specify the Nyquist rate and Nyquist intervals for the above signals **[4]**

OR

Q2) a) A 100 Hz sinusoid is sampled at rates of 140 Hz, 90 Hz and 35 Hz. In each case has aliasing occurred, and if so, what is the aliased frequency?**[6]**

b) Compare between DSP and Analog signal processing. **[4]**

Q3) a) Use the four point DFT and IDFT to determine the circular convolution.**[6]**
 $x_1(n) = \{3, 2, 1, 4\}$ and $x_2(n) = \{2, 1, 1, 3\}$.

b) Draw signal flow graph of radix-2 DIT-FFT algorithm for $N = 8$. **[4]**

OR

Q4) a) Determine Z- Transforms of **[6]**

i) $x(n) = \cos(\omega_0 n) \cdot u(n)$.

ii) $x(n) = \sin(\omega_0 n) \cdot u(n)$.

P.T.O.

- b) State and explain following properties of Z- Transform. [4]
 i) Convolution in time domain.
 ii) Differentiation in Z- Domain.

Q5) a) If $H_a(s) = \frac{1}{(s+1)(s+2)}$,

Find the corresponding H (z) using impulse invariance method for sampling frequency of 5 samples per sec. [9]

- b) Draw the direct form-I and II structures for the following systems. [8]
 $3y(n) - 2y(n-1) + y(n-2) = 4x(n) - 3x(n-1) + 2x(n-2)$

OR

- Q6) a)** The transfer function of discrete causal system is given as follows. [9]

$$H(Z) = \frac{1 - Z^{-1}}{1 - 0.2Z^{-1} - 0.5Z^{-2}}$$

- i) Find the difference equation.
 ii) Draw cascade and parallel realization.
 b) Explain the effects of finite word length in digital filter IIR filter. [8]

- Q7) a)** Determine the impulse response h (n) of a filter having desired frequency response. [8]

$$H_d(e^{j\omega}) = e^{-j(N-1)\omega/2} \quad \text{for } 0 \leq |\omega| \leq \frac{\pi}{2}$$

$$= 0 \quad \frac{\pi}{2} \leq |\omega| \leq \pi$$

N = 7, use frequency sampling approach.

- b) Compare various windows for design of FIR filters. [8]

OR

- Q8) a)** Design a bandpass linear phase FIR filter having cutoff frequencies of $\omega_{c1} = 1$ rad/sample. and $\omega_{c2} = 2$ rad/sample, use rectangular windows function. [8]

- b) Give comparison of FIR and IIR filter. [8]

- Q9) a)** Explain methods of sample rate reduction and increase. [8]
- b) With the help of block diagram explain architecture of TMS320C28XX processor. [9]

OR

- Q10)a)** Design a two stage decimator for the following specifications. [9]
- decimating factor - $D = 100$.
passband - $0 \leq F \leq 50$.
Transition band - $50 \leq F \leq 75$
Input sampling rate - 10 KHz.
Ripple - $\delta_p = 10^{-1}$, $\delta_s = 10^{-3}$
- b) Write short notes on : [8]
- a) Triggering of a converter.
b) DC motor speed control.



Total No. of Questions : 10]

SEAT No. :

P2425

[Total No. of Pages : 3

[5253]-148

T.E. (Electronics)

EMBEDDED PROCESSORS

(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side 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.*

Q1) a) Explain different operating modes of ARM Microcontroller. [4]

b) Draw and explain ARM7 programmer's model. [6]

OR

Q2) a) Explain Timer0 operation in detail. [6]

b) Describe PLL and VPB divider blocks in LPC2148 ARM microcontroller. [4]

Q3) a) Explain the following instructions for ARM7. [6]

i) MUL R0, R1, R2

ii) LDMIA R0, {R1 – R3}

iii) ORR R0, R1

b) Write a flashing LED program. Assume 8 LED's are connected to PORT0.15 to PORT0.21. [4]

P.T.O.

OR

- Q4)** a) Draw Interfacing diagram of GSM using UART with LPC2148 and write algorithm for the same. [6]
b) Write a program to generate Triangular wave using on chip DAC. [4]

- Q5)** a) What are the desired features of operating system used in embedded system? [8]
b) Compare CORTEXA, CORTEX, R and CORTEX M processors with their applications. [8]

OR

- Q6)** a) Explain CMSIS standard for ARM Cortex in details. [8]
b) What are the features of CORTEX M3 processor over ARM7 processors. [8]

- Q7)** a) Explain system and power control in ARM Cortex M3. [8]
b) Draw interfacing diagram of RGB LED with LPC1768 and write program for the same. [8]

OR

- Q8)** a) Describe how DC Motor can be control using PWM of LPC1768. [8]
b) What are the different clock sources available in LPC1768. [8]

- Q9)** a) Explain features of CAN bus of LPC 1768. [9]
b) How ETHERNET is available on LPC1768. [9]

OR

Q10) Write a short note (any three) :

[18]

- a) USB Frame Formats.
- b) CAN interfacing and frame format.
- c) ETHERNET.
- d) Compare CAN bus with ETHERNET.



Total No. of Questions : 8]

SEAT No. :

P2426

[Total No. of Pages : 2

[5253] - 149
T.E. (Electronics)
Power Electronics & Applications
(2012 Pattern) (Semester - II)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Draw neat diagrams must be drawn wherever necessary.*
- 3) *Figures to right indicates full marks.*
- 4) *Use of non programmable calculator is allowed.*
- 5) *Assume suitable data wherever necessary.*

- Q1)** a) Draw & explain Single phase semi controlled full wave rectifier for R-L load with various waveforms. Derive expression for average load voltage. [7]
- b) Draw the circuit diagram & explain operation of single phase bridge inverter for RL load with output voltage & current waveform. [7]
- c) Explain different control strategies of a chopper. [6]

OR

- Q2)** a) Explain 120° mode of operation of three phase voltage source inverter for balanced star connected 'R' load with the help of neat diagram & waveforms. [8]
- b) A 230V, 50Hz AC supply is applied to single phase full converter with RL load. If the firing angle (α) is 30° Calculate: [5]
- i) Average load voltage
 - ii) RMS load voltage
- c) With neat diagram, explain operation of class 'C' chopper. [7]
- Q3)** a) With the help of circuit diagram & waveforms, explain operation of SLR half bridge DC/DC converter. [6]
- b) Compare Switched, linear & resonant converter. [4]
- c) What is the necessity of resonant converter? Explain with neat circuit diagram & waveform working operation of ZCS. [6]

P.T.O.

OR

- Q4)** a) What is Resonant converter? Draw a neat circuit diagram, waveform & explain working operation of ZVS. [6]
b) Compare ZVS & ZCS. [4]
c) Define power quality. Explain the types of power line disturbances with their sources. [6]

- Q5)** a) Explain with block schematic working of ON line UPS. Justify why On line UPS is better than OFF line UPS. [8]
b) With the help of block schematic explain operation of Electronic ballast [8]

OR

- Q6)** a) Compare ON line UPS & OFF line UPS [6]
b) Write a short note on:
i) Power electronics in capacitor charging application [10]
ii) HVDC

- Q7)** a) Draw block schematic & explain grid connected PV system. [6]
b) Compare Stand alone PV system & grid connected PV system. [6]
c) Draw & explain block diagram of isolated grid supply system with multiple wind turbines. [6]

OR

- Q8)** a) What is meant by MPPT? Explain in detail about analog & digital control methods for MPPT [6]
b) With neat schematic explain Horizontal axis wind turbine (HAWT) in detail. [6]
c) Explain in brief control of wind turbine generator [6]



Total No. of Questions : 8]

SEAT No. :

P2427

[Total No. of Pages : 2

[5253] - 150
T.E. (Electronics)
INDUSTRIAL MANAGEMENT
(2012 Pattern)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

Q1) a) Differentiate between Public Ltd. Company and Private Ltd. Company. [6]

b) Explain in brief following: [8]

- i) Poke Yoke
- ii) Continuous improvement

c) State the differences between CPM and PERT. [6]

OR

Q2) a) Explain in brief following: [8]

- i) SIX SIGMA
- ii) Five S (5S)

b) Explain the contribution of HENRY FEYOL in the field of Management. [6]

c) A capacitor manufacturing company sells capacitor at a selling price of Rs.450/- per unit. The company has fixed cost commitment at Rs.40 Lakhs and variable cost of Rs.155/- per unit. Calculate. [6]

- i) Break —even Sales quantity
- ii) Break —even Sales
- iii) Contribution.

Q3) a) State all the functions of HRM. [5]

b) What are the objectives of HRM? [5]

c) What are the objectives & process of Human resource planning? [7]

OR

Q4) a) Explain in brief following: [6]

- i) HR Planning
- ii) Training and Development

b) What are the types of performance appraisal? [6]

c) State the objectives of performance appraisal. [5]

P.T.O.

- Q5)** a) What are the different types of Entrepreneurs? Define each type. [5]
b) Explain the different traits of Entrepreneur. [5]
c) How business ideas are generated. Explain with a help of an example. [6]

OR

- Q6)** a) State that how an individual can identify business opportunities. [6]
b) Explain all the traits of Entrepreneurship. [5]
c) State a Case study on Small scale industry of India with respect of Entrepreneurial venture. [5]

- Q7)** a) State the need, purpose & objectives of MIS. [7]
b) Mention different business models of E- Commerce with examples. [5]
c) What are the advantages of Internet marketing. [5]

OR

- Q8)** a) What are the Decision-making models? Write their characteristics as well. [5]
b) State some examples of Decision-making models. [6]
c) Describe E- Commerce and mention its disadvantages. [6]



Total No. of Questions : 8]

SEAT No. :

P2428

[Total No. of Pages : 3

[5253]-151

T.E. (E & TC/Electronics)

DIGITAL COMMUNICATION

(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Black figures to the right indicate full marks.*
- 3) *Neat diagram must be drawn whenever necessary.*
- 4) *Assume suitable data, if necessary.*

Q1) a) A signal having bandwidth of 3 KHz is to be encoded using **[8]**

- i) 8-bit PCM system
- ii) DM system

If 10 cycles of the signal are digitized, state how many bits will there in digitized output in each case. If sampling is 10 KHz. Also determine bandwidth required in each case.

- b) What is bit synchronization? Explain closed loop bit synchronizer in detail. **[6]**
- c) Explain classification of Random processes with mathematical expressions. **[6]**

OR

Q2) a) Consider a compander with $\mu = 255$ is used with $v = 3$ bit quantizer where output varies over 18.75V. For an input of 0.6V. Find quantization error with or without companding. **[8]**

- b) What are the conditions for a random process to be Wide-sense stationary? **[6]**
- c) Explain Intersymbol interference and how Eye diagram can be used to measure ISI? **[6]**

P.T.O.

- Q3) a)** In a binary transmission one message is represented by a rectangular pulse $X(t)$ and other message is transmitted by the absence of the pulse. Evaluate the signal to noise with PSD equal to $\frac{N_0}{2}$. Also sketch impulse response of matched filter. **[8]**
- b)** Sketch & explain the signal space representation of QPSK. Calculate euclidean distance for the same. **[8]**

OR

- Q4) a)** What is hypothesis Testing? Explain MAP in detail. **[8]**
- b)** Derive an expression of Error probability of integrate & dump filter. **[8]**
- Q5) a)** Sketch all the waveforms to generate MSK for the input bit stream 11000111. Write time domain expression of MSK signal. **[10]**
- b)** A binary bandpass system transmits binary data at a rate of 2.5×10^6 bits/second. During transmission AWGN with PSD equal to 10^{-14} W/Hz is added to signal. In the absence of noise received sinusoidal wave for digit 1 or 0 is 1 MV. Find the average probability of symbol error for the following system. **[8]**
- i) Coherent BPSK
- ii) Coherent BFSK
- [Erfe (2.237) = 1.84×10^{-3} , Erfe (3.1622) = 7.8×10^{-6}]

OR

- Q6) a)** Explain with block diagram BPSK Transmitter and Receiver. Explain with mathematical expressions working of BPSK Receiver. **[10]**
- b)** A binary DPSK system is to have an average probability of error $P_e < 10^{-4}$. If the average transmitted power is 150 milliwatts the channel attenuation is 80 dB and AWGN with PSD $\eta/2 = 0.5(10^{-15})$ W/Hz. Find maximum allowable bit rate for transmission. **[8]**

- Q7) a)** In a DSSS-CDMA system, the data rate $f_b = 6$ Kbps and the chip rate $f_c = 12$ mb/s. What is the jamming margin if an output SNR of 10 dB is required for a $P_e = 10^{-5}$? Assume a system loss of 1.5 dB owing to imperfections in tracking and detection. [8]
- b) A four stage shift register with feedback connections taken from the outputs of stages 4 and 1 through a modulo - 2 adder, is used for PN sequence generation. Assuming the initial contents of the shift register to be 0100, determine the output sequence. What is the length of the sequence? Draw the diagram of PN sequence generator. [8]

OR

- Q8) a)** Explain the basic principle of spread spectrum technique. With the help of block diagram and waveform explain DSSS-PSK system. [10]
- b) Explain the concept of orthogonality and explain OFDM Technique. [6]



Total No. of Questions : 10]

SEAT No. :

P2429

[Total No. of Pages : 3

[5253]-152

T.E. (E & TC)

DIGITAL SIGNAL PROCESSING

(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) List the advantages of digital signal processing over analog signal processing. [3]
- b) Explain the concept of orthogonality. [3]
- c) What should be the sampling frequency to avoid aliasing for an analog signal represented as, $x(t) = \cos(150\pi t) + 2 \sin(300\pi t) - 4 \cos(600\pi t)$. Obtain the discrete time signal if this sequence is sampled at $F_s = 400\text{Hz}$. Does aliasing occur? If yes, calculate the aliased frequencies from the original frequencies. [4]

OR

- Q2)** a) Perform the circular convolution of two sequences given below. [4]
- $$X_1(n) = \{ \underset{\uparrow}{1}, 2, 3, 4 \}$$
- $$X_2(n) = \{ \underset{\uparrow}{1}, 1, 2, 2 \}$$
- b) State and prove any 3 properties of DFT. [3]
- c) Write short note on ,“Overlap and save method” [3]

P.T.O.

- Q3)** a) What is the need of transform? What is the relationship between Z transform and DFT. [3]
- b) Compute the Discrete Cosine Transform of following sequence. [4]
 $x(n) = \{4, 3, 5, 1\}$
- c) Compute the Z transform & define its ROC for the following signals. [3]
- i) $x(n) = n^2 u(n)$ for $n \geq 0$
- ii) $x(n) = 2^{(n)} u(n-2)$

OR

- Q4)** a) By using partial fraction method find the Inverse Z transform of [3]

$$X(z) = \frac{z^2}{(z+1)(z+2)}$$
- b) Comment on, “Causality and stability”, of LTI system in Z domain. [3]
- c) Compute the DFT of the following sequence. [4]
 $x(n) = \{1, 2, 3, 4\}$

- Q5)** a) Explain in detail impulse invariance technique for IIR filter design. What are its drawbacks? How Bilinear Transformation method overcomes the limitations of impulse invariance technique. [8]
- b) A digital filter has frequency specification pass band frequency is 0.2π and stop band frequency 0.3π . What are corresponding specification for pass band and stop band frequency in analog domain if, [8]
- i) Impulse invariance technique is used for designing
- ii) Bilinear Transformation method is used for designing.

OR

- Q6)** a) Obtain direct form I and II realization of a system described by [8]
 $y(n) - 3/4 y(n-1) - 1/2 y(n-2) + 1/8 y(n-3) = x(n) + 5/4 x(n-1)$
- b) Explain the steps used for designing an IIR filter using bilinear transformation method (BLT). What is warping effect in BLT. [8]

- Q7) a)** What is FIR system? Compare FIR system with an IIR system. [8]
- b) Design FIR digital filter to approximate an ideal low pass filter with pass band gain of unity, cut off frequency 850Hz and sampling frequency 5000Hz. The length of impulse response should be 5. Use a Rectangular Window. [8]

OR

- Q8) a)** Draw & explain the characteristics of ideal filters & its requirements. Why the ideal filters are used? Explain the Gibbs phenomenon, why it occurs? [8]
- b) The desired response of FIR low pass filter is [8]

$$H_d(e^{j\omega}) = e^{-j3\omega} \quad -\frac{3\pi}{4} \leq \omega \leq \frac{3\pi}{4}$$

$$= 0 \quad \frac{3\pi}{4} \leq \omega \leq \pi$$

Determine $H(e^{j\omega})$ for $M = 7$ using Hamming window.

- Q9) a)** Explain applications of DSP in voice processing and image processing. [8]
- b) Design two stage decimator for following specifications, [10]
- Sampling rate of input signal = 20 KHz
Down sampler = 60,
Pass band = 0 to 40 Hz,
Transition band 40 to 50 Hz,
Pass band ripple = 0.01 dB, Stop band ripple = 0.002dB.

OR

- Q10) a)** Explain the importance features of TMS 320C67XX series DSP processor. Draw its Functional block diagram and explain each block in detail. [10]
- b) Explain necessity of : [8]
- MAC unit
 - Barrel shifter



Total No. of Questions : 8]

SEAT No. :

P2430

[Total No. of Pages : 2

[5253] - 153
T.E. (E & TC)
Microcontroller and Applications
(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

- Q1)** a) Explain the factors for selecting the Microcontroller for the particular application. [6]
- b) Explain the operational diagram of Timer/Counter of 8051 in detail. [6]
- c) Explain with example function of ALU in PIC for transfer of data. [8]

OR

- Q2)** a) With the help of neat block diagram explain the operation of Logic analyzer. [6]
- b) Explain the operational diagram of Interrupt with vector locations of 8051 in detail. [6]
- c) State features of PIC and explain BOD and Power down modes of PIC. [8]

- Q3)** a) Draw and explain the interrupt structure of PIC with reasons of causing Interrupts. [8]
- b) Draw an interfacing diagram 4*4 key pad and write C program to accept the key. [8]

OR

- Q4)** a) Draw an interfacing diagram to display the Uni-PUNE on LCD, also write C program. [8]
- b) Write an Embedded C program to generate PWM waveform of period = 200 μs and Duty cycle of 10% using CCPx on port pin of PIC Microcontroller [8]

P.T.O.

- Q5)** a) Draw and explain the I2C diagram of MSSP structure in detail. [8]
b) Draw and interfacing diagram to interface EEPROM using SPI protocol with program. [8]

OR

- Q6)** a) Write an Embedded C program to toggle the bits of port C after every 10 ms using interrupt. [8]
b) Explain the internal block diagram of ADC in PIC and explain the ADC conversion steps. [8]

- Q7)** a) Explain with flowchart and algorithm design of DMM using PIC18 [8]
b) Design a data acquisition system, to senses, process and display the Temp. Humidity and air pressure with flowchart and program. [10]

OR

- Q8)** a) Design a Home alarm system considering the parameters of door safety using sensors for detection of person and its movements, Display warning on LCD. [8]
b) Draw and explain Design of frequency counter with display on LCD using PIC18 Microcontroller with all details. [10]



Total No. of Questions : 8]

SEAT No. :

P2431

[Total No. of Pages : 3

[5253]-154

T.E. (E & TC)

**ELECTROMAGNETICS AND TRANSMISSION LINE
(2012 Pattern)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*

Q1) a) Using Gauss's law, derive an expression for electric field intensity (\vec{E}), due to infinite line charge with uniform line charge density ρ_L , placed along entire z-axis. [7]

b) Two homogeneous isotropic dielectrics meet on plane $z = 0$ for $z > 0$, $E_{r_1} = 4$ and for $z < 0$, $E_{r_2} = 3$. A uniform electric field $\vec{E}_1 = 5\bar{a}_x - 2\bar{a}_y + 3\bar{a}_z$ kv/m exists for $z \geq 0$, find : [6]

i) \vec{E}_2 for $z \leq 0$

ii) The angle between \vec{E}_2 and interface

iii) The energy density in $z \geq 0$

c) Using Biot-Savart Law, find magnetic field intensity (\vec{H}), due to infinitely long straight filament carrying current 'I' amperes. [7]

OR

Q2) a) A point charge of 16nc is located at Q(2, 3, 5) in free space and a uniform line charge of 5nc/m is at the intersection of the planes $x = 2$ and $y = 4$. If the potential at the origin is 100v, find potential (v) at point p(4, 1, 3). [7]

P.T.O.

- b) Derive an expression for capacitance of a parallel plate capacitor. [5]
- c) Derive point form of Amperis Circuital Law. ($\nabla \times \bar{H} = \bar{J}$) [8]

- Q3)** a) State and prove Poynting theorem and explain the significance of each term. [8]
- b) State the Maxwell's equation in point form for static electric and steady magnetic fields. Explain how these are modified for time varying fields. [10]

OR

- Q4)** a) What are uniform plane waves? Derive an expression for Helmholtz wave equation. [10]
- b) In a medium characterized by
 $\sigma = 0$, $\mu = \mu_0$, $\epsilon = \epsilon_0$ and $\bar{E} = 20 \sin(10^8 t - \beta z) \bar{a}_y$ v/m. [8]
 Calculate β and \bar{H} .

