

Total No. of Questions : 8]

SEAT No. : _____

P996

[Total No. of Pages : 2

[5870]-1001

T. E. (Civil)

HYDROLOGY AND WATER RESOURCES ENGINEERING
(2019 Pattern) (Semester - I) (301001)

Time : 2 1/2 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) 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.
- 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 Q-GIS and its application in hydrology. [10]

b) An urban catchment has area of 85 ha. The slope of catchment is 0.006 and the maximum length of water travel is 950 m. The maximum depth of rainfall with return period of is as below. [8]

Duration (min)	5	10	20	30	40	60
Depth of rainfall (mm)	17	26	40	50	57	62

If a culvert for drainage at the outlet of this area is to be designed for a return period of 25 years estimate the required peak flow rate, by assuming runoff coefficient as 0.3.

OR

Q2) a) Explain watershed delineation procedure using a topo sheet with neat sketches. [10]

b) Explain flood routing in detail. [8]

Q3) a) Explain how will you fix the capacity of reservoir using annual inflow and outflow. [10]

b) What are reservoir losses and suggest method to control leakages from reservoir? [7]

OR

Q4) a) What are various investigations required for reservoir planning? [10]

b) State measures to control reservoir sedimentation. [7]

P.T.O.

- Q5)** a) Derive the formula to calculate discharge of a well in a confined aquifer and unconfined aquifer. [10]
b) What is water logging? Explain tile drain method and also state formula for spacing of tile drains. [8]

OR

- Q6)** a) Explain reclamation of saline lands. [10]
b) State various types of tube wells and explain construction of slotted type. [8]

- Q7)** a) Explain Piped Distribution Network (PDN) and state its advantages.[10]
b) Explain Hortons curve with neat sketch. [7]

OR

- Q8)** a) What is evaporation, state Meyer's formula and Rowher's formula nd explain every term in formula. [10]
b) Differentiate between surface irrigation and subsurface irrigation and explain drip irrigation in detail. [7]



Total No. of Questions : 8]

SEAT No. :

P719

[Total No. of Pages : 2

[5870]-1002

T.E. (Civil)

WATER SUPPLY ENGINEERING

(2019 Pattern) (Semester - I) (301002)

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 indicate full marks.
- 4) Assume suitable data, if necessary and clearly state the same.
- 5) Use of an electronic pocket calculator is allowed.

Q1) a) Compare in Tabular form Aluminium and Iron Based Coagulants. [10]

Minimum 10 points of comparison are expected.

b) A settling tank is designed for an SOR of 5000 l/sq m/hr. Find the percentage of solids removal for particles of size. [8]

i) 0.07 mm and

ii) 0.03 mm. Assume temperature of water to be 20 deg C, and specific gravity of particles as 2.65.

OR

Q2) a) Enlist 06 operational troubles in filters. Explain any 02 in detail.

[6 + 3 + 3 = 12]

b) Determine dimensions of an RSGF for a town with a population of 9000 and water supply of 200 lpcd. Assume rate of filtration to be 5000 lph per sq m and L:B as 1.3. [6]

Q3) a) Enlist any 06 factors affecting bacterial removal efficiency of chlorine.

Explain any one in brief.

[6 + 3 = 9]

b) Enlist any 05 criteria for selecting a disinfectant. Explain in brief: mechanism of disinfection. [5 + 3 = 8]

OR

Q4) a) Explain in detail: Zeolite as water softening method. [5]

b) Explain any 06 forms of chlorination. Explain any two in detail. [12]

P.T.O.

- Q5)** a) Explain in detail: steps involved in designing a water distribution system
(min 03 steps are expected) [3 × 4 = 12]
b) Enlist any 03 fixtures used in water supply to a building. Explain any one in brief. [3 + 3 = 6]

OR

- Q6)** a) Explain in detail: Use of PLC and SCADA systems in Water Supply Engineering. [5 + 5 = 10]
b) A town with a population of one lakh is supplied with 200 lpcd of water. The variation in the demand is as follows: [6]

- i) 6 AM to 9 AM: 40%
- ii) 9 AM to 12 noon: 15%
- iii) 12 noon to 3 PM: 10%
- iv) 3 PM to 6 PM: 15%
- v) 6 PM to 9 PM: 20%

Find the balancing capacity of service reservoir, assuming a uniform pumping from 6 AM to 6 PM. Use mass curve method.

- Q7)** a) Explain following terms wrt Water Supply in Rural Areas : [12]
i) Participatory Approach
ii) Service Level Bench Mark
iii) Use of HDPE pipes
b) Explain in detail: Requirements of WTP for a Swimming Pool. [5]

OR

- Q8)** a) Explain in detail: requirements of plumbing in High Rise Buildings. Support your answer wrt following points: [12]
i) Water saving fixtures
ii) Pressure Control
iii) Metered Supply to every member
b) Explain in detail: current policies of government wrt rural water supply. Frame your answer wrt **har ghar jal** mission of central government. [5]



Total No. of Questions : 8]

SEAT No. :

P3832

[Total No. of Pages : 2

[5870]-1003

T.E. (Civil)

DESIGN OF STEEL STRUCTURES

(2019 Pattern) (Semester - I) (301003)

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 sketches must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Take F_e 410 grade of steel and $f_y = 250 \text{ MPa}$.
- 5) Take ultimate stress in bolt, $f = 400 \text{ N/mm}^2$.
- 6) Assume suitable data, if necessary.
- 7) Use of electronic pocket calculator, IS : 800-2007 and Steel Table is allowed.
- 8) Use of cell phone is prohibited in the examination hall.

Q1) Check adequacy of ISHB 450 @ 8.4 Kg/m to carry a factored compressive load of 750 kN at an eccentricity of 270 mm about major axis. The effective length of column is 3m. Consider only section strength. [17]

OR

Q2) Column ISHB 350 @ 661.2N/m carries an axial compressive load of 1700 kN. Design suitable bolted gusset base. The base rests on M15 grade concrete pedestal. Also design the bolted connection. [17]

Q3) a) Design laterally supported beam of effective span 6m which is subjected to bending moment of 150 kNm and shear force of 210 kN. Apply usual checks including check for web buckling and crippling. [14]

b) Write short note on web buckling and web crippling with neat sketches. [4]

OR

Q4) a) Design a laterally unsupported beam for the following data [14]

Effective span = 4m,

Maximum Bending Moment 550 KN-m,

Max. S.F. = 200KN

b) Differentiate between laterally supported beam and laterally unsupported beam. [4]

P.T.O.