- Q5)** a) What do you mean by distortion less line? Derive the expression for characteristic impedance and propagation constant for distortion less line. [8]
- b) State primary and secondary constants of a transmission line and hence derive relationship between primary and secondary constants of transmission line. [8]

OR

- Q6)** a) A transmission line has the following primary constants. [10]
 $R = 11 \Omega/\text{km}$
 $L = 0.00367 \text{ H/km}$
 $G = 0.8 \mu\text{S}/\text{km}$
 $C = 8.35 \text{ nF/km}$

At a signal of 1 KHz calculate :

- i) Z_0
 - ii) Attenuation constant in Np/km
 - iii) Phase constant in rad/km
 - iv) Wavelength
 - v) Velocity
- b) Explain the concept of reflection on transmission line and hence define reflection coefficient. [6]

- Q7)** a) What are standing waves? Derive the relation between the SWR and magnitude of reflection coefficient. [8]
- b) A Lossless transmission line with characteristic impedance of 50Ω is 30m long and operates at 2 MHz frequency. The line is terminated with a load of $(60 + j 40)$. If phase velocity is $0.6c$, where 'c' is speed of light, then find using SMITH CHART : [8]
- i) Reflection coefficient (Γ)
 - ii) VSWR
 - iii) Input Impedance (Z_{in})

OR

- Q8)** a) Derive an expression for voltage and current on dissipation less line. [8]
- b) What is impedance matching? Explain necessity of it. What is stub matching? Explain stub matching with its merits and demerits. [8]



Total No. of Questions : 8]

SEAT No. :

P2432

[Total No. of Pages : 2

[5253] - 155

T.E. (E & TC)

**SYSTEM PROGRAMMING AND OPERATING SYSTEM
(2012 Pattern)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2,Q3or Q4,Q5 or Q6, Q7 or Q8*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Write short note on MS DOS linker. [7]
b) Define language processor. Also explain various language processing tools. [7]
c) What are the differences between Macros and Functions? [6]

OR

- Q2)** a) Show parsing steps of $\langle id \rangle + \langle id \rangle * \langle id \rangle$ according to the following grammar: [7]
E ::= TE"
E" ::= +E | ϵ (epsilon)
T ::= VT"
T" ::= *T | ϵ (epsilon)
V ::= $\langle id \rangle$
- b) Explain the advance macro facilities [7]
i) Alteration of flow of control during expansion
ii) Expansion time variables
iii) Attributes of parameters
- c) Explain software tools for program development. [6]

- Q3)** a) Explain dining philosophers problem and Producer Consumer problem [6]
b) Explain Process Control Block (PCB) in details. [6]
c) What are the 4 ways of handling deadlocks? Explain each with an example. [6]

P.T.O.

OR

- Q4)** a) Explain the concept critical region and mutual exclusion with examples. [6]
b) What are threads? How are they different from processes? List different types of thread models. [6]
c) Consider the following processes where Arrival and Burst time are as shown below. [6]

Process	Burst Time	Arrival Time
P1	05	0
P2	04	2
P3	07	3
P4	06	5

Calculate the Average Waiting Time and Average Turn-around Time if the processes are scheduled using FCFS.

- Q5)** a) Consider the following Page reference string :8, 1, 3, 1, 8, 6, 4, 3, 8, 4, 8, 7, 1, 2 The number of page frames = 3, calculate the page faults and the hit ratio for Least recently used algorithm. [8]
b) Explain Virtual Memory with Segmentation [8]

OR

- Q6)** a) Explain design issues in paging. What is Demand paging? Explain with example. [8]
b) Explain the First fit, Best fit and Worst fit algorithms with example. [8]

- Q7)** a) Explain Linux file system [8]
b) Explain I/O software layers with diagram [8]

OR

- Q8)** a) Write short note on magnetic disks and optical disks. [8]
b) Explain Interrupt driven I/O and I/O using DMA. [8]



[5253] -156

T.E. (Electronics and Telecommunication Engineering)
Information Theory and Coding Techniques
(2012 Pattern) (Semester - II)

*Time : 2½ Hours]**[Max. Marks : 70**Instructions to the candidates:*

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Use of calculator is allowed.
- 4) Assume suitable data if necessary.

Q1) a) A discrete memory less source having channel matrix = $\begin{bmatrix} 0.6 & 0.4 \\ 0.3 & 0.7 \end{bmatrix}$, emits

equiprobable messages X_1 & X_2 . Draw Channel diagram and hence, find $H(X)$, $H(Y)$, $H(X,Y)$, $H(X/Y)$, $I(X;Y)$ [7]

b) Design coding and decoding technique for (5,1) linear block code. Write all valid code words, find error correcting and detecting capability of this code. Find corrected code words for following received codes. [8]

- i) 10100
- ii) 11101

c) Prove that mutual information is given by

$$I(X; Y) = H(X) + H(Y) - H(X, Y) . \quad [5]$$

OR

Q2) a) Obtain the coding efficiency of a Shannon Fano and Huffman code for a zero memory source that emits seven messages (E, N, G, L, H, S, I) with probabilities of {0.2, 0.15, 0.02, 0.1, 0.4, 0.08, 0.05} respectively. [8]

b) Explain hamming bound for perfect code and hence, comment whether following code is perfect code or not, with necessary justification. [7]

- i) (7, 4) LBC
- ii) (6, 3) LBC

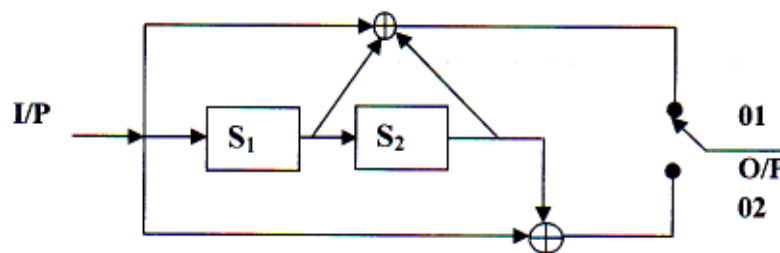
c) Explain JPEG image compression standard. [5]

P.T.O.

- Q3) a)** Use $x^4 + x + 1$ as primitive polynomial and Find [7]
- All elements of $GF(2^4)$
 - Cyclotomic decomposition,
 - Coset leaders,
 - Corresponding minimal polynomials
- b) Consider the BCH (15, 5) triple error correcting code has the following generator polynomial $g(x) = x^{10} + x^8 + x^5 + x^4 + x^2 + x + 1$. Find the errors using Gorenstein – Zierler algorithm in received polynomial $x^{13} + x^{10} + x^8 + x^4 + x + 1$ [7]
- c) Explain Selective repeat ARQ. [4]

OR

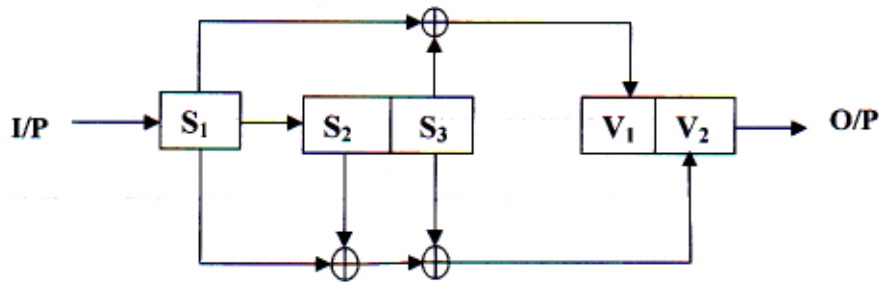
- Q4) a)** Determine the generator polynomial of double error correcting BCH code with a block length 15. Use the primitive polynomial $x^4 + x + 1$. What is minimum distance of this code. [10]
- b) Draw Syndrome generator circuit for (7,4) cyclic code generated using $g(x) = 1 + x + x^3$. Calculate syndrome for receiver vector [0110100] [8]
- Q5) a)** A convolution encoder has code rate = $\frac{1}{2}$ constraint length $K = 3$ as shown in Figure below. Draw the trellis diagram. By using Viterbi algorithm decode the sequence 010001000. [8]



- b) Explain following code [8]
- Fire code
 - Golay Code
 - CRC - code
 - Interleaved Code

OR

- Q6)** a) For the convolution encoder shown in figure below. Sketch the state diagrams, Code Tree and trellis diagram. Find the output data sequence 10011. [10]



- b) Explain Low Density Parity Check code. [6]

- Q7)** a) What are the Ungerboeck's TCM design rules. [4]
b) Write Shannon Hartley Capacity Theorem. [4]
c) What is bandwidth efficiency plane? Explain different regions in the plane. [8]

OR

- Q8)** a) Explain how coding gain is improved in TCM. [8]
b) What are the goals of communication system designer? Explain any three of them. [8]



Total No. of Questions : 8]

SEAT No. :

P2434

[Total No. of Pages : 2

[5253] - 157

T.E. (E & TC)

Antenna & Wave Propagation

(2012 Pattern) (Semester - II)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6, Q No. 7 or 8
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and stem tables is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Explain in detail the ground wave propagation. Which frequency range is used for ground wave propagation? Why vertical antenna used for ground wave propagation? [8]
- b) A 300MHz uniform plane wave propagates through fresh water for which $\epsilon_r = 78$, $\mu_r = 1$, and $\sigma = 0$. Calculate [6]
- i) Phase constant
 - ii) Wavelength
 - iii) Intrinsic constant
- c) Derive an expression of electric and magnetic field intensity in terms of vector potential F and magnetic current source M. [6]

OR

- Q2)** a) A free space microwave link operating at 10Ghz consists of transmitting and receiving antenna each having gain of 25dB. The distance between the two antennas is 30km and the power radiated by transmit antenna is 10W. Calculate the received power and path loss. [6]
- b) An antenna has radiation resistance of 72Ω , a loss resistance of 8Ω and power gain of 12dB. Determine antenna efficiency and its directivity. [4]
- c) Define and explain the following antenna terminologies: [6]
- i) Radiation pattern
 - ii) Radiation power density
 - iii) Radiation intensity
- d) State the poynting theorem. Write expression for power radiated by antenna using poynting theorem. [4]

P.T.O.

- Q3)** a) Derive power density and radiation resistance with respect to infinitesimal dipole. [8]
b) Draw current distribution and radiation pattern of $.5 \lambda$ and 1.5λ dipole [4]
c) Find the directivity of half dipole. [4]

OR

- Q4)** a) Explain important features of loop antenna. Describe radio direction finding. [6]
b) A dipole carries r.m.s. current of 200 A at 250 MHz. Its length is one meter. Calculate: [6]
i) Power radiated by the antenna.
ii) Effective height of the antenna.
iii) Directive gain of the antenna.
c) Draw the diagram of current distribution monopole antenna and also find radiation resistance of monopole antenna. [4]

- Q5)** a) Explain design equations for yagi uda antenna. Sketch modern version of 6-element Yagi Uda antenna with dimensions, inter-element spacing. [8]
b) Write steps to design dolph-Chebysheff array. Compare Dolph Chebysheff array with binomial array. [8]

OR

- Q6)** a) Draw radiation pattern of end-fire antenna array for 8 element and spacing between elements is $\lambda/4$. Find HPBW for same antenna. [10]
b) Derive the expression for directivity of Broadside array. [6]

- Q7)** a) What are electromagnetic horn antennas? What are the various types of horns? What are their practical applications? Compare these antennas with paraboloidal reflector antennas. [9]
b) Explain Microstrip antenna with its structure, working, application, advantages & disadvantages. [9]

OR

- Q8)** a) Write short note on following with respect to structural detail, radiation pattern, detailed diagrams & features; [12]
i) Biconical antenna
ii) Super Turnstile Antenna
iii) Rhombic Antenna
b) Find FNBW and power gain of 3m parabolic reflector operated at 3000MHz. [6]



Total No. of Questions : 10]

SEAT No. :

P2435

[Total No. of Pages : 2

[5253] - 158

T.E. (E & TC)

Embedded Processor
(2012 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Question 1 or 2, 3 or 4, 5 or 6, 7 or 8, and 9 or 10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) State the features of LPC2148. [4]
b) Explain instructions: [4]
i) BICEQ r2, r7, #7
ii) ADDEQ r2, r3
iii) CMP r2, r1
iv) SUBGT r1, r2, #5
c) Explain the PINSEL registers [2]
i) PINSEL0
ii) PINSEL1

OR

- Q2)** a) State significance of PLL and explain VPB divider block of LPC2148. [4]
b) Draw interfacing diagram of keypad with LPC2148 and write algorithm or draw flowchart for the same. [6]
- Q3)** a) Draw and explain format of CPSR register of ARM 7. [4]
b) Write an embedded 'C' program to generate ramp signal using on chip DAC of LPC2148. [6]

OR

- Q4)** a) Draw and explain SD card interfacing with LPC 2148. Write a embedded 'C' program for the same. [6]
b) Explain UART block of LPC2148. [4]

P.T.O.

- Q5)** a) Explain thread and handler modes of cortex M3 with the help of state diagram. [8]
b) Compare ARM CORTEX A, CORTEX M, CORTEX R processor series. [8]

OR

- Q6)** a) Explain CMSIS standard. [8]
b) Explain the need of operating system in developing complex applications in embedded system. [8]

- Q7)** a) Interface DC motor with LPC1768 and write a 'C' program to control the speed of DC motor using PWM signal with 60% duty cycle. [8]
b) Draw and explain block diagram of LPC1768. [8]

OR

- Q8)** a) Explain clock and power control block of LPC1768. [8]
b) Interface RGB LED to LPC1768 and write a 'C' program to display red, blue and green color with some delay. [8]

- Q9)** Write short note on followings. [18]
a) USB
b) CAN
c) NVIC

OR

- Q10)**a) Explain Ethernet based communication using Microcontroller. [9]
b) Explain any four GPIO registers of LPC1768 [9]



Total No. of Questions : 8]

SEAT No. :

P2436

[Total No. of Pages : 2

[5253] - 159
T.E. (E & TC)
Industrial Management
(2012 Pattern) (Semester - II)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagram must be drawn whenever necessary.*
- 3) *Figures to be right indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Draw and explain flowchart of planning in management. [7]
b) Explain any two Quality Management Assistance Tools with examples. [7]
c) Distinguish between Administration and Organization. [6]

OR

- Q2)** a) Compare the theories of F.E Taylor and Henry Fayol. [6]
b) Explain the Break —Even analysis with neat diagram. [7]
c) Write a short note on CPM. [7]

- Q3)** a) Explain role, responsibilities, and competencies of Human Resource professional. [8]
b) Write a note on Human Resource Information System (HRIS). [8]

OR

- Q4)** a) Explain the four stages of systematic approach to training. [8]
b) Distinguish between Recruitment and Selection process. [8]

- Q5)** a) Explain in detail the Franchisee type of Business Out. Enlist its advantages and Disadvantages. [9]
b) Explain in detail the Partnership. Its merits & demerits of partnership. [9]

OR

- Q6)** a) Give the detail comparisons of Private & Public sector. [9]
b) Mention the different steps to start a Small Scale Industry. Also elaborate the Policies and Incentives for SSI. [9]

P.T.O.

- Q7)** a) Define MIS; Explain how it helps to develop the productivity of employees in organizations with a neat sketch. [8]
b) Explain different types of B2C (Business to Consumer) Companies. [8]

OR

- Q8)** a) Write a note on the Information System with neat sketch and details. [8]
b) Define ERP and ERP systems; give its benefits & difficulties to implementation in organizations. [8]



Total No. of Questions : 8]

SEAT No. :

P2437

[Total No. of Pages : 2

[5253] - 160

T.E. (E & TC Engineering)
POWER ELECTRONICS
(2012 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Draw neat diagrams & waveforms wherever necessary.*
- 3) *Figures to right indicate full marks.*
- 4) *Use of nonprogrammable calculators is allowed.*
- 5) *Assume suitable data wherever necessary.*

- Q1)** a) Draw and Explain steady state characteristics of IGBT. [7]
b) Explain two transistor analogy of an SCR. Drive anode current equation of SCR. [6]
c) Draw neat circuit diagram and explain single phase full bridge converter with R-L load. State different performance parameters of the same. [7]

OR

- Q2)** a) Explain with circuit diagram and waveforms three phase inverter with 120 degree conduction mode. [7]
b) Draw and Explain the switching characteristics of SCR. [6]
c) Draw the circuit diagram of three phase Half Controlled Bridge converter with R load. Explain its operation. Draw the output voltage waveform for firing angles 30 degree & 60 degree. [7]

- Q3)** a) What is DC to DC converter? Explain Step — down Chopper (highly inductive load) with circuit diagram & waveforms. Also derive output voltage equation. [9]
b) Draw the circuit diagram of single phase AC Voltage controller with R load. Explain its operation. Draw the waveform of output voltage. [9]

OR

- Q4)** a) Input to the step up chopper is 200 V. The output required is 600 V. If the conducting time is 200 μ sec, compute Chopping frequency. If the pulse width is halved for constant frequency of operation, find the value of new output voltage. [9]
b) Draw the block schematic of SMPS and explain its advantages over Linear power supply. [9]

P.T.O.

- Q5) a)** Explain OFF-line UPS with neat block-diagram. State its specifications and applications. [6]
b) Explain with circuit diagram working of single phase separately excited DC motor drive. Draw neat waveforms across load. [10]

OR

- Q6) a)** What are AC drives? Explain with block diagram, speed control technique of three phase Induction motor by using V/F method. [8]
b) Write short notes on: [8]
i) Electronic ballast and
ii) Battery Charger

- Q7) a)** Explain SLR half bridge DC/DC converter with neat circuit diagram and waveforms. [8]
b) Explain dv/dt di/dt and snubber circuit in detail. [8]

OR

- Q8) a)** Explain with circuit diagram and neat waveforms ZVS resonant converters. [10]
b) Explain overvoltage and over current protection circuits. [6]



Total No. of Questions : 10]

SEAT No. :

P2438

[Total No. of Pages : 2

[5253] - 161

T.E. (Electrical)

ADVANCED MICRO CONTROLLER AND ITS APPLICATIONS

(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagram must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain the use of File Select Registers. **[4]**

b) Explain the functions of following SFR's related to the ports of PIC18 microcontroller PORTx, TRISx and LATx. **[6]**

OR

Q2) a) Explain the status of the flags in status register if the PIC18 MPU adds the following two numbers 0xFF and 0x01. **[6]**

b) Explain the function of Bank select register. Write an instruction in assembly language which will select BANK 2. **[4]**

Q3) a) Explain the CALL and RETURN instructions in PIC18 microcontroller. **[6]**

b) Write a program in C to configure PORT C as input port and PORT D as output port. **[4]**

OR

Q4) a) Draw the interrupt vector table for PIC18 microcontroller. Explain the steps taken by controller in execution of interrupt. **[6]**

b) Write a program in C language to load Timer 0 by a data FFAA H. **[4]**

Q5) a) Explain the steps to be followed while sending Data to LCD. **[8]**

b) With a neat diagram of interfacing of 4x4 keypad with PIC18F458. Using a flow chart explain the method of key press detection. **[8]**

OR

P.T.O.

- Q6)** a) Write a program for PIC 18 microcontroller in C to receive bytes of data serially and place the received data in WREG register continuously. Set the baud rate of 9600, 8 bit data, 1 stop bit. XTAL=10 MHz. [8]
- b) Write short note on SPI protocol. [8]

- Q7)** a) Using compare mode, write a C program for generation of square waveform with a period of 40ms. Use Timer 1 as timing resource with a pre-scalar of 1:1 [9]
- b) With a flow chart explain speed control DC motor using PIC microcontroller. [8]

OR

- Q8)** a) A stepper motor is interfaced with PIC18 microcontroller through lower nibble of Port B (RB0- RB3). Write program in C language to rotate the stepper motor in anticlockwise direction. Assume the step angle of 1.8 degree's. and oscillator frequency = 10 MHz [9]
- b) Explain how time period and duty cycle is set for generation of a waveform using PWM mode in CCP module in PIC 18 microcontroller. [8]

- Q9)** a) Explain with a neat diagram, interfacing of DAC 0808 with PIC microcontroller and write a program for TRIANGULAR waveform generation using DAC interfaced with PIC microcontroller through Port B. Assume the crystal frequency to be 10MHz [8]
- b) Explain in detail the functions of the following special function registers ADCON0, ADRESH and ADRESL of PIC18 microcontroller. [9]

OR

- Q10)** a) Explain the steps involved in programming of A/D converter in PIC18F458 microcontroller using method of polling. [8]
- b) With a flow chart explain interfacing of LM35 with PIC 18F458 for measurement of temperature. [9]



Total No. of Questions : 10]

SEAT No. :

P2439

[Total No. of Pages : 3

[5253]-162

T.E. (Electrical)

ELECTRICAL MACHINES - II

(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.No.1 or 2, Q.No.3 or 4, Q.No.5 or 6, Q.No.7 or 8, Q.No.9 or 10.*
- 2) *Neat diagram must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Explain pitch factor (Kc) with diagram. **[4]**

- b) Effective resistance of a 1MVA, 3300V, 50Hz three phase star connected alternator is 0.3Ω per phase. A field current of 35 A produces a current of 200A on short circuit and 1100V across lines on open circuit. Find the per unit change in terminal voltage when a load of 1000 kW at 0.8 power factor lagging is thrown off. **[6]**

OR

Q2) a) With a neat diagram explain construction of three phase alternator. **[4]**

- b) Explain the procedure to determine regulation of three phase alternator by e.m.f. method. **[6]**

Q3) a) Compare three phase synchronous motor with three phase induction motor on following points : **[4]**

- i) Starting
- ii) Speed
- iii) Power factor
- iv) Cost/KVA

P.T.O.