- Q5)** A truss as shown in figure 1 is having rise of 4m and spaced at 4m centre to centre used for an industrial building situated at Pune. The truss is covered with AC sheets of weight 180 N/m^2 . Calculate panel point dead load, live load and wind load. Design member LoU_1 and L_1U_1 . The design wind pressure is 876 N/m^2 and $(\text{C}_{pe} - \text{C}_{pi}) = \pm 0.8$. [18]

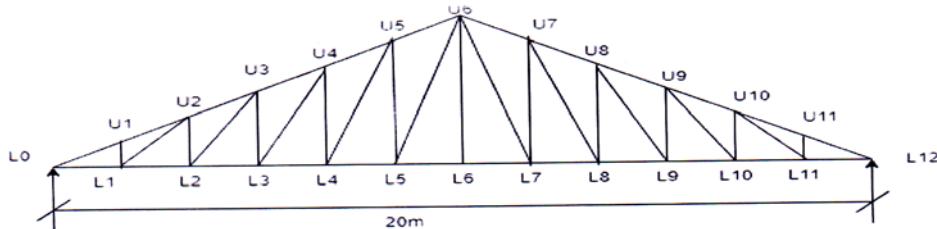


Figure 1

OR

- Q6)** Design a gantry girder supporting an electrically operated crane girder with following data : [18]

- Crane capacity 250 kN
- Self-weight of the crane girder excluding trolley 150 kN
- Self-weight of the trolley, electric motor, hook, etc. 50 kN
- Span of crane girder $= 16\text{m}$
- Minimum hook approach $= 1\text{m}$
- Wheel base $= 3.5\text{m}$
- Span of gantry girder $= 6.5\text{m}$
- Self-weight of rail section 300 N/m

- Q7)** A welded plate girder of span 25 m is laterally restrained throughout its length. It has to carry working load of 80 KN/m over the whole span excluding the self-weight. Design section of girder, end bearing stiffener and welded connections. [17]

OR

- Q8)** a) A welded plate girder of span 40 m subjected to uniformly distributed load of 100 kN/m excluding self-weight. Assume compression flange to be laterally supported. Design cross section for plate girder. [12]
- b) Write short note on stiffeners with sketch. [5]



Total No. of Questions : 8]

SEAT No. :

P720

[Total No. of Pages : 4

[5870]-1004

T.E. (Civil Engineering)

**ENGINEERING ECONOMICS AND FINANCIAL
MANAGEMENT**

(2019 Pattern) (Semester - I) (301004)

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) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data if required.
- 5) Use of non programmable scientific calculator is allowed.

- Q1)** a) Explain how construction financial management is different. [5]
b) Describe in details the role of financial manager in Construction financial management. [6]
c) A company's contract ledger shows the following details in respect of Contract, which commenced on 1 April 2019. [6]

Particular	Amount (Rs.)
Material Used	7,60,000
Direct Wages	8,00,000
Cost of Plant	2,00,000
Chargeable Expenses	70,000
Establishment Charges	50,000

The contract was completed by 31 March 2020 at a contract price of Rs. 20,00,000. The values of the materials and plant returned to store on 31 March 2020 were Rs 60,000 and Rs. 1,20,000 respectively. The contract price was received in full on 31 March 2020, Prepare a contract account.

P.T.O.

OR

Q2) a) Who is responsible for construction financial management? Explain the role of each. [6]

b) What is Contract? Explain any two types of Contracts. [5]

c) Explain how recording of site accounts is performed at project site. [6]

Q3) a) What is Budget? What are essential elements of budget? [6]

b) What is Depreciation? Enlist different method for calculation of Depreciation and explain any one in detail. [5]

c) A Company is considering two projects having cash flows as: [6]

Period	Project A	Project B
0	1500000	3000000
1	150000	100000
2	300000	500000
3	500000	1000000
4	200000	1500000
5	600000	200000
6	500000	500000
7	100000	1000000
Discounted Rate	10%	13%

Using the profitability index method, which project should the company undertake?

OR

Q4) a) What are different types of Budget? Explain any two in details. [5]

b) What are discounted cash flow techniques of Capital Budgeting? Explain any one in detail. [5]

c) A construction excavator cost Rs.900000, having a salvage value of 45000 after useful life of 15 years, assuming compound interest of 8%; calculate the depreciation on an equipment after 5 years by; [7]

i) Constant percentage method.

ii) Sinking fund method.

- Q5)** a) What are the financing resources of working capital? Explain any one in details. [6]
 b) Following is the data associated with the Company XYX, considering 10% contingencies calculate the required working capital. [6]

Particular	Amount (Rs.)	Particular	Amount (Rs.)
Bank Balance	1,05,000	Leasehold property	16,00,000
Plant & machinery	9,00,000	Goodwill	3,00,000
Investment in subsidiary	11,50,000	Profit and loss account	70,000
Socks of finished goods	1,20,000	Account receivable	2,40,000
Unclaimed dividend	6,000	Underwriting commission	45,000
Share capital	20,65,000	Deposits from public	9,00,000
Staff PF	80,000	Account payable	2,10,000
Capital redemption reserve	2,20,000	Short term loan	1,78,000
General reserve	1,90,000		

- c) Explain the components of working capital. What are the factors affecting working capital? [6]

OR

- Q6)** a) What is Working capital? Why working capital is required? [6]
 b) Prepare an estimate of working capital requirement from the following information of trading concern. [6]
 - i) Projected annual sales Rs. 6,50,000
 - ii) Percentage of net profit on sales 25%
 - iii) Average credit period allowed to debtors 10 Weeks
 - iv) Average credit period allowed by creditors 4 Weeks
 - v) Average stock holding in terms of sales requirements 8 Weeks
Allow 20% for contingencies
 c) The yearly requirement of cement by a construction firm is 1000 bags. The cost of one bag of cement is Rs. 400 and ordering cost per order is Rs. 150. Assume annual carrying cost for inventory of 20% of average inventory management. Calculate EOQ and number of orders in one year. If the lead time is 5 days calculate order point. [6]

Q7) a) Write down the roles and functions of following financial regulatory bodies: [6]

- i) IRDA (Insurance Regulatory and Development Authority)
- ii) RBI (Reserve Bank of India)

b) What is GST? With example explain the 3 components of GST. [6]

c) Calculate tax to be paid on property in Delhi, from following data: [6]

- i) Covered area – 800 sq.ft.
- ii) Unit area value for 1 month = 5.00/ Sq.ft.
- iii) Age Factor = 1.0
- iv) Use Factor = 1.2
- v) Structure Factor = 1.0
- vi) Occupancy factor = 1.0
- vii) Tax rate=11%

OR

Q8) a) What is property tax? Explain different methods used to calculate property tax. [7]

b) What is Direct Tax? Explain any four types of direct taxes which are imposed in India. [6]

c) Calculate the property tax for the apartment which used only for residential purpose, from following location data: [5]

- i) No of floors – 10 (Floor factor – 1.05)
- ii) Base value – Rs. 300/Sqft
- iii) User category factor – 0.5
- iv) Nature and type of structure – RCC (factor-1)
- v) Age of building – 26years (Age factor – 0.75)
- vi) Carpet area – 400 Sq ft
- vii) Location – Mumbai
- viii) Tax rate – 0.775%



Total No. of Questions : 8]

SEAT No. :

P721

[Total No. of Pages : 3

[5870]-1005

T.E. Civil

ADVANCED FLUID MECHANICS AND HYDRAULIC MACHINES

(2019 Pattern) (Semester - I) (Elective - I) (301005A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve 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.*

Q1) a) A jet of water issuing from an orifice 25 mm diameter under a constant head of 1.5 m falls 0.915 m vertically before it strikes the ground at a distance of 2.288 m measured horizontally from the vena-contracta. The discharge was found to be 102 lit/min. determine Cd, Cv, and Cc for the orifice. [6]

- b) Why does water hammer occur in a pipe flow? What is its effect and what are the methods to reduce water hammer? [6]
- c) Calculate the velocity of propagation of a pressure surge in a circular conduit with rigid walls in the following cases: [6]
- i) water with $K = 2.22 \times 10^3$ MPa
 - ii) oil with $K = 1.5 \times 10^3$ MPa, specific gravity = 0.8.