- b) A three phase 20 kW synchronous motor is connected to 1000V supply and has synchronous reactance of 10Ω per phase. Find the value of minimum current and the corresponding induced emf for full load condition. The efficiency of the motor is 0.8, Neglect armature resistance. [6]

OR

Q4) a) Define short circuit ratio of alternator elaborate its significance. [4]

- b) An alternator has direct axis synchronous reactance of 0.9 per unit and quadrature axis reactance of 0.55 per unit. Find the per unit open circuit voltage for full load at lagging power factor of 0.8. [6]

Q5) a) Explain construction and working of brushless d.c. motor. [8]

- b) Explain stator side speed control methods of three phase induction motor (Any two). [8]

OR

Q6) a) Explain construction and working of variable reluctance stepper motor. [8]

- b) Draw complete slip-torque characteristics of three phase induction motor and explain working of induction generator. [8]

Q7) a) Compare uncompensated a.c. series motor with compensated a.c. series motor. [8]

- b) Explain working of universal motor with its operating characteristics. [8]

OR

Q8) a) Explain procedure to plot circle diagram of a.c. series motor. [8]

- b) An universal motor having resistance of 38Ω and inductance of 0.25H connected to 230V d.c. Supply draws 1A at 2000 rpm when loaded. Find the speed and torque when the motor is connected with 230V, 50Hz a.c. Supply and loaded to draw same value of current when connected with d.c. supply. [8]

Q9) a) With neat diagram explain construction and working of split phase induction motor. Draw its torque speed characteristics. [8]

b) With a suitable diagram explain no load and blocked rotor test on single phase induction motor. How equivalent parameters are obtained from these tests. Draw equivalent circuits of the motor under two test conditions. [10]

OR

Q10)a) With neat diagram explain double field revolving theory. Hence draw torque-speed characteristics of single phase induction motor. [8]

b) A 230V, 50 Hz, 4 pole single phase induction motor has the following equivalent circuit parameters : [10]

$$R_1 = 3\Omega, R_2 = 5\Omega, X_1 = 3\Omega, X_2 = 2.5\Omega \text{ and } X_m = 75\Omega$$

Friction, windage and core losses are 50W and slip is 0.025. Calculate :

- i) Input current
- ii) Power factor
- iii) Developed power
- iv) Output power
- v) Efficiency



Total No. of Questions : 10]

SEAT No. :

P2440

[Total No. of Pages : 2

[5253] - 163
T.E. (Electrical)
POWER ELECTRONICS
(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Questions 1 or 2, Question 3 or 4, Question 5 or 6, Question 7 or 8, Question 9 or 10*
- 2) *Assume suitable data, if necessary.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

Q1) a) Describe working of single phase semi converter with RL load. Draw waveforms of load voltage, load current. **[5]**

b) Draw and explain Gate characteristic of SCR. **[5]**

OR

Q2) a) Explain single phase ac regulator feeding inductive load. Draw output voltage waveform. **[5]**

b) A single phase full converter is supplied from 230V, 50Hz source. The load consists of $R=10\Omega$ and a large inductance so as to render the load current constant. For a firing delay of 45° determine- **[5]**

- i) Average output voltage
- ii) Average output current.

Q3) a) Write a short note on rectification and inversion mode of operation of single phase controlled converter. **[5]**

b) Explain R-C triggering circuit of Thyristor. **[5]**

OR

Q4) a) Explain working of three phase half wave converter connected to resistive load with a firing angle of 60° & draw waveforms of phase voltage & phase current **[5]**

b) With neat constructional diagram explain working of GTO. **[5]**

P.T.O.

- Q5) a)** Draw and explain output and transfer characteristics of MOSFET. [8]
b) For a type A chopper circuit, source voltage $V_s = 220V$, chopping period, $T = 2000\mu s$, on period = $600\mu s$, load circuit parameters: $R = 1\Omega$, $L = 5mH$ and $E = 24V$. [8]
i) Find average output voltage.
ii) Find average output current
iii) Calculate the maximum and minimum values of steady state output current.

OR

- Q6) a)** Explain Class E chopper feeding RLE load in detail. [8]
b) What is time ratio control in dc choppers? Explain the use of TRC for controlling the output voltage in choppers. [8]
- Q7) a)** Explain working of single phase full bridge inverter. Draw all waveforms. [8]
b) Explain Sinusoidal Pulse width modulation with necessary waveforms. How voltage and frequency control is achieved. [8]

OR

- Q8) a)** Explain with circuit diagram and waveforms operation of single phase current source inverter. [8]
b) Explain single pulse width modulation with quasi square wave output & analyze the output with Fourier analysis. How harmonics in the output voltage is controlled by varying the width of pulse. [8]
- Q9) a)** Compare multilevel inverter with multi pulse inverter. [8]
b) Explain working of three phase six step voltage source inverter in 180° mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in each step. [10]

OR

- Q10) a)** Explain working of three phase six step voltage source inverter in 180° mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in each step. [10]
b) What are the techniques used for control of harmonics in output voltage of inverter? Explain any two techniques in detail. [8]



Total No. of Questions : 8]

SEAT No. :

P2441

[Total No. of Pages : 2

[5253] - 164
T.E. (Electrical)
ELECTRICAL INSTALLATION, MAINTENANCE AND
TESTING
(2012 Pattern) (End Sem.)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6*
- 2) *Neat diagram must be drawn whenever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Describe the concept of condition monitoring of electrical equipments. [6]
b) Explain the parameters of three phase induction motor. [7]
c) What are the Failure Modes Of Transformer? [7]

OR

- Q2)** a) Explain the terms:
i) Insulation stressing factors
ii) Insulation Deterioration [6]
b) Explain dissolved gas analysis. [7]
c) List Induction Motor Fault Monitoring Methods and explain any one of them. [7]

- Q3)** a) What are the causes of cable failure? [8]
b) What are capacitor banks? How their testing is done ? [8]

OR

- Q4)** a) Explain the faults in induction motor and their remedies. [8]
b) Describe various abnormal conditions in transformers, [8]

P.T.O.

- Q5) a) With the help of diagram explain supply systems. [8]**
b) Describe the types of primary and secondary distribution systems. [10]

OR

- Q6) a) Explain how Economic Choice Of AC Transmission Voltage is made.[10]**
b) Differentiate between Radial And Ring Types Of Primary Feeders. [8]

- Q7) a) Explain the classification of substations. [8]**
b) Write short note on Tolerable Step And Touch Voltages. [8]

OR

- Q8) a) While estimating, how price catalogue, labour rates and schedule of rates are correlated? [8]**
b) Describe the installation and estimation for underground LT service lines. [8]



Total No. of Questions : 8]

SEAT No. :

P2442

[Total No. of Pages : 2

[5253] - 165
T.E. (Electrical)
Industrial & Technology Management
(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data if necessary*

- Q1)** a) Define Management. What are the functions of management? [7]
- b) Explain in brief following: [6]
- i) Classification of technology
 - ii) Ishikawa Diagram
- c) Explain break-even analysis and its importance. [7]

OR

- Q2)** a) Differentiate between Public Ltd. Company and Private Ltd. Company. [7]
- b) Define Technology. State the Critical Factors in technology management. [7]
- c) Write short note on Sources of Finance. [6]

OR

- Q3)** a) State group dynamics theories. What are different types of conflicts? [10]
- b) Describe Mc Clelland's achievement theory of motivation. [8]
- Q4)** a) Define Motivation. Explain Herzberg Theory. [10]
- b) Define Entrepreneur. Explain the different traits of Entrepreneur. [8]

P.T.O.

- Q5)** a) What is Human Resource Planning? Explain process of HRP. [10]
b) What is performance appraisal? State the objectives and types of performance appraisal. [6]

OR

- Q6)** a) Differentiate between Recruitment & Selection. [6]
b) Write importance and investment in training programs. [6]
c) Explain the HR Functions. [4]

- Q7)** a) Explain the following: [12]
i) Design
ii) Patent
iii) Copyrights
b) What are the guidelines of the common IPR policy on patents? [4]

OR

- Q8)** a) What are different forms of IPR? Explain. [10]
b) State the criteria for securing Patents. [6]



Total No. of Questions : 10]

SEAT No. :

P2443

[Total No. of Pages : 3

[5253]-166

T.E. (Electrical) (Semester - II)

POWER SYSTEM - II

(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer 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.
- 2) Figures to the right indicate full marks.
- 3) Use of electronic pocket calculator is allowed.
- 4) Assume suitable data, if necessary.

Q1) a) A long transmission line delivers a load of 60MVA at 124kV, 50Hz, at 0.8 power factor lagging. The constant at transmission are $A = D = 0.986 \angle 0.32^\circ$, $B = 70.3 \angle 69.2^\circ \Omega$, $C = 4.44 \times 10^{-3} \angle 90^\circ \text{ S}$. Determine receiving end active power, Sending end voltage & current, Sending end active power, line losses. [6]

b) Explain the advantages & Disadvantages of HVDC Transmission. [4]

OR

Q2) a) A 132kV line with 2cm diameter conductor is built so that corona takes place if the line voltage exceeds 210kV (rms). If the value of the potential gradient at which ionization occurs can be taken as 30kV/cm. Find the spacing between the conductors. Assume irregularity factor = 1 & air density factor = 1. [6]

b) Write a note on receiving end power circle diagram. [4]

Q3) a) Which are the different types of HVDC links? Explain in detail. [6]

b) What is corona? Explain the different factors affecting the corona. [4]

OR

P.T.O.

- Q4) a)** A 3 phase 132kV overhead line delivers 50MVA at 132kV & power factor 0.8 lagging at its receiving end. The constants of the line are $A = 0.92 \angle 2^\circ$ & $B = 125 \angle 75^\circ \Omega$ per phase. Find [6]
 i) Sending end voltage & power angle.
 ii) Sending end active & reactive power.
- b)** Compare HVDC transmission with EHV AC transmission. [4]

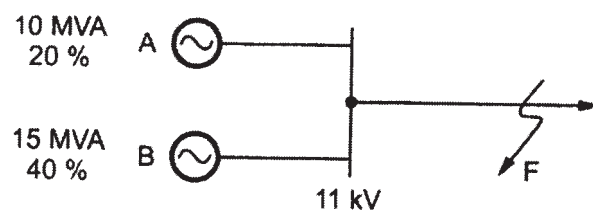
- Q5) a)** A generator 15MVA, 11kV with 15% reactance is connected to a bus bar. It feeds two motors 3MVA, 11kV & 10MVA, 11kV with 11% reactance through a transmission line having a reactance of 50Ω . Draw the reactance diagram assuming 20MVA & 15kV as base quantities. [8]
- b)** What do you mean by PU system? Explain the advantages & applications of per unit system. [8]

OR

- Q6) a)** Explain the Newton-Raphson method for load flow solution. [8]
- b)** An incomplete nodal admittance matrix for a four bus system with negligible charging admittance is given below. Find out the missing elements. [8]

$$\begin{bmatrix} 1.372 - j5.491 & -0.392 + j1.569 & -0.588 + j2.353 & Y_{14} \\ Y_{21} & Y_{22} & -1.176 + j4.706 & 0 \\ Y_{31} & Y_{32} & Y_{33} & -1.176 + j4.706 \\ Y_{41} & Y_{42} & Y_{43} & Y_{44} \end{bmatrix}$$

- Q7) a)** What are the different types of faults occurring in a transmission line? Explain each in Detail. [8]
- b)** A single line diagram of a three phase system is shown in the fig. the percentage reactance of each generator is based on its own rating. Find the short circuit current up to a point of 3 phase short circuit fault. [8]



OR

- Q8)** a) What are the current limiting reactors? Explain in detail. Also give the advantages of current limiting reactors. [8]
- b) Explain the following terms related with symmetrical fault analysis. [8]
- i) Percentage reactance
 - ii) Base kVA
 - iii) Short circuit current
 - iv) Short circuit kVA
- Q9)** a) A 3 phase 11kV, 25MVA alternator with $X_{g0} = 0.05$ PU, $X_1 = 0.15$ PU, & $X_2 = 0.15$ PU is grounded through a reactance of 0.32Ω . Calculate the fault current for a single line to ground fault. [10]
- b) Derive the expression for fault current in case of line to ground fault considering the sequence network with suitable diagram. [8]

OR

- Q10)**a) Explain the symmetrical components method used for analysis of unsymmetrical faults. [8]
- b) A 30MVA, 11kV generator has $Z_1 = Z_2 = j0.21$ PU & $Z_0 = j0.05$ PU. If a line fault occurs on the terminals of the generator, find the line currents & line to neutral voltages under fault conditions. [10]



[5253] -167

T.E. (Electrical) (Semester - II)

CONTROL SYSTEM - I

(2012 Pattern)

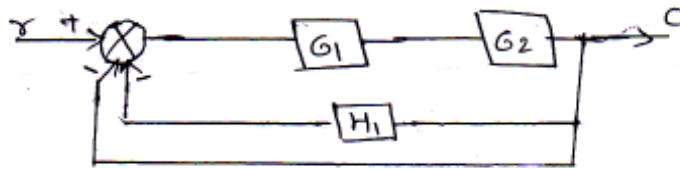
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer 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.
- 2) Use of non programmable calculator is allowed.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

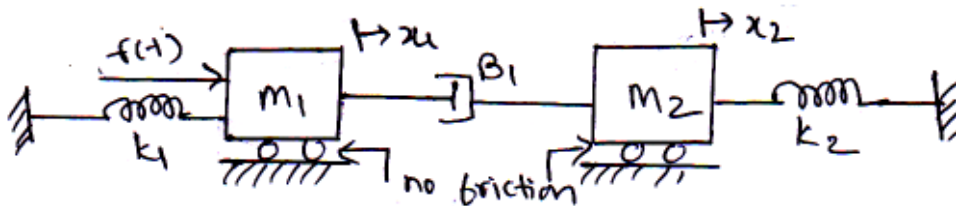
Q1) a) Using Block diagram reduction technique find the transfer function of [6]



b) Compare open loop and close loop control system. [4]

OR

Q2) a) Find transfer function of given mechanical system between x_2 & $f(t)$ [6]



b) Explain force voltage analogy. [4]

P.T.O.

Q3) a) Draw time response of second order system for

i) $\zeta = 1$

ii) $\zeta < 1$

iii) $\zeta > 1$

iv) $\zeta = 0$

Comment on response of system from that. [6]

b) Explain lag and lead network with their transfer function. [4]

OR

Q4) a) Derive transfer function of DC servomotor. [6]

b) For Unity feedback system $G(s) = \frac{100}{s^2 + 15s + 100}$ find [4]

i) Peak overshoot

ii) settling time

iii) Peak time

Q5) a) Sketch the root locus of Unity feedback system whose open loop transfer.

function is $G(s) = \frac{K}{s(s+1)(s^2+4s+13)}$. Find marginal value of K for

the system to be stable. [10]

b) Explain Routh Hurwitz criterion for determining stability of system. [6]

OR

Q6) a) Using Routh's Hurwitz Criterion for stability analysis determine stability of following system $P(s) = s^5 + 3s^4 + 5s^3 + 4s^2 + s + 3$ From that determine how many roots are there in left half s plane, right half s plane, and on imaginary axis. [8]

b) Explain any 4 rules for construction of root locus. [8]

- Q7) a)** Explain polar plot. Draw polar plot for system with open loop transfer function. [8]

$$G(s) = \frac{50}{s(s+3)(s+6)}$$

- b) Explain the nature of Bode plots for [10]
- Poles at origin
 - Simple pole and
 - Simple zero

OR

- Q8) a)** Find the Stability the following system by sketching the Bode plot. [12]

$$G(s) = \frac{200}{s(s+10)(s+2)}$$

- b) State and explain Nyquist Stability Criterion. [6]

- Q9) a)** Explain PID controller with its characteristics and its effect on system performance. [8]

- b) Explain P, PI, PID controller. [8]

OR

- Q10) a)** A second order system has an open loop transfer function

$$G(s) = \frac{k}{s(0.2s+1)}$$
 where K is proportional gain. Find the value of K so

that steady state error will be < 0.5 when input is $\frac{\pi}{6}t$ [8]

- b) Explain tuning of PID controllers using Ziegler - Nichols Method. [8]



Total No. of Questions : 8]

SEAT No. :

P2445

[Total No. of Pages : 2

[5253] - 168
T.E. (Electrical)
Utilization of Electrical Energy
(2012 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6, Q No. 7 or 8*
- 2) *Assume suitable data if necessary.*
- 3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Figures to the right side indicate full marks.*

- Q1)** a) State advantages of electrical heating over other types of heating methods. **[6]**
- b) A piece of an insulating material is to be heated by dielectric heating. The size of the piece is 12 cm × 12 cm × 3 cm. A frequency of 20 MHz is used and the power absorbed is 450 watt. If material has relative permittivity of 5 and power factor of 0.05. Calculate the voltage necessary for heating, current flowing through the material. If the voltage is limited to 1700 V, what will be the frequency to get the same loss? **[8]**
- c) State & explain factors governing electrodeposition. **[6]**

OR

- Q2)** a) Explain construction and working of **[6]**
- i) Limit switches
 - ii) Float switches
- b) Explain factors to be considered for design of illumination scheme. **[8]**
- c) Two lamp posts are 14 m apart & are fitted with 200CP lamp, each at height of 5 m, above the ground. Calculate: **[6]**
- i) Illumination midway between them.
 - ii) Illumination under each lamp.

- Q3)** a) Compare steam engine drive and electric drive. **[8]**
- b) What are the advantages & disadvantages of 25kV AC system. **[8]**

OR

P.T.O.

- Q4)** a) Discuss various current collection systems used in electric traction. [8]
b) Describe composite system. [8]

- Q5)** a) Derive the expression for simplified quadrilateral speed time curve. [8]
b) An electric train has quadrilateral speed time curve as follows:
i) Uniform acceleration from rest at 2 kmph/ps for 30 seconds.
ii) Coasting for 50 seconds,
iii) Uniform braking to rest for 20 seconds.

If the train is moving up gradient of 1 % , the train resistance is 40 N/T, rotational inertia effect is 10% of dead weight & duration of stop is 30 seconds, find the schedule speed. [8]

OR

- Q6)** a) Define with units: [8]
i) Average speed & Schedule speed
ii) Coefficient of adhesion
iii) Tractive effort,
iv) Specific energy consumption
b) A suburban electric train has a maximum speed of 70 kmph. The schedule speed including station stop of 30 seconds is 45 kmph. If the acceleration is 1.5 kmphs, find the value of retardation when average distance between stops is 4 KM. [8]

- Q7)** a) Explain with diagram shunt & bridge transition. [6]
b) Explain French method of regenerative braking. [6]
c) What are the desirable characteristics of motor for traction purpose? [6]

OR

- Q8)** a) Derive the expression for energy lost and efficiency for series parallel control of 4 DC series motor. [6]
b) Explain suitability of DC series motor for traction purpose. [6]
c) Write a note on anti-collision system. [6]



Total No. of Questions : 8]

SEAT No. :

P2446

[Total No. of Pages : 4

[5253]-169

T.E. (Electrical)

DESIGN OF ELECTRICAL MACHINES

(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Write short note on Cross over winding and Disc winding. [8]
- b) Explain use of tap changer, breather and conservator. [6]
- c) A three phase slipping induction motor has a final steady temperature rise of 40°C when running at its rated output. Calculate its half hour rating for the same temperature rise if the copper loss at rated output is 1.25 times its constant loss. The heating time constant is 90 minutes. [6]

OR

- Q2)** a) Explain the procedure to determine the total resistance of a designed transformer. [4]
- b) What are the various specifications of distribution transformer as per IS 2026. [4]
- c) Determine the main dimensions of the core, the number of turns and the area of conductors for a 5 kVA, 50 Hz, 1100/400 V, single phase core type transformer. The net conductor area in window is 60% of the net square cross section of the iron core. Assume maximum flux density of 1 Wb/m², current density of 1.4 A/mm², window space factor of 0.2 and stacking factor of 0.9. The window height is 3 times its width. [12]

P.T.O.

- Q3) a)** Explain briefly how the number of slots in a cage rotor is decided to avoid crawling and cogging. [6]
- b) Design the stator of 10 H.P., 415V, 50Hz, delta connected three phase, 4 Pole, squirrel cage induction motor. The motor has an efficiency of 0.88, power factor of 0.865 lag and winding factor of 0.955. Assume specific magnetic and electrical loading of 0.45 Wb/m² and 23000 A/m. Frame size of 160M is to be used for stator core. Assume slot/pole/phase of 3 and current density of 4.1 A/mm². [10]

OR

- Q4) a)** Derive output equation of three phase induction motor. [6]
- b) Determine the stator core dimensions, number of stator slots and number of stator conductors per slot for a 125kW, 3300 V, 50Hz, 12 pole star connected induction motor while following data : [10]
- i) Average flux density = 0.4 Wb/m²
 - ii) Conductor/meter = 27000 A/m
 - iii) Full load efficiency = 0.9
 - iv) Power factor = 0.9
 - v) Winding factor = 0.955
 - vi) Slot/pole/phase = 3

Choose main dimension to give best power factor.

- Q5) a)** What are the factors considered when estimating the length of the air gap of Induction motor? Why the length of the air gap should be as small as possible. [6]
- b) A 20kW, three phase, 6 pole, 50 Hz squirrel cage induction motor has following data : [12]
- i) Stator bore diameter = 0.32m
 - ii) Axial length of stator core = 0.125m
 - iii) Number of stator slots = 54

- iv) Number of conductors/slot = 24
- v) Current in each stator conductor = 17.5 A
- vi) Full load power factor = 0.862

Calculate :

- 1) Number of rotor slots
- 2) Rotor bar current
- 3) Area of copper rotor Bar
- 4) Length of rotor bar
- 5) Current in each end ring
- 6) Area of copper end ring
- 7) Full load slip.