OR

Q2) a) Prove that for gradual closure of valve, rise in pressure is $h_i = \frac{LV}{gt}$. [6]

b) Explain one complete cycle of water hammer. [6]

c) A tank having constant cross-sectional area was emptied through a sharp-edged orifice situated at the bottom of the tank. It took 100 seconds to empty the upper third of the tank. How long will it take to empty the middle third? [6]

P.T.O.

Q3) a) A jet of water 75 mm diameter and with velocity of 20 m/s flows tangentially on to a stationary vane which deflects the water through 120° . What is the magnitude and direction of the resultant force on the vane? If the jet flows on to a series of vanes moving in the direction of the jet with velocity 12 m/s, find [9]

- i) the force on the system of vanes in the direction of motion,
- ii) the work done per second

b) Show that the efficiency of a free jet striking normally as series of flat plates mounted on the periphery of a wheel never exceeds 50%. [8]

OR

Q4) a) A jet of water 50mm in diameter having a velocity of 20 m/s, strikes normally a flat smooth plate. Determine the thrust on the plate [9]

- i) if the plate is at rest;
- ii) if the plate is moving in the same direction as the jet with a velocity of 8 m/s.

Also find the work done per second on the plate and the efficiency of the jet when the plate is moving.

b) Show that the maximum efficiency is 100%, when a jet strikes on series of frictionless semicircular moving curved vane fixed around the circumference of a wheel. [8]

Q5) a) What are operating characteristic curves of a turbine? How do they differ from main characteristic curves? [8]

b) A Pelton wheel develops 10,000 kW, under a head of 350 m with an overall efficiency of 85% when revolving under a speed of 292 rpm. Find the unit discharge, unit power, and unit speed. If the head on same turbine falls to 260 m, find discharge, power and speed for this head. [10]

OR

Q6) a) A Pelton wheel develops 4000 kw under a net head of 120 m at a speed of 200 rpm. Assume $C_v = 0.98$, speed ratio = 0.46, efficiency = 80 % and the jet diameter ratio = 1/9. Determine i) the flow required, ii) the diameter of the wheel, iii) the diameter and number of jets required. [10]

- b) A model of Francis turbine is prepared to a scale of 1:6 and is tested under a head of 6 m. The model generates 0.215 kW power when running at 1232 rpm. What will be the speed and power generated by the prototype when working under a head of 80 m? [8]

Q7) a) Differentiate between a single stage and multistage pump. Describe multistage pumps with impellers in series and parallel. [8]

- b) A centrifugal pump running at 1455 rpm discharges 115 lit/s against a head of 25 m. If the diameter of the impeller is 250 mm and its width is 50 mm, find the vane angle at the outer periphery. The manometric efficiency of the pump is 75%. [9]

OR

Q8) a) Draw a neat sketch of centrifugal pump. Explain function of each component. [8]

- b) The inlet and outlet blade angles of the impeller of centrifugal pump are 60° and 40° respectively. The width of the impeller is 30 mm. The inlet and outlet diameters of the impeller are 180 mm and 600 mm respectively. Find the speed of the pump to deliver $0.15 \text{ m}^3/\text{s}$ of water. Flow at inlet is entirely radial. Find also the head generated by the impeller and the manometric head and the impeller power. The manometric efficiency of the pump is 85%. [9]



Total No. of Questions : 8]

SEAT No. :

P722

[Total No. of Pages : 2

[5870]-1006

T.E. (Civil Engineering)

RESEARCH METHODOLOGY AND IPR (Elective - I)

(2019 Pattern) (Semester - I) (301005b)

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 and Q.7 or Q8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right bracket indicate full marks.
- 4) Assume suitable data, if necessary and clearly state.

Q1) a) Define the term ‘Data’, How it is different from ‘facts’ and ‘scores’? [9]

b) Why is the data edited? Also list the various steps in the processing of data. [9]

OR

Q2) a) Indicate the need for data collection and describe the nature of data. [9]

b) Explain how would researcher work out the following statistical measures which often used? [9]

- i) Coefficient of variation;
- ii) Arithmetic average;
- iii) Coefficient of skewness;
- iv) Regression equation of X on Y;

Q3) a) Describe the precautions that the researcher should take while interpreting his findings. [8]

b) Explain essential features of report writing highlighting the importance and implication of research outcomes. [9]

P.T.O.

OR

- Q4)** a) Describe the qualitative and quantitative data interpretation methods. [8]
b) Discuss the guidelines of oral presentation of a research report. [9]

- Q5)** a) How does WIPO promote the protection of intellectual property? [8]
b) Outline the main differences between utility models and patents. Does India have legislation on Utility models? [9]

OR

- Q6)** a) What are the basic principles of international Intellectual Property protection? [8]
b) What is Intellectual Property Rights (IPR)? What are the different types of IPR, explain who is benefitted from each type of IPR and how? [9]

- Q7)** a) Comment on the Patent Act 1970 and its amendment. Explain in brief the Patent filing procedure. What are the differences between Product Patents and Process Patents? [9]
b) Define Industrial Design and discuss the need to protect it as an intellectual property. [9]

OR

- Q8)** a) Describe Copyright and the works protected under copyright act. Briefly explain the process of obtaining copyright. [9]
b) Define Patentability? Explain the utility of patents. [9]



Total No. of Questions : 8]

SEAT No. :

P723

[Total No. of Pages : 2

[5870]-1007

T.E. (Civil Engineering)

CONSTRUCTION MANAGEMENT

(2019 Pattern) (Semester - I) (Elective - I) (301005C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer any one from questions 1 or 2, 3 or 4, 5 or 6, 7 or 8.*
- 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 Working capital? Explain in detail. [6]

b) Explain Minimum Wages act 1948 and its importance. [6]

c) Explain the need and importance of labor laws in construction sector. [6]

OR

Q2) a) Write short note on Project balance sheet. [6]

b) Explain Workman compensation Act 1923 and its importance. [6]

c) Write short note on Profit loss account statement. [6]

Q3) a) Explain Value engineering along with its applications. [6]

b) Explain the importance of insurance in risk management. [6]

c) Explain Sensitivity analysis. [5]

OR

P.T.O.

- Q4)** a) Explain decision tree analysis, simulation analysis. [6]
b) What is energy cost escalation? Comment on impacts of energy cost escalation on infrastructure projects. [6]
c) What are the principals of risk management? [5]

- Q5)** a) Explain the role of material management in construction management. [6]
b) Explain Codification and classification in material management. [6]
c) Explain the concepts of logistics and supply chain management. [6]

OR

- Q6)** a) Explain the role of ERP in material management. [6]
b) Write short note on EOQ and inventory control methods. [6]
c) Explain the role and responsibility of material manager. [6]

- Q7)** a) Write short note on Fuzzy logic and Genetic algorithm. [6]
b) Write short note on performance evaluation and appraisal. [6]
c) Write short note on Human resource information system. [5]

OR

- Q8)** a) Explain the role of ERP in human resource management. [6]
b) What are the applications of ANN in Civil Engineering? [6]
c) Write short note on training and development. [5]



Total No. of Questions : 8]

SEAT No. :

P724

[Total No. of Pages : 2

[5870]-1008

T.E. (Civil)

**Elective - I: ADVANCED CONCRETE TECHNOLOGY
(2019 Pattern) (Semester - I) (301005D)**

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) Neat diagrams must be drawn wherever necessary.

Q1) a) What are air entraining admixtures? How do they improve the workability? [9]

b) What are corrosion inhibiting admixtures? [9]

OR

Q2) a) Explain polycarboxylate based admixtures. [9]
b) Explain naphthalene based admixtures. [9]

Q3) a) What are hybrid fiber blends? How do they improve the performance of concrete? [8]

b) What are the types of steeel fibers? Explain their applications. [9]

OR

Q4) a) What are synthetic fibers? Explain using appropriate examples. [8]
b) How do steel fibers affect the fresh properties of concrete? [9]

Q5) a) How can plastic shrinkage be minimized? [9]
b) Explain the mechanism involved in autogenous shrinkage. [9]

P.T.O.

OR

- Q6)** a) What are the transport properties of concrete? [9]
b) Explain carbonation in concrete. [9]

- Q7)** a) Explain the working of ultrasonic pulse velocity meter. [8]
b) What is corrosion? How is it measured? [9]

OR

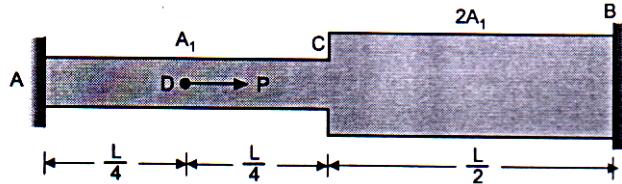
- Q8)** a) What are concrete cores? How are they extracted? [8]
b) Explain the permeability test on concrete. [9]



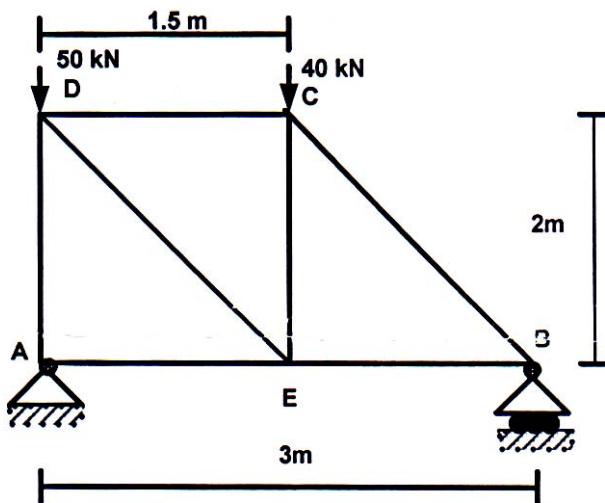
[5870]-1009**T.E. (Civil)****MATRIX METHODS OF STRUCTURAL ANALYSIS****(2019 Pattern) (Semester - I) (Elective - I) (301005e)****Time : 2½ Hours]****[Max. Marks : 70****Instructions to the candidates :**

- 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) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Develop the stiffness matrix [S], force matrix [A] and displacement matrix [D] for the bar shown in the figure. Write the equilibrium equation in form $A = SD$. [9]

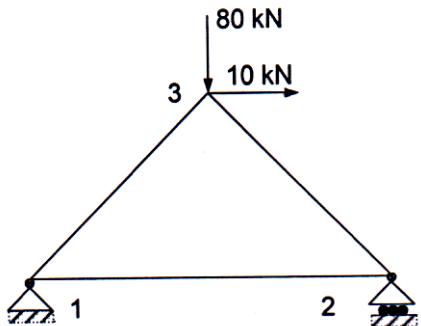


- b) Develop the member stiffness matrix for member AD, ED and CD for the truss shown in figure. Take $AE = 5000 \text{ kN}$ for all the bars. Write the force vector and the displacement vector in form of known and unknown quantities. [9]

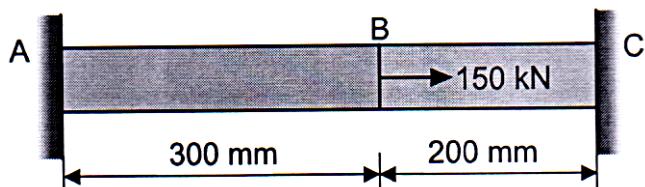
**P.T.O.**

OR

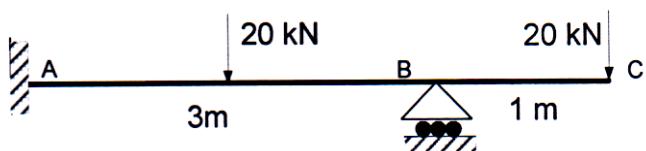
- Q2)** a) For the given truss having equilateral triangular shape, derive the global stiffness matrix using direct stiffness matrix. Length of the member = L, area = A and Young's modulus of elasticity = E. [9]



- b) A square bar of 20 mm side is held between two rigid supports and loaded as shown in Figure. Find the reactions at the supports A and C and the extension of portion AB. Assume $E = 200 \text{ GPa}$. Use stiffness matrix approach. [9]



- Q3)** a) A beam AC with overhang of 1 m is loaded and supported as shown in figure. Using member stiffness approach of matrix method of analysis, determine the rotations at B and C. The 20 kN load is acting at the centre of span AB and at the free end of span BC. [8]

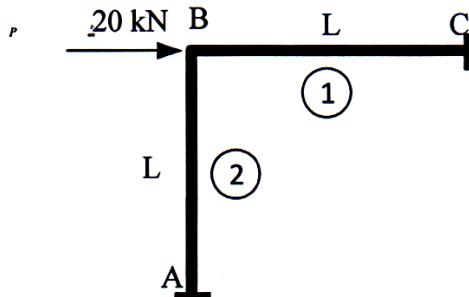


- b) Explain the significance of transformation matrix. Derive the standard transformation matrix of plane frame element. [9]

OR

- Q4)** a) For the frame shown in the figure, determine the member stiffness matrix $[Sm]G$ in global coordinates for element 1 of the frame shown in figure. [8]

Take $E = 200 \text{ GPa}$, $A = 0.04 \text{ m}^2$, $I = 0.0004 \text{ m}^4$, $L = 3.5 \text{ m}$.



- b) Derive the standard stiffness matrix of beam element. [9]

- Q5)** a) Explain the significance of transformation matrix for grid element. Derive the standard transformation matrix of grid element. [9]

- b) Derive the local stiffness matrix for a grid member having the following details. Take $G = 70 \text{ GPa}$, $A = 0.04 \text{ m}^2$, $I = 0.0004 \text{ m}^4$, $L = 3.5 \text{ m}$. [9]

OR

- Q6)** a) Derive the standard stiffness matrix of grid element. [9]

- b) Derive the transformation matrix for a grid member having its local axis inclined at an angle of 45 degree with the global x axis and having the following details. [9]

Take $G = 70 \text{ GPa}$, $A = 0.04 \text{ m}^2$, $I = 0.0004 \text{ m}^4$, $L = 3.5 \text{ m}$.