Assume current density of 7A/mm^2 for rotor bar and end ring and resistivity of copper as $0.02\ \text{Ohm-m}$.

OR

- Q6)** a) What is unbalanced magnetic pull (UMP)? Explain the procedure to calculate UMP. **[8]**
- b) A 15kW three phase, 6 pole, 50 Hz, 415v, star connected squirrel cage induction motor has 54 stator slots each containing 18 conductors. Calculate the value of bar and end ring currents. The numbers of rotor bars are 64. The motor has an efficiency of 0.9 and a power factor of 0.85. The rotor mmf may be assumed as 90% of stator mmf. Also find the bar and end ring section if current density is 6A/mm^2 . **[10]**
- Q7)** a) Explain the procedure to calculate the magnetizing current of an induction motor. **[8]**
- b) Explain the procedure to calculate the Zig-zag leakage reactance and tooth top leakage reactance of three phase induction motor. **[8]**

OR

Q8) a) Sketch the paths of the following leakage fluxes of three phase induction motor. **[8]**

- i) Slot leakage flux
- ii) Zig-zag leakage flux
- iii) Tooth top leakage flux
- iv) Overhang leakage flux

b) Calculate overhang and slot leakage reactance for a 75 kW, 3000V, 8 pole 50Hz three phase star connected slip ring induction motor having following data: stator bore = 0.66m, stator core length = 0.5m, number of stator turns/phase = 286, total specific permeance due to stator slot = 4.9μ . The stator has full pitch winding. **[8]**



Total No. of Questions : 10]

SEAT No. :

P2447

[Total No. of Pages : 2

[5253] - 170

T.E. (Electrical)

Energy Audit and Management
(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary
- 3) Figures to the right indicates full marks
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary

- Q1)** a) Explain Indian energy scenario. [5]
b) What are the duties of Energy Manager under EC act 2001?. [5]

OR

- Q2)** a) Give salient features of Electricity Act- 2003. [5]
b) Define supply side management (SSM). What are its disadvantages? [5]

- Q3)** a) Explain implementation of SSM strategy through power factor tariff for controlling power demand. [5]
b) What is forced field analysis? How it is used in Energy Management?[5]

OR

- Q4)** a) Explain role of VAR compensation in demand side management (DSM).[5]
b) Explain role of renewable energy sources in energy management. [5]

- Q5)** a) Why energy audit is necessary? What are their types? Explain any one in detail. [9]
b) Explain various action plans for implementation of energy conservation options. [9]

OR

- Q6)** a) Explain energy audit case study in cement industry. [9]
b) Explain CUSUM charts. Give various steps used in energy performance analysis using CUSUM technique. [9]

P.T.O.

Q7) a) Explain various energy conservation opportunities and measures in illumination area. [8]

b) Which type of losses occurs in induction motor? What are the efficiency improvement measures for each type of loss? [8]

OR

Q8) a) What is co-generation? Explain energy conservation measures in waste heat recovery system. [8]

b) Explain various energy conservation opportunities and measures in DG set. [8]

Q9) a) Explain various financial appraisal techniques. [10]

b) Explain energy audit case study of an IT industry. [6]

OR

Q10) a) Define and explain sensitivity analysis? What are its objectives? What are the factors to be considered while carrying out sensitivity analysis? [10]

b) Explain energy audit case study in sugar factory. [6]



Total No. of Questions : 10]

SEAT No. :

P2448

[Total No. of Pages : 2

[5253] - 171

T.E. (Instrumentation & Control)
EMBEDDED SYSTEM DESIGN
(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10*
- 2) *Draw neat diagram wherever necessary.*
- 3) *Figures to right indicate full marks.*
- 4) *Assume suitable data, if necessary*

- Q1)** a) What is the functions of following pins of 8051 microcontroller? [6]
i) INT1
ii) T0
iii) T1
b) Explain with an example, AC (Auxiliary carry) flag in 8051 microcontroller. [4]

OR

- Q2)** a) Explain with an example, RR Acc. and RRC Acc. instructions of 8051 microcontroller. [6]
b) What is an alternative function of PORT-0 of 8051 microcontroller. [4]
- Q3)** a) Draw internal block diagram of data memory map of 8051 Microcontroller. [2]
b) Explain with connection diagram, serial communication with PC using RS-232 signal standard with 8051 microcontroller. [8]

OR

- Q4)** a) Explain alternative function of P3.6 (WR) and P3.7 (RD) pins of 8051 microcontroller [2]
b) Explain with circuit diagram and flow chart, interfacing of DAC 0808 with 8051 microcontroller for generation of sawtooth waveform. [8]

- Q5)** Explain with circuit diagram and flow chart, interfacing of 3 relays for driving Red, Yellow and Green signals for 30, 20 and 60 seconds respectively, using 8051 microcontroller. [16]

OR

P.T.O.

Q6) Explain with timing diagram START, STOP and ACK functions for serial interfacing of RTC with 8051 microcontroller. Also explain the registers of RTC. [16]

Q7) a) Explain following instructions with an application. [8]

i) ROL

ii) RRC

b) 7-seg codes are stored in a data memory from 0060 to 0069. Write a flow chart to access the data bytes and present the same to port-B of ATmega 8535 microcontroller. [10]

OR

Q8) a) What are the features of AVR microcontrollers? [8]

b) Explain following instructions of ATmega 8535 microcontroller with an example. [10]

i) BREQ

ii) BRNE

iii) BRSH

iv) BRCC

v) BRCS

Q9) Explain Fast PWM mode of Timer-0 in ATmega 8535 microcontroller Elaborate an application of the mode. Also comment on its interrupts [16]

OR

Q10) If an input of 1.853Vdc is applied to ADC0 pin of ATmega 8535 Microcontroller. Calculate digital output for following conditions: [16]

a) $V_{ref} = AV_{cc}(5vdc)$ with $ADLAR=0$ and $ADLAR=1$

b) $V_{ref} = \text{internal } V_{ref}$. With $ADLAR=0$ and $ADLAR=1$



Total No. of Questions : 10]

SEAT No. :

P2449

[Total No. of Pages : 2

[5253] - 172

T.E. (Instrumentation & Control)
INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS
(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Define Qualitative & Quantitative Analysis with examples [4]
b) With a neat schematic, Explain the working of Double Beam Colorimeter. [6]

OR

- Q2)** a) Write short note on Discharge type atomizer. [4]
b) Explain Fourier Transform Infrared Spectroscopy with a neat diagram. [6]

- Q3)** a) Write short note on Inductive Coupled Plasma. [4]
b) Explain the principle & experimental setup for Coulometry. [6]

OR

- Q4)** a) Explain the Excitation signals in Voltametry. [4]
b) State Beers and Lambert's Law. Derive the mathematical expression to combine all the laws & the deviation. [6]

- Q5)** a) What is Chemical Shift, Explain the working of NMR Spectrometer with neat sketch. [10]
b) Explain the working of Hydrocarbon Analyzer with a neat sketch. [8]

OR

- Q6)** a) What is Raman & Rayleigh Scattering? Explain Raman Spectrometer with a neat diagram? [10]
b) Write short note on Spectrofluorimeter [8]

P.T.O.

Q7) a) Enlist various types of mass analyzer & explain any one type of mass analyzer in detail. [8]

b) With the help of neat diagram, explain the working of Gas Chromatography [8]

OR

Q8) a) Explain the working of High Performance Liquid Chromatography with neat sketch. [8]

b) Explain with the help of block diagram, working of mass spectrometer. [8]

Q9) a) State & prove Bragg's Law of Diffraction [8]

b) Explain the working of Ionization Chamber with a neat sketch. [8]

OR

Q10) a) What is Auger Electron? Explain Auger Emission Spectroscopy [8]

b) With the help of neat diagram, explain the working of Scintillation Counter. [8]



Total No. of Questions : 10]

SEAT No. :

P2450

[Total No. of Pages : 2

[5253] - 173

T.E. (Instrumentation & Control)
CONTROL SYSTEM COMPONENTS
(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Draw neat sketches wherever necessary.*
- 2) *Answer 05 questions.*
- 3) *Q1 or Q2, Q3 or Q4, Q5 or Q6. Q7 or Q8. Q9 or Q10.*
- 4) *Assume suitable data.*

- Q1) a)** Sketch & Describe an operation of **[6]**
i) DIP Switch.
ii) Selector Switch.
iii) Rotary Switch.
b) Compare pneumatic and hydraulic system. **[4]**

OR

- Q2) a)** Explain Electromechanical Relay with following points. **[6]**
i) Diagram
ii) Working principle
iii) Construction
b) Give the two applications of **[4]**
i) Push Button
ii) Slide Switch.

- Q3) a)** What is breaking of motors.Explain any one method in detail. **[6]**
b) Write the advantages of industrial contactor. **[4]**

OR

- Q4) a)** Draw and explain the pneumatic circuit for speed control of a double acting cylinder. **[6]**
b) What purpose does following serve in pneumatic supply.
i) Air receiver
ii) Air cooler **[4]**

P.T.O.

Q5) a) It is required to have continuous reciprocation of double acting cylinder once start signal is given by operator. Design a hydraulic circuit diagram. [10]

b) Explain various properties of oil to be used in hydraulic system. [8]

OR

Q6) a) For a hydraulic system implement a sequencing circuit for two double acting cylinders using standard hydraulic circuit symbols. [10]

b) Compare hydraulic systems with electrical systems based on following.[8]

i) Power Generated

ii) Installation

iii) Economy

iv) Application.

Q7) a) Explain with a neat sketch the construction & working of synchros. State its application. [8]

b) What is Flow Totalizer. Explain any one type [8]

OR

Q8) a) What are different standard ISA sequences for alarm annunciator. [8]

b) State the need of a circuit breaker. Explain Types & operating principle of circuit breaker. [8]

Q9) a) Explain with respect to bistable amplifier the following points: [8]

i) Principle of operation

ii) Characteristics

iii) Working

iv) Application

b) Explain various methods to make an instrument safe in hazardous area. Explain the concept of any one method. [8]

OR

Q10)a) Explain hazardous area and material classification as per NEC standards.[8]

b) Design & Explain Intrinsic safety circuit by using zener barrier in hazardous area. [8]



Total No. of Questions : 10]

SEAT No. :

P2451

[Total No. of Pages : 3

[5253]-174

T.E. (Instrumentation and Control)

CONTROL SYSTEM DESIGN

(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) Design a cascade lead compensator for unity feedback system such that dominant closed loop poles provides damping ratio $\xi = 0.5$ and have natural frequency $\omega_n = 4\text{rad/sec}$. [10]

$$G(s)H(s) = \frac{4}{s(s+2)}$$

OR

Q2) a) What is need of compensator in control systems? What do you mean performance specification? State performance specification in time and frequency domain. [6]

b) What are advantages and limitations of Lead and Lag compensators in control systems? [4]

Q3) Explain Ziegler Nicholas tuning methods. Write different tuning parameters for P, PI, PID controllers. [10]

OR

P.T.O.

Q4) The forward path transfer function of unity feedback control systems is given

as $G(s) = \frac{5}{(s+2)(s+5)}$ consider the design specification $\omega_n = 4\text{rad/sec}$ and

$\xi = 0.6$. Design a PI controller. [10]

Q5) a) Obtain state model in three different canonical form for system with transfer function [12]

$$\frac{Y(s)}{U(s)} = \frac{s^2 + 3s + 2}{s^3 + 4s^2 + 3s + 2}$$

b) Determine transfer function system for following state model. [6]

$$\dot{x} = \begin{bmatrix} 1 & 4 \\ -2 & -5 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u \text{ and } y = \begin{bmatrix} 2 & 1 \end{bmatrix} x$$

OR

Q6) a) Find out transfer function of system from state model. [6]

$$\dot{x} = \begin{bmatrix} -1 & -1 \\ 3 & -5 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 2 \end{bmatrix} x$$

b) Obtain state model of system into different canonical form from given T.F. [12]

$$\frac{Y(s)}{U(s)} = \frac{1}{(s+2)^2(s+1)}$$

Q7) a) Determine state transition matrix using Cayley Hamilton theorem for

following plant matrix $A = \begin{bmatrix} 1 & 4 \\ -2 & -5 \end{bmatrix}$. [8]

b) Determine controllability and observability of system of following state model.

$$\dot{x} = \begin{bmatrix} -3 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -1 \end{bmatrix} x + \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} u \text{ and } y = \begin{bmatrix} 1 & 1 & 0 \end{bmatrix} x$$
 [8]

OR

Q8) Obtain output response of following system with unit step input and initial condition as $x(0) = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$. [16]

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u \text{ and } y = [6 \quad 1]x$$

Q9) Develop the state model in cascade form for transfer function given below. [16]

$$\frac{Y(s)}{U(s)} = \frac{1}{(s+4)(s+5)}$$

Determine the state feedback gain matrix for the application of state feedback such that the poles are located at $s = -1 \pm 2j$.

OR

Q10) The state space representation of system is given below. [16]

$$\dot{x} = \begin{bmatrix} 0 & 15 \\ 1 & 0 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u. \text{ and } y = [0 \quad 2]x$$

Determine observer gain matrix such that $s = -2 \pm 3j$ are eigenvalues of observer gain matrix.



Total No. of Questions : 10]

SEAT No. :

P2452

[Total No. of Pages : 2

[5253] - 175

**T.E. (Instrumentation and Control Engineering
INDUSTRIAL ORGANIZATION AND MANAGEMENT
(2012 Pattern)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams should be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) write short notes on -

- a) Inventory and its control. [5]
- b) Ishikawa diagram [5]

OR

- Q2)** a) Define management. Explain any four functions of it briefly. [5]
b) What is pollution? What may be the remedies to reduce the pollution in a manufacturing industry? [5]

- Q3)** a) Explain briefly Porter's 5 forces of competition. [5]
b) Explain the importance of purchasing. [5]

OR

Q4) Write notes on

- a) BCG Matrix [5]
- b) Quality circle [5]

Q5) a) Write short notes on —

- i) Manpower planning [5]
- ii) Motivation [5]
- b) Briefly explain different functions of Human resource department. [6]

OR

- Q6)** a) Explain the role of Human resource manager in modern industries. [8]
b) Explain training methods according to the levels of management. [8]

P.T.O.

- Q7)** a) Explain the different sources of finance. [6]
b) Explain concept of budget, its objectives and types. [6]
c) What is capital budget? What are its methods? [6]

OR

- Q8)** Write short notes on — [18]
a) Capital
b) Budget, objectives and types
b) Balance sheet

- Q9)** Write notes on:
a) E- business and business strategies. [8]
b) ERP — need for a manufacturing industry [8]

OR

- Q10)**a) Explain MIS and its usefulness to modern business organizations. [8]
b) Write a note on “Business Ethics and Professional Ethics”. [8]



[5253] -176

T.E. (Instrumentation & Control)
DIGITAL SIGNAL PROCESSING
(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer 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.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Use of electronic pocket calculator is allowed.
- 4) Assume suitable data, if necessary.

Q1) a) Determine the cross - correlation for the following sequences : [7]

$$x(n) = \{2, 1, 2, 3\} \text{ and } h(n) = \{1, 4, 2, 7\}$$

b) Determine the poles and zeros of the discrete - time system described by following difference equation : [3]

$$y(n) = 2.25y(n-1) - 3.5y(n-2) + x(n) + 5x(n-1)$$

OR

Q2) a) Classify the discrete - time signals with examples. [7]

b) Draw the pole - zero plot for the system function, [3]

$$H(z) = \frac{1 - z^{-2}}{1 + 2z^{-1} + z^{-2}}$$

Q3) a) Determine the impulse response of the system described by [4]

$$H(z) = \frac{1 - \frac{1}{4}z^{-1}}{1 - \frac{1}{6}z^{-1} - \frac{1}{6}z^{-2}}$$

P.T.O.

- b) Determine the circular convolution for the sequences using graphical method : [6]

$$x_1(n) = \{4, 1, 0, 2\} \text{ and } x_2(n) = \{5, 7, 3, 1\}$$

OR

- Q4)** a) What is the magnitude and phase response at 200 Hz of $H(z) = 2 - 2z^{-4}$? [3]

- b) Compute the circular convolution of the following sequences using DFT - IDFT method : [7]

$$x_1(n) = \{5, 3, 2, 1\} \text{ and } x_2(n) = \{6, 4, 7, 9\}$$

- Q5)** Compute the 8 - point DFT of the sequence $x(n) = \left\{ \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, 0, 0, 0, 0 \right\}$ using

- a) radix - 2 decimation - in - time algorithm [8]

- b) radix - 2 decimation - in - frequency algorithm [8]

OR

- Q6)** Compute the DFT of the sequence $x(n) = \{1, 2, 3, 4, 0, 0, 0, 0\}$ using

- a) radix - 2 decimation - in - time algorithm [8]

- b) radix - 2 decimation - in - frequency algorithm [8]

- Q7)** Design a finite impulse response (FIR) low pass filter with cut - off frequency of 1 KHz and sampling rate of 4 KHz with length $M = 11$ using following window functions :

- a) Rectangular window [6]

- b) Hamming window [6]

- c) Hanning window [6]

OR

Q8) Design a FIR high - pass filter cut - off frequency of 1 kHz and sampling rate of 4 kHz with length $M = 11$.

- a) Determine the coefficients the filter using a rectangular window. [6]
- b) Determine the filter coefficients using Blackman window. [6]
- c) Determine the filter coefficients using Bartlett window. [6]

Q9) a) Compare the FIR and IIR filter design methods. [6]

- b) Determine $H(z)$ using impulse invariance method for an analog transfer function. [6]

$$H(s) = \frac{1}{s^2 + 0.5s + 2} \text{ .Assume } T = 1 \text{ sec.}$$

- c) Explain the bilinear transformation method to convert analog filter to digital filter. [4]

OR

Q10) Design a digital Butterworth low - pass filter using bilinear transformation to satisfy the following specifications : [16]

$$\begin{aligned} 0.7071 \leq |H(e^{j\omega})| \leq 1 & \quad 0 \leq \omega \leq 0.2\pi \\ |H(e^{j\omega})| \leq 0.1, & \quad 0.5\pi \leq \omega \leq \pi \end{aligned}$$

Assume $T = 1$ sec.



[5253] - 177

T.E. (Instrumentation & Control)

Process Loop Components

(2012 Pattern) (End Sem)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Questions of Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6, Q No. 7 or 8, Q No. 9 or 10*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data if necessary.*

Q1) a) Define the following giving proper example. **[8]**

- i) Controlled Variable
- ii) Manipulated Variable
- iii) Load variable
- iv) Set point

b) Explain the working principle of two wire transmitter **[2]**

OR

Q2) a) Explain level measurement in an open vessel using differential pressure transmitter **[5]**

b) Explain the working of I to P converter. **[5]**

Q3) a) Draw the response of P, PIPD and PID controller for ramp input **[5]**

b) Name and explain the keys on the faceplate of digital controller. **[5]**

OR

Q4) a) Explain the concept of rate before reset. **[5]**

b) Explain different process lags. **[5]**

Q5) a) State the advantages of Programmable Logic Controller over relay based system. **[6]**

b) Gives examples of digital input, digital output, analog input and analog output of Programmable Logic Controller. **[6]**

c) Draw using proper symbols relay ladder diagram for flashing light. **[6]**

OR

P.T.O.

- Q6)** a) Explain different types of timers in Programmable Logic Controller. [8]
b) Explain the automation of reciprocation of Single acting cylinder using Programmable Logic Controller. Develop ladder diagram for the same.[10]

- Q7)** a) Explain the working of angle valve. [8]
b) Define/explain the following. [8]
i) Turndown
ii) Equal percentage characteristics
iii) Guiding
iv) Trim

OR

- Q8)** a) Compare advantages and drawbacks of electro hydraulic actuator. [8]
b) Explain any two control valve accessories [8]

- Q9)** a) Level is being controlled in a tank using a control valve. The flow range is 100 to 1000 gpm. The liquid is mineral oil and has a specific gravity of 0.88 Line pressure is 100 to 150 psi and the throttling pressure drop varies from 50 to 110psi. The temperature may vary from 70 to 140 ° F. Find Cv. [8]
b) Compare cavitation and Flashing [8]

OR

- Q10)**a) Suggest methods to prevent aerodynamic control valve noise. [8]
b) Write a short note on High pressure service control valves. [8]



Total No. of Questions : 12]

SEAT No. :

P2455

[Total No. of Pages : 2

[5253] - 178

T.E. (Instrumentation and Control)

**Unit Operations & Power Plant Instrumentation
(2012 Pattern)**

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve 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) *Figures to the right side indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) What are the various types of evaporators? Explain one in detail with diagram.[6]

OR

Q2) What is continuous drum vacuum filter? Explain with diagram. Write one application of it. [6]

Q3) Write the material and energy balance equation for evaporator. [8]

OR

Q4) Write material balance equations for fractionators. [8]

Q5) What are the types of turbines used in hydroelectric power plant. Explain one type in detail with diagram. [6]

OR

Q6) Explain horizontal axis wind turbines with diagram. Write the variables affecting in the power conversion. [6]

Q7) a) Draw steam and water circuits in boiler. Explain in detail. [8]

b) How does the CFBC works. How does the air - fuel ratio is controlled in boiler. [8]

OR

Q8) a) Explain air fuel ratio control and steam temperature and pressure control in boiler. [8]

b) Explain the sequence of operations in coal handling in thermal power plant. [8]

P.T.O.