- Q7)** a) Write the computer algorithm and flowcharts for generating the global/structure stiffness matrices for bar. [8]

- b) For a space frame member, develop the member stiffness matrix with proper sketches. [9]

OR

- Q8)** a) Derive the local member stiffness matrix and transformation matrix for space truss member. [8]

- b) Write the flowchart showing the generation of the global stiffness matrix for a plane frame member. [9]



Total No. of Questions : 8]

SEAT No. :

P726

[Total No. of Pages : 3

[5870]-1010

T.E. (Civil)

Elective - I: ADVANCED MECHANICS OF STRUCTURES
(2019 Pattern) (Semester - I) (301005f)

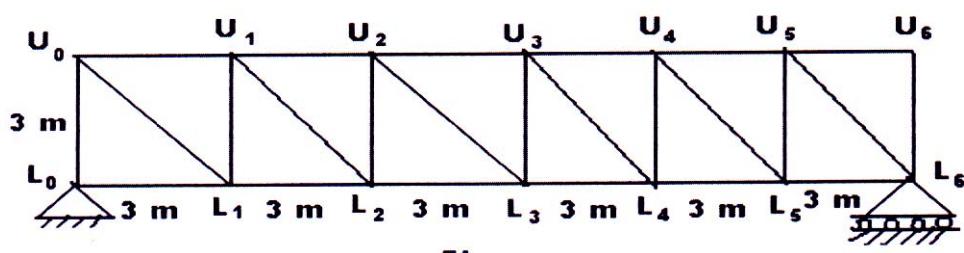
Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicates full marks.
- 4) Assume suitable data, if necessary and clearly state.
- 5) Use of cell phone is prohibited in the examination hall.
- 6) Use of electronic pocket calculator is allowed.

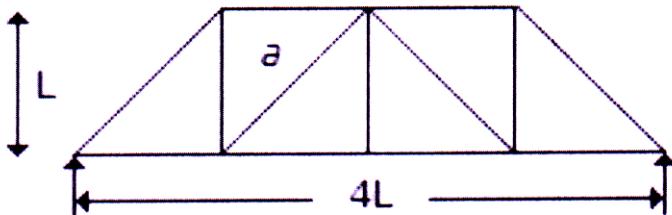
- Q1)** a) Two point loads of 100 kN and 200 kN spaced 3m apart cross a girder of span 12m from left to right with the 100 kN leading. Draw the ILD for shear force and bending moment and find the values of maximum shear force and bending moment at a section 4m from the left hand support. Also evaluate the absolute maximum bending moment due to the given loading system. [12]
- b) Draw the ILD for the forces in members, U_2L_2 and U_2L_3 of the truss shown in figure. [6]



OR

P.T.O.

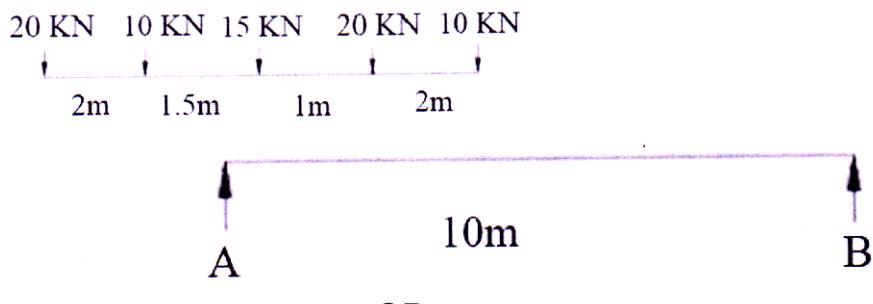
- Q2)** a) Draw the influence line diagram for the force in member 'a' of the truss shown in figure. [6]



- b) A simply supported beam has a span of 16m is subjected to a UDL (dead load) of 5 kN/m and a UDL (live load) of 8 kN/m (longer than the span) traveling from left to right. Draw the ILD for shear force and bending moment at a section 4m from the left end. Use these diagrams to determine the maximum shear force and bending moment at this section. [12]

- Q3)** a) A truck with axle loads of 40 kN and 60 kN on a wheel base of 5m rolls across a 10m span. Compute the maximum bending moment and the maximum shearing force. [7]

- b) A system of concentrated load shown in figure, role beam left to right, S.S. beam span of 10m and 10 kN load leading. Find Absolute max+ve S.F, Absolute max-ve S.F and Absolute max BM. [10]



OR

- Q4)** a) A train of 5 wheel loads crosses a simply supported beam of span 22.5m. Using influence lines, calculate the maximum positive and negative shear forces at mid span and absolute maximum bending moment anywhere in the span. [7]

- b) A single rolling load of 100 kN moves on a girder of span 20m.
 (i) Construct the influence lines for (1) shear force and (1) bending moment for a section 5m from the left support. (ii) Construct the influence lines for points at which the maximum shears and maximum bending moment develop. Determine these values. [10]

- Q5)** a) Explain stresses in curved beam. [9]
b) Difference between a straight beam and a curved beam. [9]

OR

- Q6)** a) Explain Winkler-Bach theory. [8]
b) Why stress concentration occur at inner side or concave side of curved beam. [10]

- Q7)** a) Derive the expression for the horizontal thrust in a three hinged parabolic arch carrying UDL over entire span. [9]
b) Find the maximum bending moment at a section 30m from the left end of the three hinged stiffening girder of span 100m when a UDL of 10 kN/m, 5m length crosses the girder. [8]

OR

- Q8)** a) Which theorem is utilized in solving the two hinged arch? State the theorem. What is a three hinged arch and two hinged arch. [8]
b) Derive the expression for the horizontal thrust when the two hinged arch is subjected to uniformly distributed load throughout the span. [9]



Total No. of Questions : 8]

SEAT No. :

P727

[Total No. of Pages : 3

[5870]-1011

T.E. (Civil)

**WASTE WATER ENGINEERING
(301012) (2019 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, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of scientific calculators is allowed.

Q1) a) Explain the purpose of biological treatment of wastewater? [4]

b) Explain the term Aeration period (H.R.T.), Volumetric BOD loading, F/M Ratio, Sludge age in detail. [7]

c) An average operating data for activated sludge treatment plant is as follows [7]

- i) Wastewater flow = 35000 m³/day
- ii) Volume of aeration tank = 10900 m³
- iii) Influent BOD = 250 mg/lit
- iv) Effluent BOD = 20 mg/lit
- v) MLSS = 2500 mg/lit
- vi) Effluent suspended solids = 30 mg/lit
- vii) Waste sludge suspended solids = 9700mg/lit
- viii) Quantity of waste sludge = 220 m³/day

Calculate

- 1) Aeration period (hrs)
- 2) F/M ratio
- 3) % efficiency of BOD removal
- 4) Sludge age (days)

P.T.O.

OR

- Q2)** a) Explain difference between suspended growth and attached growth process. [4]
- b) Draw flow diagram of activated sludge process and explain its working. [7]
- c) An average operating data for conventional activated sludge treatment is as follows. [7]
- Wastewater flow 20500 m³/d
 - Volume of aeration tank - 3500 m³
 - Influent BOD - 300 mg/lit
 - BOD removal from primary sedimentation tank - 30%
 - Effluent BOD - 10 mg/lit, mixed liquor suspended solids - 2500 mg/lit. Determine aeration period (hrs), food to microorganism ratio, percentage efficiency of BOD removal.