- Q9)** a) Explain the instrumentation used in combustion chamber in detail. [9]
b) Write start up and shut down procedure of steam turbines. [9]

OR

- Q10)**a) What is the role of condition monitoring system in turbine instrumentation? Explain in detail. [9]
b) How does the optimization of boiler can be achieved? Explain with a plot of boiler losses with excess air. [9]

- Q11)**a) Write differences among wind, hydroelectric and solar power plant.[10]
b) Write a short note on smoke detector. [6]

OR

- Q12)**a) Write the differences among thermal power, hydroelectric power and nuclear power. [10]
b) Write a short note on electrostatic precipitator. [6]



Total No. of Questions : 10]

SEAT No. :

P2456

[Total No. of Pages : 2

[5253] - 179

T.E. (Instrumentation and Control)
INSTRUMENT & SYSTEM DESIGN
(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or 08, Q9 or Q10.*
- 2) *Neat circuit diagrams should be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Write a note on IP standard. **[4]**

b) Output range of a transducer is from 0 to 5 mV. Design a signal conditioning circuit using suitable IC such that output should be 0 to 5 V. Give features of the same IC. **[6]**

OR

Q2) a) What is noise? Explain thermal noise and popcorn noise. **[5]**

b) Write a note on Prototyping, its need, advantages and disadvantages. **[5]**

Q3) a) Write features of IC XTR 110. Enlist its applications and write transfer function. **[5]**

b) Explain the terms EMI and EMC. Give various ways to eliminate EMI. **[5]**

OR

Q4) a) What is grounding? Explain multipoint grounding technique with neat diagram. **[5]**

b) How to configure IC AD 594 for standalone celsius thermometer? **[5]**

Q5) a) Enlist various features and applications of IC 4046. Compare the phase comparators in this IC. **[9]**

b) Draw the equivalent circuit corresponding to the inverter symbol in IC ULN 2803 and explain its operation. Enlist features of the IC. **[9]**

OR

Q6) a) Draw the internal circuit diagram of IC MCT 2E and explain its working. What is CTR? Enlist the applications and features of it. **[9]**

b) Explain Auto zero, Integrate and De-integrate phase of IC 7107. Give expression for conversion cycle time. **[9]**

P.T.O.

- Q7)** a) Give the design rules for analog circuit PCBs. [8]
b) Explain the need of soldering. What are the different methods? Explain dip soldering method with advantage and disadvantages. [8]

OR

- Q8)** a) Explain different types of printed circuit boards. [8]
b) Write a note on flux and solder mask. [8]

- Q9)** a) Differentiate between reliability and quality. [8]
b) Draw the failure rate curve and explain its modes. [8]

OR

- Q10)**a) Explain the terms MTTR, MTBF and MTTF and reliability. [8]
b) Explain the importance of documentation in system design. [8]



Total No. of Questions : 10]

SEAT No. :

P2457

[Total No. of Pages : 2

[5253] - 180

T.E. (Instrumentation & Control)
BIO-MEDICAL INSTRUMENTATION
(2012 Pattern) (Semester - II)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) What are the different Physiological parameters of human body & list out the suitable transducers for its measurement.(Any 3) [6]
b) Define [4]
i) Motion Artifact
ii) Half cell potential

OR

- Q2)** a) List out the different Pre amplifier in biomedical applications. [4]
b) Why silver - silver chloride electrode is suitable in biomedical applications. [6]

- Q3)** a) Compare the Invasive and Non- Invasive blood pressure measurement techniques. [5]
b) Draw and explain the block diagram of Phonocardiogram. [5]

OR

- Q4)** a) Explain Electromagnetic blood flow meter. [5]
b) Draw and explain the Heart Rate Meter. [5]

- Q5)** a) What is Electroencephalography? Explain with neat diagram EEG machine. [10]
b) What is Biofeedback in EEG System? [6]

OR

- Q6)** a) Draw a neat labeled diagram of 10-20 electrode system and explain unipolar and bipolar measurement in EEG. [10]
b) Elaborate on various waves in EEG along with its frequency and significance. [6]

P.T.O.

- Q7)** a) What are Rods and cones in the Human vision system? Explain the function performed by each of them. [8]
b) Brief out on [8]
i) Acoustic impedance
ii) Ear masking

OR

- Q8)** a) What are three main section of Human auditory system? And Explain the function performed by them. [8]
b) Differentiate between speech and pure tone audiometer. [8]

- Q9)** a) What is spirogram? Explain various terms related to spirogram. [10]
b) Explain the mechanism of respiration. [8]

OR

- Q10)**a) What is Oxygenator? List out different types of Oxygenator. Explain any one type of Oxygenator. [10]
b) Write a short note on oxygen gas analyzer [8]



[5253]-181

T.E. (Computer)

THEORY OF COMPUTATION

(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data if necessary.*

Q1) a) Determine a Regular Expression over the alphabets $\{0, 1\}$ for the following [6]

- i) All strings containing exactly two 0's
- ii) All strings that do not end with 01
- iii) All strings starting with 11

b) Define Pumping Lemma and apply it to prove the following : [6]

$$L = \{0^m 1^n 0^{m+n} \mid m, n \geq 1\} \text{ is not regular.}$$

c) Give the Right & Left linear grammar for the following DFA shown in Fig 1 [8]

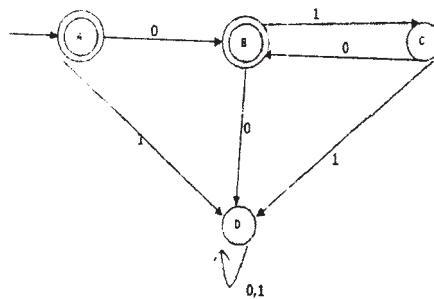


Fig 1

OR

P.T.O.

Q2) a) State Principle of Mathematical Induction and apply it to show that $n^4 - 4n^2$ is divisible by 3 for all $n > 0$. [6]

b) Make use of Arden's theorem to determine the regular expression for the finite automata shown in **Fig 2**. [6]

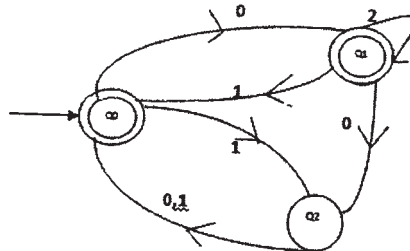


Fig2

c) Construct a DFA for the following left linear grammar [8]

$$S \rightarrow B1|A0|C0, B \rightarrow B1|1, A \rightarrow A1|B1|C0|0, C \rightarrow A0$$

Q3) a) What is a Turing Machine? Give the formal definition of TM. Design a TM that replaces every occurrence of xyy by yxx . [9]

b) Write short note on : [9]

- i) Halting Problem of Turing Machine.
- ii) Universal Turing Machine (UTM).
- iii) Recursively Enumerable Languages.

OR

Q4) a) What is a post machine? Give formal definition of Post Machine. Construct a Post Machine for Accepting strings for the language $a^x & b^x$. [9]

b) What are the different ways for extension of TM? Explain. Construct a two tape TM to convert an input W into WW^R . [9]

Q5) a) Construct a PDA that accept $L = \{a^n b^n | n \geq 1\}$ through Empty stack [7]

b) Obtain CFG for the PDA given below : [9]

$$\begin{aligned} \delta(q_0, 1, z_0) &= \{q_0, xz_0\} & \delta(q_0, 1, x) &= \{q_0, xx\} \\ \delta(q_0, 0, x) &= \{q_1, x\} & \delta(q_0, \epsilon, z_0) &= \{q_0, \epsilon\} \\ \delta(q_1, 1, x) &= \{q_1, \epsilon\} & \delta(q_0, 1, z_0) &= \{q_0, z_0\} \end{aligned}$$

OR

- Q6)** a) What is PDA? What are the different ways of constructing a PDA? Explain each with example. [8]
- b) What is NPDA? Construct a NPDA for the set of all strings over $\{a,b\}$ with odd length palindrome. [8]
- Q7)** a) What do you mean by NP-Problems? Justify why the Travelling Salesman problem is a NP-Problem. [8]
- b) What do you mean by Polynomial Time Reduction? Explain with suitable example. [8]

OR

- Q8)** a) What is Kruskal's Algorithm? How can we solve this problem using Turing Machine? [8]
- b) What is Clique Problem? Show that it is a NP-Complete problem. [8]



Total No. of Questions : 10]

SEAT No. :

P2459

[Total No. of Pages : 2

[5253] - 182
T.E. (Computer Engineering)
OPERATING SYSTEMS DESIGN
(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*

Q1) Elaborate on the following algorithms in brief any two.

[10]

- a) `iget ()`
- b) `ifree ()`
- c) `namei ()`
- d) `getblk ()`

OR

Q2) a) Describe the structure of a regular file with proper diagrammatic representation. **[5]**

b) What is free space management (FSM)? Explain how bit vector and linked list performs FSM. **[5]**

Q3) a) Write and explain algorithms for **[6]**

- i) Allocating region
- ii) Freeing a region

b) Elaborate on the race condition in catching signals. **[4]**

OR

Q4) a) Explain with example data structures used for demand paging. **[6]**

b) State in brief page aging. **[4]**

Q5) a) Write short notes on **[8]**

- i) Tunix system
- ii) Performance Limitations

b) Explain in short — pipe, message queues Explain multiprocessor system with it benefits. **[8]**

P.T.O.

OR

- Q6)** a) What is ptrace system call? Explain Process tracing in detail. [8]
b) Provide solution to producer- Consumer process problem using semaphore. [8]
- Q7)** a) Write short note on egrep, fgrep and sort utility. [9]
b) Write short notes on nmake and cmake. [4]
c) Differentiate BIOS with EFI? [3]

OR

- Q8)** a) Write a short note on [6]
i) Mork Manager
ii) Shim Manager
b) What is secure boot? [2]
c) What is make utility? Explain it with example. Consider your own makefile. [8]
- Q9)** a) Write a note on handheld devices. List various OS used for handheld devices. [6]
b) Write a short note on [6]
i) Frame of references
ii) Windows vista scheduling
c) Draw and explain Android OS architecture. [6]

OR

- Q10)**a) Explain the design issues of multiprocessor scheduling. [6]
b) Explain scheduling in [6]
i) Linux Operating Systems
ii) UNIX free BSD OS.
c) Compare Windows NTFS and ReFS file systems. [6]



Total No. of Questions : 10]

SEAT No. :

P2460

[Total No. of Pages : 2

[5253] - 183

T.E. Computer Engineering (Semester - I)
DATA COMMUNICATION AND WIRELESS SENSOR
NETWORK
(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Question number 1,2,3,4 (10 marks each) Attempt Q1 OR Q2, Q3 OR Q4*
- 2) *Question number 5,6,9,10 (16 marks each) Attempt Q5 OR Q6, Q9 OR Q10*
- 3) *Question number 7,8 (18 marks each) Attempt Q7OR Q8*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Assume Suitable data if necessary.*
- 6) *Figures to the right indicate full marks.*

Q1) a) Comment on the performance of stop and wait ARQ, GO back-n ARQ and selective repeat ARQ with suitable diagrams. **[6]**

b) Explain Category 1 and Category 2 WSN applications. **[4]**

OR

Q2) a) Explain Framing. Detail the methods of framing.(fixed and variable size framing) **[6]**

b) What is RFID communication? Differentiate between RFID and Bar Code communication. **[4]**

Q3) a) Give definitions. **[4]**

i) Baud rate

ii) Bit rate

iii) SNR

iv) Shannon Hartley Theorem

b) Explain with help of diagram frequency hopping spread spectrum What are advantages of FH/SS over DS/SS. **[6]**

OR

Q4) a) Compare Circuit, Packet and Message switching. **[6]**

b) Draw and explain Bluetooth Frame Format. **[4]**

P.T.O.

- Q5)** a) Explain Significance of LEACH protocol? Comment on various approaches for the cluster selection in LEACH protocol. [6]
 b) How hidden station and exposed station problem affects the communication in wireless network. Justify. [5]
 c) Differentiate with the suitable example Contention based protocol and Schedule based protocol. [5]

OR

- Q6)** a) Explain the detailed working of STEM protocol. Differentiate between STEM-T and STEM-B protocol. [6]
 b) SMAC protocol is used for efficient energy utilization in WSN. Justify. [5]
 c) With the help of detailed flow schematic diagram explain CSMA-CA protocol. [5]

- Q7)** a) State with TRUE or FALSE with justification” SPIN uses attribute value pairs for data and queries” [6]
 b) What are different routing challenges and design issues in WSN? [8]
 c) Elaborate on ZigBee protocol in WSN [4]

OR

- Q8)** a) Explain GEAR routing in WSN. [8]
 b) Explain the following. [4]
 i) Adaptive Routing Protocol with examples
 ii) Non adaptive routing protocol with examples
 c) Explain in detail data dissemination and gathering. [6]

- Q9)** a) Comment on importance of localization. Explain phases of localization in detail. [6]
 b) With the help of architectural block diagram explain Nano RK OS of WSN. [5]
 c) Explain information based sensor tracking. [5]

OR

- Q10)**a) Explain in detail the operating system design issues in WSN with reference to architecture and functions. [6]
 b) What is the impact of anchor node placement in WSN? [5]
 c) With flow chart explain the working of IDSQ. [5]



Total No. of Questions : 10]

SEAT No. :

P2461

[Total No. of Pages : 2

[5253] - 184

T.E. (Computer Engg.)

DATABASE MANAGEMENT SYSTEMS APPLICATIONS

(2012 Course) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer 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*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary*

Q1) a) Explain View and Index Objects in SQL. [5]

b) Draw an ER diagram for Banking Enterprise. [5]

OR

Q2) a) Explain Normalization. Explain 3 NF with Example. [5]

b) Explain advantages of DBMS over file systems. [5]

Q3) a) Consider following structure for MongoDB collections and write a query for following requirements in MongoDB (Any 3) [5]

Teachers(Tname, dno, experience, salary, date_of joining)

Students(Sname, roll_no, class)

- i) Write a MongoDB query to create above collections & for insertion of some sample documents.
- ii) Find the information about all teachers of dno = 2 and having salary greater than or equal to 10,000/-
- iii) Find the student information having roll_no = 2 or Sname = Anil
- iv) Display Total no of Students of TE Class

b) Explain key-value data store model of NOSQL databases. [5]

OR

Q4) a) What are NOSQL Database Types? Explain Document database type in detail. [5]

b) What are ACID Properties of Transaction? Explain Isolation in detail.[5]

P.T.O.

- Q5)** a) Explain different Parallel System Architectures with their advantages and disadvantages. [8]
b) Explain 3-tier and 2-tier web architecture with diagram considering suitable example. [8]

OR

- Q6)** a) Explain different steps required for JAVA to MongoDB database connection using JDBC. [8]
b) Explain distributed database system architecture. [8]

- Q7)** a) What is XML? Explain XQuery and FLWOR with Example. [7]
b) Explain Hadoop Architecture in Detail. Also explain how map reduce works. [10]

OR

- Q8)** a) Write XML Document for Book Data (Category, Title, Author, and Price).
Write XQuery to retrieve all book information with price>30. [7]
b) Write a Short note on R Programming [5]
c) Write a Short note on Hive Database [5]

- Q9)** a) Explain BIS Components in Detail. [5]
b) Explain Association Rule mining Algorithm with Example [7]
c) Differentiate between OLAP and OLTP. [5]

OR

- Q10)**a) Write short note on Data-mining regression analysis. [5]
b) Explain K Means Clustering Algorithm with Suitable Example. [7]
c) What is Classification? Explain different steps in Classifications? [5]



Total No. of Questions : 8]

SEAT No. :

P2462

[Total No. of Pages : 2

[5253] - 185

T.E. (Computer)

COMPUTER FORENSIC AND CYBER APPLICATIONS

(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Assume suitable data, if necessary.
- 4) Figures to the right indicate full marks.

- Q1)** a) Explain OSI Model with diagram. [8]
b) Explain schedule selection and coordination in S-MAC. [6]
c) Comment on language of Computer Crime Investigation. [6]

OR

- Q2)** a) Explain the functions of the following network components: [12]
i) Switch
ii) Bridge
iii) Gateways
iv) Repeater
b) Explain the following terms with example: [4]
i) Computer crime
ii) Computer Forensics
c) What is authentication and reliability related to digital evidence ? Explain Authenticity process in detail. [4]

- Q3)** a) Explain the following with example:- [8]
i) Digital evidence as Alibi
ii) Cyber stalking
b) How will you apply forensic science to computers? [8]

OR

P.T.O.

- Q4)** a) Enlist the important features from Indian IT act with reference to cyber crime and forensics. [8]
b) Comment on Violent crime and digital evidence. [8]

- Q5)** a) What is FAT file system? Compare FAT and NTFS file system. [8]
b) Explain patents, trademark and copyrights in detail. [8]

OR

- Q6)** a) Write short note on :- [8]
i) E-mail forgery
ii) Digital evidence on Mobile devices
b) Explain in brief Intellectual Property Rights (IPR). [8]

- Q7)** a) Enlist the steps for handling digital evidence at various Layers. [9]
b) Explain the steps applied in forensic science for TCP/IP network. [9]

OR

- Q8)** a) What is the role of sniffer in evidence collection at physical layer? [9]
b) Write short note on fraud detection in mobile and wireless network. [9]



Total No. of Questions : 10]

SEAT No. :

P2463

[Total No. of Pages : 2

[5253] - 186

T.E. (Computer Engineering)

**Principles of Concurrent and Distributed Programming
(2012 Pattern) (End Semester)**

Time : 2 1/2 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Question 1 or 2, 3 or 4, 5 or 6, 7 or 8, and 9 or 10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Explain in detail Declarative programming model. [6]
b) Write Short note on LISP. [4]

OR

- Q2)** a) Explain in detail Functional programming model. [6]
b) What is the structure of a LEX file? [4]

- Q3)** a) Explain [6]
• General purpose computer architecture,
• Special purpose computer architecture.
b) Explain Amdahl's law. [4]

OR

- Q4)** a) Explain Message Passing Model in parallel programming. [6]
b) Write a note on Fengs classification. [4]

- Q5)** a) Explain reliability and scalability issues in designing distributed operating system. [10]
b) Explain the following terms with respect to operating system : [8]
i) System image.
ii) Autonomy
iii) Fault Tolerance Capability.

OR

- Q6)** a) Explain performance issue in designing distributed operating system. [10]
b) Write a note on DCE cell. [8]

P.T.O.

- Q7)** a) Explain types of virtualization. [8]
b) Explain the common approaches to virtual computer systems. [8]

OR

- Q8)** a) Differentiate between Virtual System and Distributed System. [8]
b) Explain DomainO and DomainU Memory Management in Xen? [8]

- Q9)** a) Explain global memory in CUDA. [8]
b) Differentiate between Multi-CPU and Multi-GPU systems. [4]
c) Write short notes on: [4]
• CUDA threads
• CUDA blocks

OR

- Q10)**a) Explain threads in CUDA. Also explain problem decomposition [8]
b) Explain texture memory in CUDA. [4]
c) Write short note on CUDA kernels. Also explain Kernel call syntax. [4]



Total No. of Questions : 10]

SEAT No. :

P2464

[Total No. of Pages : 2

[5253] - 187

T.E. (Computer Engineering)

EMBEDDED OPERATING SYSTEMS

(2012 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer: Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No. 7 or Q.No. 8, Q.No. 9 or Q.No. 10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) What is priority inversion? What are the solutions available to handle the priority inversion? [6]

b) What is Readers-Writers problem? [4]

OR

Q2) a) Explain the RISC architectural features of ARM. [4]

b) What are the quality points that rate a scheduling algorithm? [4]

c) Name four Embedded Operating Systems. [2]

Q3) a) What are the reasons for the growth and popularity of Embedded Linux? [3]

b) Explain steps involved in compiling Linux Kernel for ARM -XScale architecture as a target. [5]

c) Name four executables or binaries of Embedded Linux. [2]

OR

Q4) a) What is cross development environment for Linux? Elaborate. [5]

b) What is Busy Box? How to configure it? Explain its usefulness in embedded systems. [5]

Q5) a) Name and explain the typical bootloader used for embedded/target board? Also mention the commands available with such a bootloader. [6]

b) How to format and partition a USB stick? Explain the commands used. [7]

c) How flash memory is used in embedded/target board? What are its limitations? [4]

OR

P.T.O.

- Q6)** a) What are the different types of device drivers? Explain depmod and rmmod. [6]
b) How MTD utility is useful for target boards? How to enable and use MTD services? [6]
c) What is Das U-Boot? What are U-Boot command sets? [5]

- Q7)** a) What is core dump? How to debug a core dump? [7]
b) Recognize and explain the following: [6]
i) ps
ii) strace
iii) mtrace
c) What is KGDB? [4]

OR

- Q8)** a) What is a stepper motor? How to interface BBB with Stepper motor?[7]
b) How do modern processors and compilers make it difficult to debug Linux kernel? [6]
c) What are the challenges faced while debugging Linux application code?[4]

- Q9)** a) Explain in details steps involved while porting Linux on a target board.[8]
b) What are the scheduling policies used by Linux to schedule real time processes? [6]
c) Explain Zygote for Embedded Android. [2]

OR

- Q10)**a) What are real-time processes? Which latency periods affect their performance? [8]
b) What is real-time scheduling in Linux? [4]
c) Explain System Server and Activity Manager for Embedded Android.[4]



Total No. of Questions : 8]

SEAT No. :

P2465

[Total No. of Pages : 2

[5253] - 188

T.E. (Computer Engineering)

Computer Networks

(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Neat Diagrams must be drawn wherever necessary*
- 2) *Assume suitable data, if necessary*
- 3) *Draw neat diagrams whenever necessary.*

- Q1)** a) What is the difference between persistent & non persistent HTTP? Also explain HTTP message format. [6]
- b) Explain FTP. [4]
- c) Explain working of DHCP. [6]
- d) What is the silly window syndrome problem? Suggest solution to overcome the problem [4]

OR

- Q2)** a) What is the difference between Integrated services and Differentiated services. Explain Resource Reservation Protocol (RSVP) in detail. [8]
- b) Give the significance of following commands with syntax. [6]
- i) IP config
 - ii) Ping
 - iii) Traceroute
- c) What are four general techniques to improve QoS- Quality of Service? Explain any one in detail. [6]
- Q3)** a) Explain Bluetooth frame format in detail. [5]
- b) Explain CSMA/CA in detail? [5]
- c) How much time in a Bluetooth one-slot frame is used for the hopping mechanism ? What about a three-slot frame and five-slot frame? [6]

P.T.O.

OR

- Q4)** a) Compare and explain 802.11a, 802.11b and 802.11g wireless standards with respect to [8]
- i) Frequency
 - ii) Signal to Noise ratio
 - iii) Bandwidth
 - iv) Range
- b) Explain addressing mechanism in 802.11 frame format. [4]
- c) Write short note on Network Allocation Vector (NAV)? [4]

- Q5)** a) Write a short note on (Any Two) [8]
- i) GMPLS
 - ii) Mobile IP
 - iii) H.323 used in VoIP
- b) What is DTN ? Explain different layers of DTN. [8]

OR

- Q6)** a) What are the components of VANET? What do you mean by dedicated short range communication in VANET? [8]
- b) What is VoIP? Explain SIP (Session Initiation Protocol) in detail. [8]

- Q7)** a) Explain ATM Header? Explain Application Adaptation Layer in detail.[10]
- b) Explain SONET Frame format in detail. [8]

OR

- Q8)** a) Explain Client layers of Optical fiber. [8]
- b) Explain working of SDN in detail with diagram. [10]



Total No. of Questions : 10]

SEAT No. :

P2466

[Total No. of Pages : 2

[5253] - 189

T.E. (Computer Engineering)
SOFTWARE ENGINEERING
(2012 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10*
- 2) *Neat diagram must be drawn whenever necessary.*
- 3) *Black figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Discuss software process? Describe the framework and umbrella activities? [5]

- b) Explain management and customer myths . Why a late project can not be placed back on schedule by merely adding people to the project teams? [5]

OR

Q2) a) Illustrate the characteristics of SRS? [5]

- b) Describe CRC? Write the steps for identifying analysis classes using CRC modeling. [5]

Q3) a) For banking system ,make your assumptions about the scope of the system identify four use cases and depict them in diagram. [5]

- b) Discuss refactoring? Give the importance of refactoring in improving quality of software. [5]

OR

Q4) a) Explain Elements of analysis model? [5]

- b) Explain data centered layered architectures with neat diagrams. [5]

Q5) a) Usability of software product is tested during which type of testing? How is usability tested? [5]

- b) Differentiate between alpha testing and beta testing? [5]

- c) Describe system testing ? What are the different kinds of System testing that are usually performed on large software products? [7]

OR

P.T.O.

- Q6)** a) Explain Boundary value analysis testing and orthogonal Array testing. [5]
b) Explain smok testing and regression testing? [5]
c) why the highly coupled module difficult to unit test? [7]

- Q7)** a) Justify process decomposition ? what are the work tasks for communication process using process decomposition? [5]
b) Explain metric for object oriented projects. [5]
c) Explain W5HH principles. [7]

OR

- Q8)** a) Differentiate between Measure and Metric? What are attributes of effective Software Metric? [5]
b) Describe Software configuration management ? Explain the change control mechanism in software configuration management. [5]
c) Assess Risk identification ? Name the different categories of risks? [7]

- Q9)** a) Describe Service-oriented architecture? [5]
b) Explain OCL? Where it is used? [5]
c) Discuss architectural patterns in details. [6]

OR

- Q10)**a) Describe client server computing? Explain [5]
b) Discuss architectural patterns in details. [5]
c) McCall's Quality Factors. [6]



Total No. of Questions : 10]

SEAT No. :

P2467

[Total No. of Pages : 3

[5253]-190

T.E. (Computer Engineering)

DIGITAL SIGNAL PROCESSING APPLICATIONS

(2012 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Assume suitable data if necessary.

Q1) a) Describe Properties of DT systems. [5]

b) How DFT is obtained from Fourier Transform (FT)? State the relationship between FT and DFT. [5]

OR

Q2) a) Find circular convolution of a given DT signals by using DFT and IDFT method where, [5]

$x(n) = \{2, 1, 2, 1\}$ and $h(n) = \{1, 2, 3, 4\}$ with

$X[k] = \{6, 0, 2, 0\}$ and $H[k] = \{10, -2 + 2j, -2, -2 - 2j\}$

b) Explain in brief the sampling theorem and aliasing effect. [5]

Q3) a) Compare between DIT FFT and DIF FFT algorithm. [5]

b) Obtain the Z Transform of sequence $x(n) = -\alpha^n u(-n-1)$ and sketch the ROC. [5]

P.T.O.

OR

Q4) a) How can we compute Linear Convolution using N point Circular Convolution? [5]

b) State the Scaling and Time shifting properties of Z transform. What is the significance of ROC in ZT? [5]

Q5) a) What are filter structures? Explain how the Direct and Cascade form of FIR filters are obtained and realized from the system function H(Z). [9]

b) A DT System is given by -

$$y(n) = \left(\frac{3}{4}\right)y(n-1) - \left(\frac{1}{8}\right)y(n-2) + x(n) + \left(\frac{1}{2}\right)x(n-1)$$

Obtain and Draw Direct Form – I and Direct Form – II IIR filter structure. [9]

OR

Q6) a) Obtain and realize Linear Phase FIR filter structure for a DT system.

$$H(z) = \left(1 + \frac{1}{2}z^{-1} + z^{-2}\right) \left(1 + \frac{1}{4}z^{-1} + z^{-2}\right)$$

What are the advantages of this filter structure? [9]

b) Derive the Direct Form-II IIR filter structure from system function H(Z) and represent it using multipliers, adders and delay elements. [9]

Q7) a) Compare DSP processor architecture with conventional Microprocessor. List the number of DAGs and supporting memory pointer registers used in DSP Processor. [8]

b) What is SHARC? Explain how SHARC DSP processor supports the multiprocessing capabilities. [8]

OR

Q8) a) What is OMAP? Explain the Software architecture of OMAP in brief. [8]

b) State and explain in brief OMAP multimedia applications. [8]

- Q9)** a) Draw and explain Compact Disk playback system. [8]
b) Write a short note on Television Video Signals. [8]

OR

- Q10)** a) What is Comanding? How important this process is in audio processing?
Explain the Comanding process in brief. [8]
b) Draw and explain Human Speech Model in speech synthesis and
recognition. [8]



Total No. of Questions : 10]

SEAT No. :

P2468

[Total No. of Pages : 2

[5253]-191

T.E. (I.T.)

COMPUTER NETWORK TECHNOLOGY

(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Your answer will be valued as a whole.
- 5) Assume suitable data if necessary.

Q1) a) Explain Distance Vector routing algorithm with suitable example. [6]

b) Explain request and response messages in HTTP. [4]

OR

Q2) a) Draw and explain TCP header format. [6]

b) Explain IP fragmentation. [4]

Q3) a) Draw and explain TCP state transition diagram. [6]

b) What is supernetting? Explain reason to perform subnetting. [4]

OR

Q4) a) How web pages are made dynamic using CGI. [6]

b) Explain Border Gateway protocol with message format. [4]

P.T.O.

- Q5)** a) Explain CSMA/CA in detail. [8]
b) Differentiate between IEEE 802.11 and IEEE 802.16 [8]

OR

- Q6)** a) Explain MAC layer mechanism IEEE 802.11, [8]
b) Explain architecture of WLAN with diagram. [8]

- Q7)** a) Explain Piconet and Scatternet architecture in Bluetooth. [8]
b) Length of SIFS period must be shorter than DIFS period in IEEE 802.11 specification why? [8]

OR

- Q8)** a) Draw and explain sensor node architecture. [8]
b) Explain working of STEM and its types. [8]

- Q9)** a) Explain any two routing protocols in MANET. [10]
b) Explain operating environment constraint in WSN. [8]

OR

- Q10)**a) List various techniques for minimizing wastage of energy in S-MAC. Explain any three in detail. [10]
b) Write short note on (Any Two) : [8]
i) Wi-Fi offloads.
ii) Software defined Network.
iii) Web of things.



[5253]-192

T.E. (I.T.)

**THEORY OF COMPUTATION
(2012 Pattern) (End Semester)**

Time : 2½ Hours]

[Max. Marks : 70

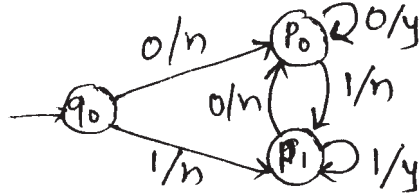
Instructions to the candidates:

- 1) Neat diagram must be drawn wherever necessary.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

Q1) a) Define the following with suitable examples [4]

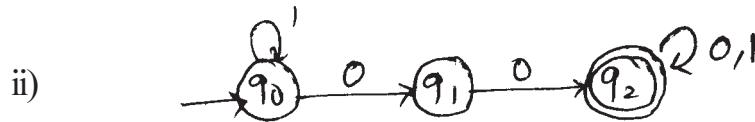
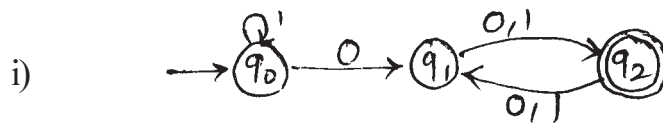
- i) FA
- ii) Regular Expression

b) Convert Mealy machine to Moore machine. [6]



OR

Q2) a) Find the regular expression for the following : [4]



b) Prove that the following language is non regular, using pumping lemma. [6]

$$L = \{a^n b^n \mid n > 0\}$$

- Q3)** a) Write a CFG which generates the language L denoted by [6]
 i) $(a+b)^*bbb(a+b)^*$
 ii) $\{0^m 1^n 0^{m+n} | m, n \geq 0\}$
- b) Write short note on chomsky hierarchy. [4]

OR

- Q4)** a) Convert the following grammar into GNF [4]
 $S \rightarrow ABA | AB | BA | AA | A | B$
 $A \rightarrow aA | a$
 $B \rightarrow bB | b$

- b) Define the following with suitable example. [6]
 i) Chomsky normal form
 ii) Leftmost derivation
 iii) Regular grammar

- Q5)** a) Design a post machine that accepts the following language. [8]
 $L = \{a^n b^n a^n | n \geq 0\}$
- b) Explain the following using suitable examples. [8]
 i) Acceptance of a CFL by empty stack by a PDA.
 ii) Acceptance of a CFL by final state by a PDA.

OR

- Q6)** a) Construct a PDA for the language described as “The set of all strings over $\Sigma = \{a, b\}$ with equal no. of a’s and b’s. [8]
- b) Give formal definitions of PDA and PM. Compare them. [8]

- Q7)** a) Design a TM that adds two unary numbers. Show stepwise functioning of TM for the input: 11 + 111 [10]
- b) Write a short note on : [8]
- i) Power of TM over finite state machine.
- ii) Universal turing machine

OR

- Q8)** a) Construct TM for the following : [10]
- i) Language consisting of string having any number of 0's & even no. of 1's over $\Sigma = \{0,1\}$.
- ii) Increment the value of any binary number by one.
- b) Define TM. Explain its working. Give the types of TM & applications of the same. [8]
- Q9)** a) What is reducibility? What are undecidable problems? Describe at least four undecidable problems in case of TMs. [8]
- b) Write a short note on encoding of TM. [8]

OR

- Q10)**a) Write a short note on church Turing hypothesis. [4]
- b) Describe at least four undecidable problems in case of CFGs. [4]
- c) Define recursively enumerable languages and recursive languages with suitable example. [8]



Total No. of Questions : 10]

SEAT No. :

P2470

[Total No. of Pages : 2

[5253] - 193

T.E. (Information Technology)
DATABASE MANAGEMENT SYSTEMS
(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume suitable data, if necessary*

- Q1)** a) What are the three data anomalies that are likely to occur as a result of data redundancy? Can data redundancy be completely eliminated in database approach? [6]
- b) Explain aggregation and specialization concept with the help of diagrams. [4]

OR

- Q2)** a) What is view? What are the advantages of View? Write and Explain create view syntax. [6]
- b) Explain Stored Procedure with suitable example. [4]
- Q3)** a) Explain Boyce-Codd Normal Form with example and why 4NF is more desirable than BCNF. [6]
- b) Consider the following employee database [4]
- employee (employee-name, street, city)
- works (employee-name, company-name, salary)
- company (company-name, city)
- manages (employee-name, manager-name)
- Where the primary keys are underlined.
- Give an expression in SQL for each of the following queries.(Any Two)
- i) Find the names of all employees who work for First Bank Corporation.
 - ii) Find the names and cities of residence of all employees who work for First Bank Corporation.
 - iii) Find all employees in the database who live in the same cities and on the same streets as do their managers.

OR

P.T.O.

- Q4)** a) Explain following terms with the help of example. [6]
i) Recoverable schedule.
ii) Cascadeless schedule
b) Explain ACID properties of transaction. [4]

- Q5)** a) Draw and Explain architectures of parallel databases? List Advantages and disadvantages of parallel database architectures? [8]
b) Draw and explain centralized database management system. [6]
c) Explain Internet database systems. [4]

OR

- Q6)** a) Explain Data fragmentation and data replication with respect to distributed database systems. [8]
b) Compare the two-tier and three-tier client server architectures. [6]
c) Explain various system parameters of parallel databases [4]

- Q7)** a) Define the terms encoding and decoding with respect to JSON. [4]
b) What is XML schema? Explain difference between XML schema and XML DTD. [6]
c) List and discuss the important features of Hadoop. [6]

OR

- Q8)** a) List and discuss the elements of Big Data. [4]
b) What are different data types of JSON? List any four differences between XML and JSON? [6]
c) What is the role of Namenode and Datanodes in an HDFS cluster? Draw and explain. [6]

- Q9)** a) What is data mining? Describe the steps involved in data mining. [8]
b) What is On-Line Analytical Processing (OLAP)? What are benefits of OLAP? How is data mining different from OLAP? [8]

OR

- Q10)**a) Draw and explain various components of data warehouse. [8]
b) Write short note on: [8]
i) SQLite Databases
ii) Mobile Databases



Total No. of Questions : 10]

SEAT No. :

P2471

[Total No. of Pages : 2

[5253] - 194
T.E. (Information Technology)
SOFTWARE ENGINEERING
(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer 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.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary*

Q1) a) Define Software. Compare software & hardware based on their failure curves. [5]

b) Discuss any five software myths & realities. [5]

OR

Q2) a) What is unified process? How steps of unified process can be used in Building a website that hosts All-India Entrance test. [5]

b) Write short note on Extreme Programming (XP). [5]

Q3) a) What is SCRUM? Describe SCRUM process framework. [5]

b) Draw use case diagram for Library Management System. [5]

OR

Q4) a) Explain any five Requirement Engineering Tasks. [5]

b) List different Agile practices. Explain Test driven development. [5]

Q5) a) Explain any five issues consider for designing software. [8]

b) What is software architecture? Explain Data centered and object oriented architectural style of the system. [8]

OR

Q6) a) What is functional Independence? Differentiate between coupling functional independence and cohesion functional independence. [8]

b) State elements of Design model? What are the elements of architectural design? Explain design principles [8]

P.T.O.

- Q7)** a) What is Fitt's Law? How is it used in UI design? [8]
b) Write short note on Interface Designs Principles. [8]

OR

- Q8)** a) What are different models in interface analysis and design? Explain each model in detail. [8]
b) Explain Shneiderman's 8 golden rules. [8]

- Q9)** a) i) What are challenges of Global Software Development?
ii) Short note on collaborative development. [8]
b) How do we certify a software component during cleanroom testing?[10]

OR

- Q10)**a) Explain SCM process in detail. [8]
b) Write short note on Taxonomy of CASE tools [10]



Total No. of Questions : 10]

SEAT No. :

P2472

[Total No. of Pages : 2

[5253] - 195
T.E. (Information Technology)
WEB ENGINEERING & TECHNOLOGY
(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Define Web Engineering and Web Application. [5]
b) What are the components of generic web application? Explain with suitable example. [5]

OR

- Q2)** a) What are the restrictions in Integrated web design? [5]
b) Explain functional design for web applications. [5]

- Q3)** a) Write HTML code which include table, hyperlink, character formatting and ordered, unordered list. [5]
b) List various client side and server side technologies. [5]

OR

- Q4)** a) What do you mean by internal and external style sheet? [5]
b) Explain 2 Tier and 3 Tier Architecture for web application. [5]

- Q5)** a) What are the advantages of PHP over other scripting languages? [8]
b) Write a PHP script to store data in the database. [8]

OR

- Q6)** a) How is MySQL database connected to PHP? Discuss PHP ODBC in detail. [8]
b) Briefly explain the basic structure of PHP program with an example. [8]

P.T.O.

- Q7)** a) Explain XML Schema, DTD and XSL with example. [8]
b) How do servlets work? Explain in brief. [8]

OR

- Q8)** a) What is Java Servlet and Java Server Page? Explain the life cycle of Servlet. Name the method of Servlet Request Class. [8]
b) What is JSP? Enlist advantages of JSP over CGI? [8]

- Q9)** a) Write a short note on - WordPress. [9]
b) What do Content Management Systems do? How do CMS work? [9]

OR

- Q10)** a) What are the needs and benefits of a web CMS? Discuss in brief. [9]
b) What are the essential functionalities and services that any web CMS should provide? [9]



Total No. of Questions : 10]

SEAT No. :

P2473

[Total No. of Pages : 3

[5253]-196

T.E. (Information Technology) (Semester - II)
DESIGN AND ANALYSIS OF ALGORITHMS
(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

- Q1) a)** Explain direct proof and proof by counter example techniques. **[4]**
- b)** Define following asymptotic notations: **[6]**
- i) Theta
 - ii) Little Oh
 - iii) Little Omega

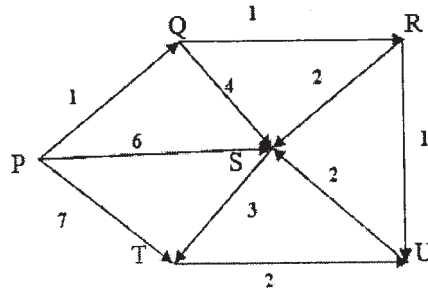
OR

- Q2) a)** Write an algorithm for binary search using recursion and find out its best case, average case & worst case time complexities. **[5]**
- b)** Consider 0/1 knapsack problem by: $N = 3$; $W = (4, 6, 8)$ and $P = (10, 12, 15)$. Using dynamic programming. Determine the optimal profit for the knapsack of capacity 10. **[5]**
- Q3) a)** Explain the following terms with reference to Greedy Technique. **[5]**
- i) Feasible solution and Optimal solution
 - ii) Subset paradigm and ordering paradigm
- b)** Write Warshall's algorithm for finding transitive closure and find its time complexity. **[5]**

P.T.O.

OR

- Q4) a)** Apply Dijkstra's algorithm for finding all shortest paths from a single source 'P' in a given graph. [5]



- b) Write a note on Masters theorem. [5]

- Q5) a)** State the principle of backtracking: Explain the constraints used in backtracking with an example. [8]

- b) Write an algorithm for Hamiltonian cycle problem using backtracking method. [8]

OR

- Q6) a)** What is m-colorability optimization problem? Explain with an example. [8]

- b) Find all possible solutions for 5- queens' problem using backtracking method. [8]

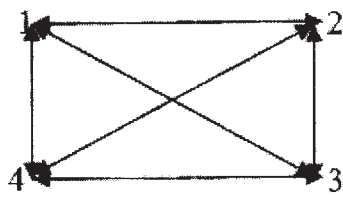
- Q7) a)** Explain the term : [10]

- i) Branch and Bound.
- ii) LC search.
- iii) FIFO branch & bound.
- iv) Bounding function.
- v) Difference in LIFOBB and LCBB.