- Q3)** a) Explain the aerated lagoon with respect to its working principle and applications. [3]
- b) Design an oxidation pond for treating sewage from residential colony with 5000 persons, contributing sewage @ 120 lit per capita per day. The 5-day BOD of sewage is 300 mg/lit. [7]
- c) Explain the construction and working of oxidation pond with neat labeled sketch. [7]

OR

- Q4)** a) What is phytoremediation and root zone technology? [3]
- b) Explain the construction and working of Trickling filter with labeled sketch. [7]
- c) Determine the size of High-Rate Trickling Filter for the following data. [7]
- Sewage flow = 4.5 MLD
 - Recirculation ratio (R/I) = 1.5
 - BOD of raw sewage = 250 mg/lit
 - BOD removal in primary sedimentation tank = 30%
 - Final effluent BOD desired = 30 mg/ lit

- Q5)** a) Explain Up-flow anaerobic sludge blanket reactor UASBR with neat sketch. [4]
b) Explain the construction and working of Septic Tank. [7]
c) Design the dimensions of septic tank for small colony of 150 persons provided with an assured water supply from municipal head works at the rate of 120 lit per person per day. Assume suitable data required.[7]

OR

- Q6)** a) Write shorts notes on tretiary treatment of waste water. [4]
b) Explain the working of Sequential batch reactor (SBR) and Moving bed bio reactor (MBBR) in detail. [7]
c) Explain the working of Fluidized membrane bioreactor (FMBR) and membrane bio reactor (MBR) in detail. [7]

- Q7)** a) Write the different techniques for dewatering of sludge? [3]
b) Draw a neat sketch of single stage anaerobic digester and explain its working. [7]
c) Sedimentation tank is treating the flow of 4.5 MLD containing 275 ppm of suspended solids. Tank removes around 50% of suspended solids. Calculate the quantity of sludge produce per day in bulk and weight if [7]
i) Moisture content of the sludge is 98%
ii) Moisture content of the sludge is 96%

OR

- Q8)** a) What are the advantages of grey-water recycling? [3]
b) Explain driving forces for recycling and reuse of waste water. [7]
c) Discuss the reuse opportunities of wastewater in municipal, industrial and agricultural sectors. [7]



Total No. of Questions : 8]

SEAT No. :

P997

[Total No. of Pages : 6

[5870]-1012

T.E. (Civil)

DESIGN OF RC STRUCTURES

(2019 Pattern) (Semester - II) (301013)

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.*
- 2) *Bold figures to the Right indicate full marks.*
- 3) *IS 456-2000 and non programmable calculator are allowed in the examination.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Mere reproduction from IS Code as answer, will not be given full credit.*
- 6) *If necessary, assume suitable data and indicate clearly.*

Q1) a) What is Redistribution of moments and what are advantages of it? **[5]**

b) Design the second flight (midlanding level to first floor level) of a dog legged staircase of public building with the following data: **[13]**

- i) Floor to floor height = 3.3m
- ii) Rise = 150mm; Tread = 300mm; Width of flight = 1.5m
- iii) Width of mid level landing = 1.5m
- iv) width of floor level landing = 1.8m
- v) Width of supporting beams = 300mm
- vi) Supporting beams are provided at the outer edges of both landings
- vii) Material = M30, Fe 500
- viii) Draw details of reinforcement. Use LSM approach.

OR

P.T.O.

Q2) a) Explain the terms bond stress and development length. Calculate development length for 20mm diameter bar in tension by LSM approach. [5]

- i) for M25 concrete and Fe 500 steel.
- ii) for M20 concrete and Fe 250 steel.

b) Cantilever reinforced concrete floor beam with following data : [13]

- i) Center Span of beam = 2.5 m
- ii) Width of supporting columns = 450mm
- iii) Beam width = 230 mm
- iv) The beam is subjected to working dead load of 20 kN/m (including its self-weight) and working live load of 18 kN/m.
- v) Material - M25, Fe 500
- vi) Design longitudinal reinforcement (with curtailment) and shear reinforcement.
- vii) Show details of reinforcement. Use LSM

Q3) Design a continuous beam ABCD for flexure and shear using IS Code method. AB=BC=CD=4.5m. The beam carries dead load of 20 kN/m (including its self-weight) and live load of 12 kN/m. Take material M25 and Fe 500. Show the reinforcement detail in longitudinal section and cross-section at continuous supports and at mid spans. Use LSM. [17]

OR

Q4) Continuous RC beam ABCD of rectangular section is simply supported at A and D and continuous over support B and C. Span AB = 5.0m, BC = 4.0m and CD = 6.0m. The beam carries working dead load of 20 kN/m (including its self-weight) and working live load of 12 kN/m. The beam supports 120mm slab on one side. Calculate design moment for all **spans and supports** after 20% redistribution of moments. Design all spans and supports sections for **flexure only**. Draw the reinforcement details. [17]

Material - Concrete of grade M30, Fe 500 reinforcement.

- Q5)** a) Explain different parameters of interaction curves for the design of column. [5]
- b) Design a uni-axial short column by limit state method with material M25 and Fe 500 to carry a working load of 800 kN, working moment of 60 kN-m about major axis bisecting the depth of column. The unsupported length of column is 4.0m. The column is fixed at both the ends. Show detailed design calculations and reinforcement details. [13]

OR

- Q6)** Design a bi-axial short column by limit state method with material M20 and Fe 500 to carry Ultimate load of 1600 kN. Factored moment of 110 kN-m about major axis bisecting the depth of column and 60 kN-m about minor axis bisecting the width of column. The unsupported length of column is 3.6m. The column is fixed at both the ends. Show details of reinforcement in plan and sectional elevation. [18]
- Q7)** Design an isolated pad footing for a working axial load of 800 kN. Use M25 grade of concrete and Fe 500 grade of steel. SBC of soil is 200 kN/m². Show detailed design calculations and reinforcement details in plan and sectional elevation. [17]

OR

- Q8)** Design a slab type rectangular combined footing for two columns A and B subjected to working axial load 750 kN and 800 kN, respectively. Center to center to distance between two columns is 2.5m. Size of both the columns is 380 × 380mm. Safe bearing capacity of soil is 150kN/m². Use M25 concrete and Fe 500 steel. neglect check for one way shear. [17]