- b) Write and explain the upper bound function for 0/1 Knapsack problem by branch and bound method. [8]

OR

Q8) What is travelling sales person problem? Find the solution of the following travelling sales person problem using Dynamic approach and Branch and Bound approach. **[18]**



$$\begin{pmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{pmatrix}$$

- Q9)** a) What do you mean by P, NP, NP-Hard and NP-Complete problems? Give an example of each category. **[8]**
- b) Explain the need and significance of parallel algorithms. **[8]**

OR

- Q10)a)** Explain the following : **[8]**
- i) Computational complexity.
 - ii) Decision problems.
 - iii) Deterministic and Non-deterministic classes.
 - iv) Complexity classes.
- b) Explain the possible parallel computations using complete binary tree. **[8]**



Total No. of Questions : 10]

SEAT No. :

P2474

[Total No. of Pages : 4

[5253] -197

**T.E. (IT) (Semester - II)
Systems Programming
(2012 Pattern)**

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answer 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*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Define the following terms with examples. **[5]**

- i) Compiler
- ii) Interpreter
- iii) Loader
- iv) Assembler
- v) Macroprocessor

b) Explain in detail data structures used in Pass I and Pass II of assembler.**[5]**

OR

Q2) a) Generate symbol table, literal table, pool table, Intermediate code and Target Code for the given assembler program. Assume a hypothetical instruction set with every instruction of length 1. **[8]**

```
START 1000
A DS 05
LOAD A
SUB AREG, ='10'
DIV BREG, ='10'
TRANS L
L2 READ TEMP
LORG
L ADD AREG, ='5'
SUB BREG, ='15'
ADD B
```

P.T.O.

```

B EQU L+10
  ORIGIN L2 + 20
TEMP DS 5
C DC 10
  STOP
  END

```

b) List down the phases of a compiler. [2]

Q3) a) Compare Compile and Go Loader v/s Absolute Loader. [4]

b) For the 'C' code given below, give the different tables that would be generated as output of lexical analysis. [6]

```

main ()
{
    int i = 1, sum = 0, n;
    float avg;
    printf("Enter a value for n:");
    scanf("%d", &n);
    sum = 0;
    do
    {
        sum = sum + i;
        i ++;
    }
    while (i <= n);
    avg = sum / (float)n;
    printf("average : %f", avg);
    getch ( );
}

```

OR

Q4) a) Write a short note on Lex and Yacc. [4]

b) Explain flow chart / Algorithm of pass I of direct linking loader. [6]

Q5) a) With a neat diagram explain the classification of parsers. [6]

b) Define table driven predictive parser. For the following grammar

$$S \rightarrow aSbS/bSaS/\epsilon$$

Construct table - driven predictive parser and parse the string "ab". [8]

c) Compare bottom up and top down parser. [4]

OR

Q6) a) Using the table given, parse the string $id - id * (id - id) / id$ using an operator precedence parser. [10]

	+	-	*	/	^	id	()	s
+	✓	✓	✓	✓	✓	✓	✓	✓	✓
-	✓	✓	✓	✓	✓	✓	✓	✓	✓
*	✓	✓	✓	✓	✓	✓	✓	✓	✓
/	✓	✓	✓	✓	✓	✓	✓	✓	✓
^	✓	✓	✓	✓	✓	✓	✓	✓	✓
id	✓	✓	✓	✓	✓	✓	✓	✓	✓
(✓	✓	✓	✓	✓	✓	✓	✓	✓
)	✓	✓	✓	✓	✓	✓	✓	✓	✓
s	✓	✓	✓	✓	✓	✓	✓	✓	✓

b) Explain the concept of handle in bottom up parsing and explain it w.r.t. the given example : [4]

$$S \rightarrow SS+ / SS* / a \text{ for the string } aaa*a++$$

c) Compare LALR and CLR parsers. [4]

Q7) a) What is SDD? Explain synthesized and inherited attributes with suitable example. [8]

b) For the statement given below, generate intermediate code in the form of: [8]

i) postfix notation

ii) Parse Tree

iii) Quadruple

iv) Triple

$$S = (a + b) / (c - d)$$

OR

- Q8)** a) Explain concept of type checking. [4]
b) For the given piece of code generate TAC : [8]
X, Y : ARRAY [1 – 10, 1 – 10] OF INTEGER;
for (j = 1; j <=5; j++)
X[2*i – 1][j] = Y[2 * i] [j]
c) Explain the need for intermediate code generation. [4]

- Q9)** a) Discuss code generation issues. [4]
b) Discuss with suitable example machine dependent code optimization. [8]
c) Write a short note on activation record. [4]

OR

- Q10)** a) Explain following machine independent optimization techniques : [8]
i) Loop invariation
ii) Common sub - expression eimination.
iii) Dead code elimination
iv) Strength reduction
b) Compare machine dependent and independent optimization. [4]
c) Explain different storage allocation strategies. [4]



Total No. of Questions : 10]

SEAT No. :

P2475

[Total No. of Pages : 4

[5253] -198

T.E. (Information Technology) (Semester - II)

OPERATING SYSTEM

(2012 Pattern)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answers 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.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

SECTION - I

- Q1)** a) State the essential difference between the following types of OS : Batch processing, multiprogramming, real - time. **[6]**
- b) Consider a computer with N processors in a multiprocessor configuration.**[4]**
- i) How many processes can be in each of the Ready, Running, and Blocked states at one time?
 - ii) What is the minimum number of processes that can be in each of the Ready, Running, and Blocked states at one time?

OR

- Q2)** a) What is the purpose of system calls, and how do system calls relate to the OS and to the concept of dual - mode (kernel mode and user mode) operation. **[6]**
- b) Describe in detail the functions of OS as a resource manager. **[4]**

P.T.O.

Q3) a) Consider the following set of processes : **[6]**

Process Name	Arrival Time	Processing Time
A	0	3
B	1	5
C	3	2
D	9	5
E	12	5

Apply RR with $q = 1$, SJF (Preemptive) and show Avg. waiting time and Turn around time.

b) List the key design issues for an SMP operating system. **[4]**

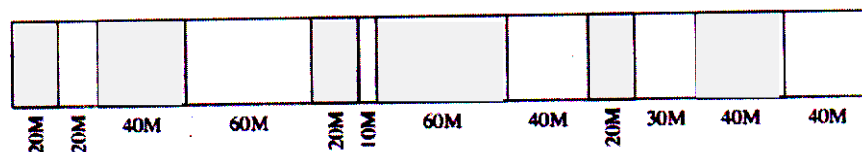
OR

Q4) a) Draw and explain the Unix process state transition diagram. **[6]**

b) Define the terms : **[4]**

- i) Deadlock
- ii) Livelock
- iii) Turnaround time and
- iv) Response time

Q5) a) A dynamic partitioning scheme is being used, and the following is the memory configuration at a given point in time : **[6]**



The shaded areas are allocated blocks; the white areas are free blocks. The next three memory requests are for 40 M, 20 M, and 10M. Indicate the starting address for each of the three blocks using the following placement algorithms:

- i) First - fit
- ii) Best - fit
- iii) Worst - fit

- b) Describe the following : [6]
- i) Principle of locality
 - ii) Thrashing &
 - iii) External Fragmentation
- c) A 1 - Mbyte block of memory is allocated using the buddy system. [6]
- i) Show the results of the following sequence with a figure for Request 100 K, Request 240 K, Request 64 K, Request 256 K, Release 240, Release 100, Request 75 K, Release 64, Release 240, Release 256
 - ii) Show the binary tree representation following Release 240.

OR

- Q6)** a) Explain the following terms in brief : [6]
- i) Working set model
 - ii) Thrashing
 - iii) Lazy swapper
- b) Given the following page reference string : 1, 2, 3, 2, 5, 6, 3, 4, 6, 3, 7, 3, 1, 6, 3, 4, 5, 3, 2, 4, 3, 4, 5, 1 Number of page frames are 4. Show the page trace and calculate the number of page frames for the following page replacement policies [12]
- i) LRU
 - ii) Optimal
 - iii) FIFO

Also explain Belady's anomaly.

- Q7)** a) A disk drive has 640 cylinders, numbered 0 - 639. The drive is currently serving the request at cylinder 68. The queue of pending requests in FIFO order is : 84, 153, 32, 128, 10, 133, 61, 69. Starting from the current head position, what is the total distance that the disk arms moves to satisfy all the pending requests for the following disk scheduling algorithms: [12]
- i) FCFS
 - ii) C - SCAN
 - iii) SCAN
 - iv) SSTF

- b) Why I/O buffering is necessary? State and explain different I/O buffering techniques. [6]

OR

Q8) a) Assume a disk with 200 tracks and the disk request queue has random requests in it as follows : 55, 58, 39, 18, 90, 160, 150, 38, 184. Find the no. of tracks traversed and average seek length if

- i) FIFO
- ii) SSTF
- iii) C - SCAN
- iv) SCAN

is used and initially head is at track number 100 [12]

b) Describe the following : [6]

- i) File sharing
- ii) Record blocking

Q9) a) Write characteristics of following : [14]

- i) Ubuntu EDGE
- ii) Embedded Linux
- iii) NACH Operating System
- iv) Android OS.

OR

Q10) a) Write a steps for kernel compilation with necessary commands. [6]

b) Write a pseudo code for simple kernel module and explain procedure of inserting a new module in existing kernel with all necessary steps. [8]



Total No. of Questions : 10]

SEAT No. :

P2476

[Total No. of Pages : 2

[5253] - 199

T.E. (Information Technology)
MULTIMEDIA TECHNOLOGIES
(2012 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) What is Authoring Tools. Explain the Authoring tools used in a Education field. [5]

b) What is Distributed Multimedia System? Explain with suitable example. [5]

OR

Q2) a) Define multimedia system. What are its building blocks? Explain in brief. [5]

b) Write and explain Huffman Coding algorithm for the input with frequencies of occurrences A(3) B(5) 8(E) H(2) I(7). Construct Huffman Tree. [5]

Q3) a) What are image acquisition techniques? Explain image enhancement by spatial filtering [5]

b) What are different Image File Format explain each. [5]

OR

Q4) a) What are various audio compression techniques? Explain ADPCM in brief. [5]

b) Write a short note on characteristic of sound wave Amplitude, Frequency, Waveform, Speed. [5]

P.T.O.

Q5) a) What is digitization of video? Explain process of digitization of video with neat sketch. [8]

b) What is a need of video file formats? Explain AVI and H.261 briefly. [8]

OR

Q6) a) What is multimedia streaming? Explain RTP and RTSP Protocols in detail. [8]

b) Explain with suitable diagram encoding and decoding of MPEG 4. Also explain [8]

i) Profiles and levels

ii) Descriptors

iii) Scene Graph

Q7) a) State and explain twelve principles of animation. [8]

b) What is Animation? Explain different technique used to create Animation. [8]

OR

Q8) a) What is animation? Explain following techniques of animation [8]

i) Motion Cycling

ii) Onion Skinning

b) What is OpenGL? Write and explain main features of OpenGL. Explain OpenGL shadowing and rendering technique. [8]

Q9) a) What is virtual reality? How does multimedia techniques are used to implement virtual reality. [6]

b) Explain head mounted displays and their use in multimedia applications. [6]

c) What are the various categories of nodes in VRML? Explain in brief. [6]

OR

Q10) a) Explain GStreamer based Multimedia Framework. [6]

b) Describe Android Multimedia Framework Architecture. [6]

c) Differentiate between Virtual reality and Augmented reality with suitable example. [6]



Total No. of Questions : 10]

SEAT No. :

P2477

[Total No. of Pages : 2

[5253] - 200

T.E. (Information Technology)

INFORMATION TECHNOLOGY PROJECT MANAGEMENT

(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answers Question 1 or 2, 3 or 4, 5 or 6, 7 or 8 and 9 or 10.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Explain scientific management. [4]
b) What is product life cycle? [3]
c) Explain Traceability matrix. [3]

OR

- Q2)** a) Explain salient features of management with human relations approach & behavioral science. [3]
b) Explain classes of new product. [3]
c) Explain 4 m's resources for project resources. [4]

- Q3)** a) Explain 5 dimensions of leading Technical professionals. [4]
b) Explain Product planning and control procedure. [3]
c) Explain process capability baseline. [3]

OR

- Q4)** a) Explain steps in decision making process. [3]
b) Explain Break Even Chart Analysis. [3]
c) Explain Actual VS Estimated schedule. [4]

- Q5)** a) What is role of Manager in Project Metrics? [8]
b) What is purpose of Peer review? [8]

OR

- Q6)** a) Explain project monitoring and control cycle. [8]
b) What are a Project Audit, & Why Is It Done? [8]

P.T.O.

- Q7)** a) What are the benefits of ERP? [8]
b) Explain risks in ERP. [8]

OR

- Q8)** a) Explain process of ERP implementation. [8]
b) State and explain success and failure factors of ERP implementation. [8]

- Q9)** a) How to make good choice as Project Manager? [10]
b) Explain Professional Responsibility of Project Manager. [8]

OR

- Q10)** a) Explain Major Roles of Project Team in Professional Responsibility. [10]
b) Explain Software Configuration Management as a process. [8]



Total No. of Questions : 10]

SEAT No. :

P2478

[Total No. of Pages : 3

[5253] -201
T.E. (Chemical)
CHEMICAL ENGINEERING MATHEMATICS
(2012 Pattern)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Use Gauss Elimination method to solve the following equation by partial pivoting. **[5]**

$$x_1 + 20x_2 + x_3 = 22$$

$$-x_1 - x_2 + 20x_3 = 18$$

$$20x_1 + x_2 - x_3 = 20$$

b) State the classification of numerical methods to obtain the root of equation. **[5]**

OR

Q2) a) Explain Thomas algorithm for tridiagonal matrix. **[5]**

b) Using Gauss seidal method solve the following set of equations up to three decimal place accuracy. **[5]**

$$x + 3y + z = 10$$

$$x + 2y + 5z = 12$$

$$4x + y + 2z = 16$$

P.T.O.

Q3) In an attempt to understand the mechanism of the depolarization process in a fuel cell, an electrokinetic model for mixed oxygen - methanol current on platinum was developed in the laboratory at. A very simplified model of the reaction developed suggests a functional relation in an integral form. To find the time required for 50% of the oxygen to be consumed, the time, T(s) is given by

$$T = - \int_{1.22 \times 10^{-6}}^{0.61 \times 10^{-6}} \left(\frac{6.73x + 4.3025 \times 10^{-7}}{2.316 \times 10^{-11} x} \right) dx$$

Use Simpson's 1/3 rule to find the time required for 50% of the oxygen to be consumed. [10]

OR

Q4) a) State the graphical interpretation of False position method. [5]

b) The temperature viscosity relationship for hydrodynamic bearing is given as follows :

T°C	40	41	42	43	44	45
Z(Cp)	52.5	50	47.5	45	43	41

Calculate the temperature of lubricant for a viscosity of 43.2 Cp using backward difference method. [5]

Q5) In Chemical engineering one relation is commonly used for the concentration

ratio C as $\frac{dc}{dt} = KC^n$ for time t where K is a reaction rate constant and n is a

order of reaction. If K = 0.08 and n = 1.5. Find the concentration ratio at t = 2. If initial condition C(0) = 11.23 for the accuracy of 0.1 using Modified Eulers method. [16]

OR

Q6) a) Using Runge - Kutta 4th order method solve $\frac{dy}{dx} - y = 0$. Given y(0) = 2, h = 0.1. Find y at x = 0.2. [8]

- b) Temperature at one surface of slab of thickness, $x = 20$ cm is $T = 500^\circ\text{C}$. Find the temperature of other surface of slab by taking step size in thickness $\Delta x = 4$ cm. Heat flux is 1000 W/m^2 . Use following governing

relation of heat flow.
$$\frac{dt}{dx} = -\frac{q}{A} \left[\frac{1}{0.5(0.01T + 1)} \right] \quad [8]$$

- Q7)** Solve the boundry value problem $\frac{d^2y}{dx^2} - 64y + 10 = 0$ Using finite difference method and calculate $y(0.5)$, taking step size $h = 0.25$. [16]

OR

- Q8)** Solve $\frac{\partial u}{\partial t} = \frac{d^2u}{dx^2}$ for the following condition using crank - Nicolson method. At $x = 0$ and $x = 3$, $u = 0$ for all values of t . At $t = 0$, $u = x^2$ for $0 < x < 3$. Take increment in x as 1 and increment in t as 0.1. Find all values of u for $t = 0$ to $t = 0.3$. [16]

- Q9)** a) What is Optimization and discuss its applications in detail. [9]
 b) What are the limitations of linear programming. [9]

OR

- Q10)** a) What are the advantages of linear programming. [9]
 b) Maximize $z = 2x_1 + 3x_2$ [9]
 Subject to $x_1 + x_2 \leq 30$
 $x_2 \geq 3$
 $x_2 \leq 12$
 $x_1 - x_2 \geq 0$
 $0 \leq x_1 \leq 20$



Total No. of Questions : 10]

SEAT No. :

P2479

[Total No. of Pages : 4

[5253]-202

T.E. (Chemical Engineering) (Semester - I)

MASS TRANSFER - I

(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10.
- 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.

Q1) a) Explain Molecular and eddy diffusion. [4]

- b) Ammonia gas is diffusing at a constant rate through a layer of stagnant air 1mm thick. The gas mixture contains 45% by volume of ammonia at one boundary of the stagnant layer. The ammonia diffusing to the other boundary is quickly absorbed and concentration is negligible at that plane. The temperature is 300°K and the pressure atmospheric, and under these conditions the diffusivity of ammonia in air is 0.18 cm²/sec. Calculate the rate of diffusion of ammonia through the layer. [6]

OR

Q2) a) Write a short note on Penetration theory. [4]

- b) A volatile organic compound benzene costing Rs. 45 per kg, is stored in a tank 10m diameter and open at top. A stagnant air film 10mm thick is covering the surface of the compound beyond which the compound is absent. If the atmospheric temperature is 25°C. Vapor pressure of the compound is 150 mmHg and its molar diffusivity is 0.02 m²/hour, calculate the loss of benzene is Rs./day. [6]

P.T.O.

- Q3) a)** Explain the concept of Interphase Mass transfer? Also explain the concept of equilibrium with example. [4]
- b) Explain the process for determination of number of theoretical plates for counter current absorption process. [6]

OR

- Q4) a)** Write a short notes on : [4]
- i) Minimum Gas-liquid ratio for absorber.
- ii) HETP.
- b) Ammonia is to be removed from its mixture with air by scrubbing with water in a packed tower. A gas mixture entering the column contains 6% NH_3 (Vol%) and rest air (Vol%) water free of NH_3 enters in the column in countercurrent direction. If 90% of the ammonia is to be removed using NH_3 free water at the rate of 2 mole water per mole of air. Determine the exit concentration of ammonia. The gas-liquid equilibrium relationship if $Y = 0.08X$, where, $Y = \frac{\text{Moles of NH}_3}{\text{Mole of air}}$, $X = \frac{\text{Moles of NH}_3}{\text{Mole of water}}$ [6]

- Q5) a)** Write a short note on : [8]
- i) Lewis relationship.
- ii) Psychrometric chart.
- b) The air in a room is at 26.7°C and a pressure of 101.325 KPa and contains water vapour with a partial pressure $P_A = 2.76$ KPa. Calculate the following :
(Data at 26.7°C , Vapour pressure of water is $P_{As} = 3.50$ KPa.) [8]
- i) Humidity (H)
- ii) Saturation Humidity (H_s)
- iii) Percentage Humidity (H_p)
- iv) Percentage relative Humidity (H_R)

OR

- Q6) a)** Derive an equation for height of packing required in a forced draft countercurrent cooling tower in terms of $Z = HTU \times NTU$

$$\text{where, N.T.U} = \int_{HG_1}^{HG_2} \frac{dHg}{Hf - Hg}$$

use basic equation for heat & mass transfer in counter current cooling tower. State the assumptions used. **[10]**

- b) Explain in details about the equipments used for humidification process. **[6]**

- Q7) a)** Write a short note on (Any two) : **[8]**

- i) Material of packings and their characteristics.
- ii) Linde Trays, Valve tray, Bubble Cap Tray
- iii) Types of columns.

- b) Explain the mechanical agitation for gas-liquid contact considering following points : **[8]**

- i) Impeller speed
- ii) Gas flow rate
- iii) Impeller power, Bubble diameter, gas hold-up

OR

- Q8) a)** Describe the operating characteristics of Seive tray considering following points : **[8]**

- i) Flooding
- ii) Weeping
- iii) Coning
- iv) Dumping

- b) Compare packed tower and tray tower with consideration of following points : **[8]**

- i) Gas holdup
- ii) Pressure drop
- iii) L/t ratio
- iv) Floor loading

Q9) a) What are the different types of dryers. Explain working and principle of any one type in detail. **[8]**

b) A batch of solid is to be dried from 28 to 6% moisture on wet basis. The initial weight of the solids is 380 kg and drying surface is 0.15 m²/40 kg dry weight. The critical moisture content is 18% on a dry basis and the constant drying rate is 0.32 kg/m² hr. For the falling rate period following data are available. Calculate the time required for drying. **[10]**

Moisture content % dry basis	25	21.9	19	16	13.6	11	8.2	7.5	6.4
Rate of drying kg/m ² hr.	0.30	0.27	0.24	0.21	0.18	0.15	0.07	0.044	0.025

OR

Q10)a) Explain the concept of equilibrium in drying. Also draw rate of drying curve and explain constant rate period and following rate period. **[8]**

b) A batch of solid for which the following table of data applies is to be dried from 25% to 6% moisture under conditions identical to those for which the data were tabulated. The initial weight of the wet solids is 300 kg and the drying surface is 1 m²/8 kg dry weight. Determine the time for drying. **[10]**

X	0.35	0.25	0.20	0.18	0.16	0.14	0.12	0.10	0.09	0.08	0.064
N	0.3	0.3	0.3	0.266	0.239	0.208	0.180	0.150	0.097	0.07	0.025

where $X = \frac{\text{kg moisture}}{\text{kg dry solids}}$ & $N = \frac{\text{kg moisture evaporated}}{\text{m}^2 \cdot \text{hr}}$



Total No. of Questions : 10]

SEAT No. :

P2480

[Total No. of Pages : 2

[5253] - 203

T.E. (Chemical)

INDUSTRIAL ORGANIZATION AND MANAGEMENT

(New) (2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain Single Ownership with advantages and disadvantages. [6]

b) Write a note on Merit Rating. [4]

OR

Q2) Explain with a neat sketch Line and Staff Organization along with Advantages. [10]

Q3) Explain various functions of Storekeeper. [10]

OR

Q4) a) Explain in detail Recruitment. [4]

b) Explain different types of Wages. [6]

Q5) a) Explain in detail Penetration Pricing and Skimming Pricing. [8]

b) What is sales promotion? Explain sales promotion technique. [8]

OR

Q6) a) Write an explanatory note on Marketing Research. [8]

b) What is sales forecasting? Explain the two types of sales forecasting in detail. [8]

P.T.O.

- Q7)** a) Write Notes on [8]
i) Antidumping Duty
ii) International Trade
b) Explain in detail the procedure to import equipment from foreign source. [8]

OR

- Q8)** a) Explain in detail various factors affecting international trade. [8]
b) Explain the role of Quality Circles for Quality Management of a process industry. [8]

- Q9)** Write short notes on [18]
a) FERA and FEMA
b) Patent and Patent Rights
c) Monopolies Restrictive Trade Practices (MRTP)

OR

- Q10)** a) Explain the term Agreement in Contract Act. Explain the various types of Contract according to enforceability, formation and performance. [12]
b) Write note on Work study [6]



Total No. of Questions : 10]

SEAT No. :

P2481

[Total No. of Pages : 2

[5253] - 204
T.E. (Chemical)
Chemical Process Technology
(2012 Pattern) (Semester - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume Suitable data if necessary*

- Q1)** a) Explain the production of bromine from sea water with figure. [5]
b) Differentiate between unit operations and unit processes with proper examples. [5]

OR

- Q2)** a) Explain the production of Salt from sea water by solar evaporation. [5]
b) Explain the Kraft pulp process for Paper production. [5]

- Q3)** Describe the DCDA process for mfg of Sulphuric acid. [10]

OR

- Q4)** Explain the ammonia oxidation process for mfg of Nitric acid. [10]

- Q5)** Explain the hydrogenation of oil with PFD and engg problems involved. [10]

OR

- Q6)** Describe the continuous hydrolysis and saponification process for Soap mfg. [10]

- Q7)** a) Explain Alkylation & Hydroalkylation. [10]
b) Explain the production of Producer gas & Natural gas. [10]

OR

- Q8)** a) Describe in details the various refinery operations. [10]
b) Explain Polymerization in details. [10]

P.T.O.

- Q9)** a) Describe the production of Vinyl Chloride [10]
b) Explain the production of Cumene. [10]

OR

- Q10)**a) Explain the production of EDC. [10]
b) Explain the manufacturing of Formaldehyde. [10]



Total No. of Questions : 10]

SEAT No. :

P2482

[Total No. of Pages : 3

[5253]-205

T.E. (Chemical)

CHEMICAL ENGINEERING THERMODYNAMICS - II
(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side 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.*

- Q1)** a) Explain the effect of temperature and pressure on chemical potential. [5]
- b) The fugacity of component 1 in a binary liquid mixture of components 1 and 2 at 298K and 20 bar is given by $\bar{f}_1 = 50x_1 - 80x_1^2 + 40x_1^3$ where \bar{f}_1 is in bar and x_1 is mole fraction of component 1. [5]

Determine:

- i) Fugacity of pure component 1 and
- ii) Fugacity coefficient ϕ_1
- iii) The Henry's law constant
- iv) Activity coefficient γ_1 .

OR

- Q2)** a) A container is divided into two compartments one containing 3 moles of hydrogen at 298K and 1 bar and the other containing 1 mole of nitrogen at 298K and 3 bar. Calculate the free energy of mixing when the partition is removed. [5]
- b) Prove that if Henry's Law is obeyed by component 1 in a binary solution over a certain concentration range, Lewis Randall rule will be obeyed by component 2 over the same concentration range. [5]

P.T.O.

Q3) a) Two suffix Margules equation is the simplest equation for excess Gibbs free energy. $G^E = Ax_1x_2$, where A is an empirical constant independent of composition. Derive the expressions for the activity coefficients that result from this expression. [5]

b) Explain the VLE diagram. [5]

OR

Q4) a) Explain minimum and maximum boiling azeotropes. [4]

b) The azeotrope of ethanol-benzene system has a composition of 44.8% by mole ethanol with a boiling point of 341.4K at 101.3 kPa. At this temperature vapour pressure of ethanol is 67.4 kPa and that for benzene is 68.9 kPa. What are the activity coefficients in a solution containing 10% by mole of ethanol. [6]

Q5) a) Explain the Redlich Kister method and mid-point method for testing consistency of thermodynamic data. [9]

b) Verify if the following data are consistent: [9]

x_1	0	0.2	0.4	0.6	0.8	1.0
γ_1	0.576	0.655	0.748	0.856	0.95	1.0
γ_2	1.0	0.985	0.930	0.814	0.626	0.379

OR

Q6) a) Using the criterion for phase equilibrium show that the change in entropy during phase change can be calculated from the latent heat of phase change and the absolute temperature as $\Delta S = \Delta H/T$. [6]

b) The activity coefficient for component 1 in a binary mixture is given by the expression $\ln \gamma_1 = ax_2^2 + bx_2^3 + cx_2^4$ where a , b and c are concentration independent constants. Derive an equation for $\ln \gamma_2$ in terms of x_1 . [6]

c) State and explain the stability criteria for phase equilibrium. [6]

- Q7) a)** Explain the criteria for reaction equilibrium. [8]
- b) A gas mixture contains 4 moles ammonia, 4 moles hydrogen and 2 moles ammonia initially. The reaction taking place is $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$. Derive expressions for the mole fractions of various components and explain how the conversion of limiting reactant is related to the extent of reaction. [8]

OR

- Q8) a)** Derive the expression for reaction equilibrium constant $K = K_f = K_\phi K_P$. [7]
- b) Calculate the equilibrium constant for the reaction $\text{N}_2\text{O}_4(g) \rightarrow 2\text{NO}_2(g)$ if the free energy of formation at 298K of N_2O_4 is 97,540 J/mol and for NO_2 is 51,310 J/mol. [5]
- c) Give the criteria for feasibility of a reaction. [4]
- Q9) a)** Describe the effect of temperature on equilibrium constant. [6]
- b) A gas mixture containing 25% CO, 55% H_2 and 20% inerts is to be used for methanol synthesis according to the reaction: $\text{CO}(g) + 2\text{H}_2(g) \rightarrow \text{CH}_3\text{OH}(g)$. The gas mixture leaving the reactor is in equilibrium at 300 bar and 625 K. Assume that the equilibrium mixture forms an ideal solution and K_f and K_ϕ are 4.9×10^{-9} and 0.35 respectively. What is the percentage conversion of CO? [10]

OR

- Q10)a)** Explain the phase rule for reacting systems. [6]
- b) One mole of steam undergoes the water gas shift reaction at 1100 K and 1 bar. $\text{CO}(g) + \text{H}_2\text{O}(g) \rightarrow \text{CO}_2(g) + \text{H}_2(g)$. The equilibrium constant for the reaction $K = 1$. Assuming ideal behavior calculate the fractional dissociation of steam when CO is supplied in 100% excess and only 50% of theoretical requirement. [10]



Total No. of Questions : 10]

SEAT No. :

P2483

[Total No. of Pages : 2

[5253] - 207
T.E. (Chemical)
Transport Phenomena
(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 4) *Assume suitable data if necessary.*

Q1) Derive the expression of momentum flux and velocity distribution for adjacent flow of two immiscible fluids in a slit which is half-half filled with both fluids.[10]

OR

Q2) Derive the expression of temperature distribution for viscous heat source.[10]

Q3) Glycerine is flowing through a horizontal tube 1 ft. long and 0.1 in. inside diameter. For a pressure drop of 40 psi, flow rate is $0.00398 \text{ ft}^3 \text{ min}^{-1}$. Density of glycerine is 1.261 gm/cc . Find viscosity of glycerine in centipoises. [10]

OR

Q4) a) Explain mass balance equation at steady state. [5]

b) A copper wire has a radius 2 mm and length 5 m. For what voltage drop would the temperature rise at the wire axis be 10°C if the surface temperature of the wire is 20°C .? For copper, Lorenz number is $2.23 \times 10^{-8} \text{ volt}^2 \text{ K}^{-2}$. [5]

Q5) Derive Navier Stoke's equation of motion. [18]

OR

Q6) a) Derive continuity equation. [12]

b) Explain dimensionless form of equation of change. [6]

P.T.O.

Q7) Derive Ergun equation for flow of fluid through packed bed. Explain its significance. [16]

OR

Q8) a) Derive expression of fanning friction factor and Reynolds number for laminar flow of fluid through tube. [8]

b) Explain macroscopic energy balance equation. [8]

Q9) a) Explain mass transfer coefficients by film theory. [8]

b) Explain Reynold's and Prandtl's analogy. [8]

OR

Q10)a) Explain Chilton-Colburn analogy. [8]

b) Explain Martinnelli's analogy. [8]



Total No. of Questions : 10]

SEAT No. :

P2484

[Total No. of Pages : 4

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T.E. (Chemical Engineering)

CHEMICAL ENGINEERING DESIGN - I

(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) A storage tank of diameter 20 m and height 12 m is to be constructed. The plates of size 6300 mm × 1800 mm in varying thickness are available for fabrication. Density of liquid to be stored is 1000 kg/m³. Material of construction is carbon steel having permissible stress of 165 N/mm². Weld joint efficiency is 85% and corrosion allowance is 1.5 mm. Calculate total numbers of courses required and thickness of each course. [7]

b) Write a short note a Hortonspheres. [3]

OR

Q2) A tall vertical vessel 1.7 m in diameter and 15 m in high is to be provided with skirt supports. Weight of the vessel with all its attachments is 80,000 kg. Diameter of skirt is equal to diameter of the vessel. Height of skirt is 2.4 m. Wind pressure acting over vessel is 100 kg/m² seismic coefficient = 0.08, permissible tensile stress of skirt material = 960 kg/cm², permissible compressive stress is 1/3 of yield stress of material. Yield stress is 2400 kg/cm². Estimate the thickness of the skirt support. [10]

P.T.O.

Q3) 1.2kg/sec of an organic liquid is to be cooled from 45°C to 20°C. The organic liquid is cooled by chilled water supplied from a refrigeration unit at a temperature of 5°C and can be heated upto 10°C. Use tubes of 12 mm ID and 2 mm wall thickness. Length of tubes is 1.5 m. Properties of organic liquid and water are :

Properties	Organic liquid	Water
Specific heat, J/Kg K	2150	4180
Viscosity, Ns/m ²	0.25×10^{-3}	0.8×10^{-3}
Density, kg/m ³	716	1000
Thermal conductivity, W/mK	0.133	0.61

Fouling resistance for organic liquid = 0.0002 m² K/W, Fouling resistance for water = 0.0004 m² K/W, Correction factor for LMTD = 0.86. Steel tubes are to be used. Thermal conductivity of steel tube = 45 W/mk. Design a suitable heat exchanger. **[10]**

OR

Q4) a) Discuss briefly on shell and tube side heat transfer coefficients in a shell and tube heat exchanger. **[4]**

b) What is temperature correction factor? How is it calculated? Why is it used in design of heat exchanger? **[6]**

Q5) a) In case of reboilers how the heat transfer coefficient is calculated for Pool boiling. Explain all the equations involved in the calculations. **[8]**

b) Explain the design methods for mixed vapor condensers and how the true temperature difference is evaluated in such cases? **[8]**

OR

Q6) a) A single effect evaporator is to be designed to operate at absolute pressure of 0.13 bar. Estimate the heat transfer area necessary to concentrate 4500 kg/hr of caustic soda solution from 10% to 40% (by weight) using saturated steam at 117°C as heating media. The overall heat transfer coefficient may be taken as 1.25 KW/m² °C.

Data: Specific heat of feed = 4000 J/kg °C, Specific heat of product = 3260 J/kg °C, Feed temperature = 18°C, BPR = 30°C, Density of boiling liquid = 1390 kg/m³. The liquid level in the evaporator is 1200 mm above the heating surface. [8]

- b) Explain various methods of feeding for multiple effect evaporators. [8]

- Q7)** a) Toluene is continuously nitrated to mono-nitrotoluene in a cast iron vessel, 1 m diameter, fitted with a propeller agitator 0.3 m diameter, rotating at 2.5 Hz. The temperature is maintained at 310 K by circulating 0.5kg/sec cooling water through a stainless steel coil 25 mm OD and 22 mm ID, wound in form of a helix, 0.8m in diameter. The reacting material is having the same physical properties as 75% sulphuric acid. If the mean water temperature is 290 K, what is the overall heat transfer coefficient for desired heat transfer?

Properties:

Water- Thermal conductivity = 0.59 W/m K, Cp = 4180 J/kg K, viscosity = 1.08 mN s/m², density = 998 kg/m³

75% sulphuric acid- Thermal conductivity = 0.40 W/m K, Cp = 1880 J/kg K, viscosity = 6.5 mN s/m², density = 1666 kg/m³, Viscosity at the surface = 8.6 mN s/m²

Thermal conductivity of stainless steel is 15.9 W/m K, Dirt resistance at inside and outside surfaces are 0.0002 and 0.0004 m² K/W respectively.

[12]

- b) Explain criteria for jacket selection in a reactor. [6]

OR

- Q8)** a) A pitched blade turbine impeller running at 90 rpm is used for agitating 5000 liter of liquid with a density of 900 kg/m³ and viscosity of 100 cP. The tank diameter is 1 m and the ratio of agitator diameter to tank diameter is 0.4. Find the power required for mixing. [10]

N_{Re}	1000	2000	3000	4000
N_p	1.1	1.2	1.3	1.4

- b) Discuss the power requirements calculation for agitation systems. [8]

Q9) a) Design a horizontal separator to separate 10,000 kg/h of liquid, density 962.0 kg/m³, from 12,500 kg/h of vapor, density 23.6 kg/m³. The vessel operating pressure will be 21 bars. **[8]**

b) Write about knockout drum, role of demister pad and reflux drum. **[8]**

OR

Q10)a) Explain the importance of column auxiliaries. **[6]**

b) Design a decanter to separate light oil from water. The oil is the dispersed phase. Oil flow rate is 1000 kg/h, density of oil is 900 kg/m³ and viscosity of oil is 3 mNs/m². Water flow rate is 5000 kg/h, density of water is 1000 kg/m³ and viscosity of water is 1 mN s/m². **[10]**



Total No. of Questions : 10]

SEAT No. :

P2485

[Total No. of Pages : 4

[5253]-209

T.E. (Chemical)

MASS TRANSFER - II

(2012 Pattern) (End Semester)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) A 100 kmol of mixture containing 40% by mole of A (more volatile) and 60% by mole of B is differentially distilled till the composition of the residue is 0.31. Calculate the percentage of liquid distilled. If the same distillation was carried out using flash what would be the fraction of liquid vaporized? The equilibrium data: [6]

x	0	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
y	0	0.13	0.21	0.375	0.5	0.6	0.7	0.77	0.83	0.9	0.95	1

b) Explain the principle of azeotropic and extractive distillation. [4]

OR

Q2) a) A liquid mixture of benzene and toluene containing 45% by mole of benzene, is to be distilled at the rate of 100 kmol/h. Feed enters at a temperature of 327.6 K. Distillate contains 5% by mole of toluene and the bottom product contains 90% by mole of toluene. Reflux ratio is 4:1. Average heat capacity of feed is 159kJ/kmol K and the average latent

P.T.O.

heat is 32100 kJ/kmol. Calculate the distillate and bottom molar flow rate and the number of plates required. B.P. of benzene = 353K and B.P. of Toluene = 383.8 K. Equilibrium data : [8]

x	0	0.13	0.258	0.411	0.581	0.78	1.0
y	0	0.261	0.450	0.632	0.777	0.90	1.0

b) What is partial condenser? [2]

Q3) a) An aqueous solution containing 0.7 kmol/m³ of solute is contacted with an organic solvent containing 0.004 kmol/m³ of solute. The raffinate stream from the column has a solute concentration of 0.68 kmol/m³. The organic phase flow rate is 20 l/h and that of aqueous solution is 30 l/h. The column height is 1.4 m and column diameter is 0.0045 m². Determine the volumetric mass transfer coefficient and HTU based on extract phase if equilibrium relation is given by $C_{org.} = 0.025 C_{aq.}$ [7]

b) Describe the working principle of pulse extraction column. [3]

OR

Q4) a) A mixture of benzene and toluene containing 55 mole % benzene is distilled to give 95 mole% benzene and a bottom product containing 7 mole % benzene. The feed is liquid at bubble point and a total condenser is used. Find the number of plates required at total reflux. The equilibrium data : [5]

x	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
y	0	0.21	0.37	0.51	0.62	0.71	0.78	0.85	0.91	0.95	1.0

b) Explain the selection criteria for solvent in a liquid-liquid extraction process. [5]

Q5) a) Seeds containing 25% by weight of oil are to be extracted in a countercurrent plant and 85% of the oil is extracted as 45% solution in solvent. Fresh solvent is fed to the system and with every 2 kg insoluble solid 1 kg solution is removed. Find the number of equilibrium stages required and the amount of solvent required. [10]

b) Explain constant and variable underflow. [6]

OR

- Q6)** a) Give the steps for finding number of stages in triangular method for multistage countercurrent leaching with schematic and graphical representation. [9]
- b) Give the functioning of a Bollman Extractor. [7]
- Q7)** a) Equilibrium water adsorbed by a silica gel in contact with moist air is given by $Y = 0.0344 X$, where $Y = \text{kg water / kg dry air}$ and $X = \text{kg water adsorbed / kg silica gel}$. 0.5 kg silica gel containing 5% moisture on dry basis is placed in a collapsible vessel in which there is 10 m^3 of moist air. The partial pressure of water vapour is 15 mmHg. The total pressure and temperature are 760 mmHg and 298 K respectively. Calculate the quantity of water adsorbed. [8]
- b) What is LUB? Derive relevant equations and give diagrammatic and graphical representation. [8]

OR

- Q8)** a) A solution of washed raw cane sugar is colored by the presence of small amounts of impurities. The solution is to be decolorized by treatment with an adsorptive carbon in a contact filtration plant. The original solution has a color concentration of 9.6 measured on an arbitrary scale and it is desired to reduce color of 0.86. Calculate the minimum quantity of the fresh carbon per kg solution for a continuous countercurrent process when the solid fed is solute free. The data for an equilibrium isotherm is as follows : [10]

Kg carbon/kg solution	0	0.001	0.004	0.008	0.02	0.04
Equilibrium color	9.6	8.6	6.3	4.3	1.7	0.7

- b) Explain why an adsorbent needs to be regenerated and the methods of regeneration. [6]

- Q9)** a) Give the various types of pressure driven membrane processes. Give applications for each. [8]
- b) Why is supersaturation required in crystallization? Explain the related theory. [6]
- c) Explain the terms rejection, permeability, membrane fouling, cake resistance. [4]

OR

- Q10)a)** Explain Swenson Walker crystallizer's working. [8]
- b) A Swenson Walker crystallizer is used to produce hydrated crystals of sodium sulphate ($\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$) by cooling a solution from 310 K to 300K with the help of cooling water which enters at 280K and leaves at 290K. Assuming evaporation to be negligible, determine the number of sections of the crystallizer each 3m long, required to process 0.3 kg/s of product. Data: Solubility of Na_2SO_4 at 310K = 40 kg/100 kg water, Solubility of Na_2SO_4 at 300K = 14 kg/100 kg water, Mean heat capacity of liquor = 3.8 kJ/kg K, heat of crystallization = 230 kJ/kg, available area for heat transfer = $3\text{m}^2/\text{m}$ length of crystallizer, overall heat transfer coefficient = 0.14 kW/m²K. [10]



Total No. of Questions : 10]

SEAT No. :

P2486

[Total No. of Pages : 3

[5253]-210

T.E. (Chemical)

PROCESS INSTRUMENTATION & CONTROL

(2012 Pattern)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q. No, 1 or 2. Q. No. 3 or 4. Q. No. 5 or 6, Q. No. 7 or 8. Q. No. 9 or 10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, slide ruler, Mollier Charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Explain different types of transducers? [5]
b) Explain need and scope of process instrumentation. [5]

OR

- Q2)** a) Write note on dynamic characteristics of measuring instruments. [5]
b) Define all the process variables and state their unit of measurement. [5]

- Q3)** a) Explain with diagram, construction and working calibration of pressure sensors using dead-weight tester. [5]
b) Explain with diagram, construction and working capsule. [5]

OR

P.T.O.

Q4) a) Define temperature and give classification of temperature measuring instruments. [5]

b) Explain optical pyrometer with diagram, construction and working. [5]

Q5) a) Explain classification of flow measuring instruments. [8]

b) Explain with diagram, construction and working ultrasonic mass flow meter. [8]

OR

Q6) a) Explain classification of level measuring instruments. [8]

b) Explain air purge level measurement method with diagram & construction. [8]

Q7) Describe with diagram the following techniques of composition analysis. [16]

a) IR absorption spectroscopy.

b) Mass spectroscopy.

OR

Q8) Write note on : [16]

a) HPLC.

b) gas chromatography.

c) liquid chromatography.

d) P^Hmeter.

Q9) a) Describe the heat exchanger automatic control system with block diagram. [9]

b) Derive the dynamic response equation of first order system for step changes. [9]

OR

Q10)a) An air to open valve on the inflow controls level in a tank. When the process is at the set point the valve opening is 50%. **[9]**

An increase in outflow results in the valve opening increasing to a new steady state value of 70%. What is the resulting offset if the controller PB is:

i) 50%

ii) 20%

b) Explain with diagram distillation column control system. **[9]**