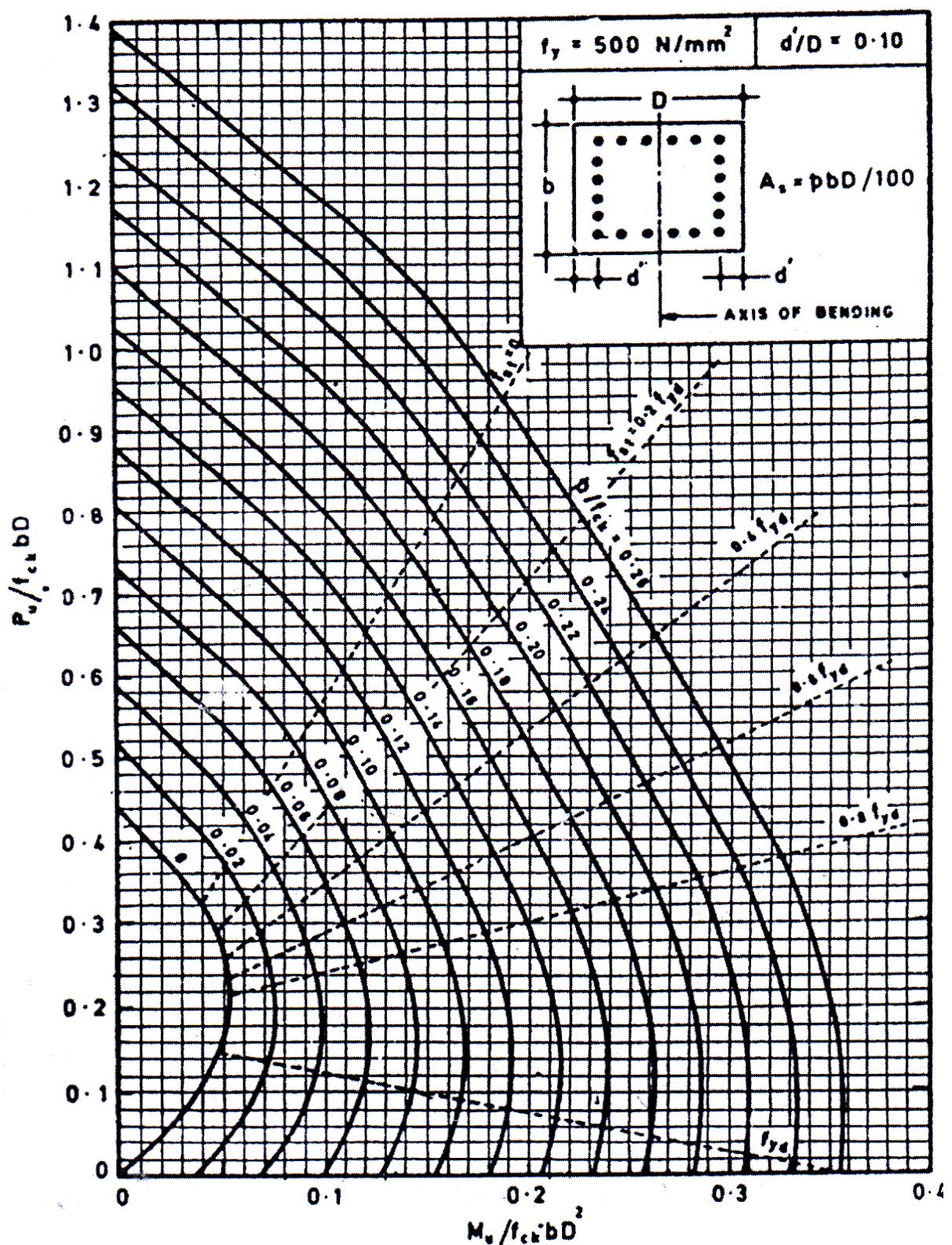


Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

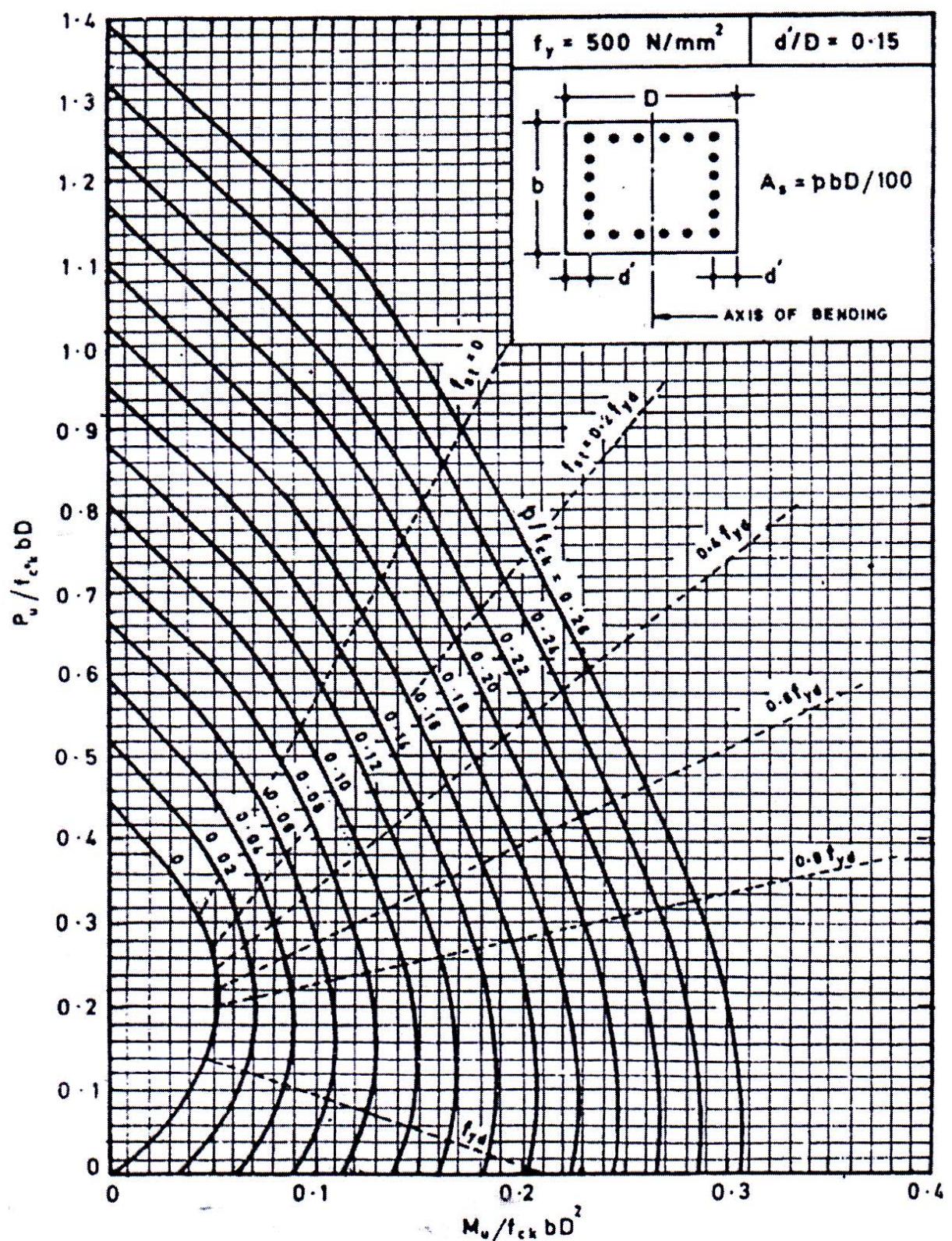


Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

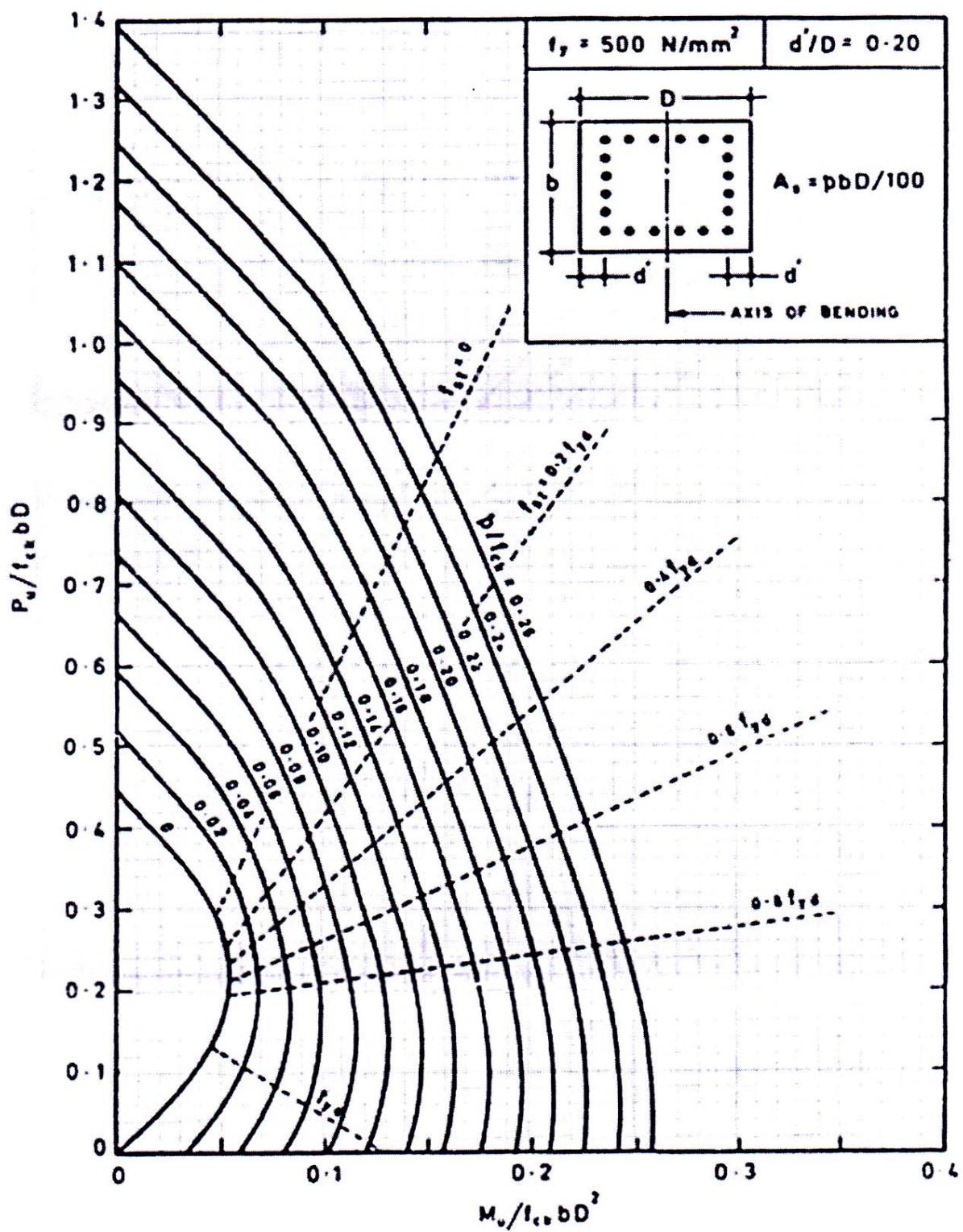


Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides



Total No. of Questions : 8]

SEAT No. :

P728

[Total No. of Pages : 2

[5870]-1013

T.E. (Civil)

**REMOTE SENSING & GEOGRAPHIC INFORMATION
SYSTEM**

(2019 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, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) use of electronic pocket calculator is allowed in the examination.
- 5) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Describe Global Navigation satellite system in detail. [6]
b) Explain the necessity of GNSS in various fields. [6]
c) Compare different GNSS systems throughout the world. [5]

OR

- Q2)** a) Define IRNSS and illustrate its structure. [6]
b) Define DGPS. Write sources of errors of DGPS. [6]
c) Write Advantages of GPS. [5]

- Q3)** a) List the image interpretation keys and explains any two in detail with the help of necessary diagram. [6]
b) Describe digital image classification (supervised & unsupervised). [6]
c) Define Triangular Irregular network Model (TIN) and its applications. [6]

OR

- Q4)** a) What is Digital Image Processing? What are the most common image processing functions. [6]
b) Differentiate between Visual and Digital image interpretation. [6]
c) State the application of DEM. [6]

P.T.O.

- Q5)** a) Write in detail about various components of GIS. [6]
b) Illustrate Cloud computing with types and applications. [6]
c) Define Database? Name the types of data base. [5]

OR

- Q6)** a) Write a note on fundamentals of Cartography and map creation in GIS.[6]
b) Define Geographical Information system and state spatial data types.[6]
c) Enlist the applications of GIS in Civil Engineering & Explain any one in detail. [5]

- Q7)** a) Define Raster and Vector Data types. Explain with neat diagram. [6]
b) Explain the application of GIS in Demarcation of Dam Catchment. [6]
c) What is Georeferencing of GIS data? And explain its importance in the field of GIS? [6]

OR

- Q8)** a) Enumerate different Attribute Data models and explain any one of them. [6]
b) Write GIS data types and its representation. [6]
c) Explain the application of GIS in Urban Planning. [6]



Total No. of Questions : 8]

SEAT No. :

P729

[Total No. of Pages : 2

[5870]-1014

T.E. (Civil)

**ADVANCED ENGINEERING GEOLOGY WITH ROCK
MECHANICS**

(2019 Pattern) (Elective - II) (Semester - II) (301015A)

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) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Write a note on amygdaloidal basalt as construction material. [6]
b) Explain in detail the role of geology in Urban development and planning. [6]
c) What is R.I.S.? Explain R.I.S. with case study, in Deccan Trap area. [6]

OR

- Q2)** a) What are favorable conditions/characteristics of the rock for the purpose of construction material? [6]
b) Write in detail on treatments given to fracture/fracture zone. [6]
c) Explain case studies of historical buildings constructed without consideration of geology and now facing serious problems. [6]

- Q3)** a) Define rock mechanics. Explain the importance of it in civil engineering. [6]
b) Calculate RQD recovery and Core recovery from following table. [6]

Run in m	Piece No.	Length in cm	Nature of fracture
3-6 m	1	13	J
	2	10	J
	3	90	M
	4	45	M
	5	50	M
	6	13	J
	7	50	J
	8	6	J
	9	8	J
6-9 m	10	120	M
	11	70	M
	12	90	M
	13	10	M

P.T.O.

- c) Calculate apparent resistivity values at different depth zones. [6]

Sr. No	R	A	apparent resistivity
1	1.80	1	?
2	1.76	2	?
3	1.57	3	?
4	1.42	4	?
5	1.29	5	?
6	1.10	10	?

OR

- Q4)** a) Describe Q-system of classification of rock masses. [6]
 b) What is R.Q.D.? Is this system useful for Deccan trap rocks? Explain. [6]
 c) What is electrical Resistivity method of Geophysical Exploration? Explain Wenner method. [6]

- Q5)** a) Write case study illustrating the failure of major projects owing to negligence of geological studies. [6]
 b) Explain treatment to be given to a dyke crossing dam alignment. [6]
 c) What are the reasons of tail channel erosion in Deccan Trap area? [5]

OR

- Q6)** a) Write a note on suitability of amygdaloidal basalt for percolation tank. [6]
 b) Discuss relationship between local Geology and location of Spillway in Deccan Trap. [6]
 c) Discuss the strength and water tightness characters of Amygdaloidal Basalt from dam foundation point of view. [5]

- Q7)** a) Describe various unfavorable field characters of rocks during tunneling. [6]
 b) Whether the tunnels are suitable through limestone and quartzite. [6]
 c) Explain in brief safe bearing capacity during bridge construction. [5]

OR

- Q8)** a) Can we locate a pier of bridge partly on weathered rock and on dyke? [6]
 b) Discuss with suitable examples suitability of compact basalts from tunneling point of view. [6]
 c) Explain in detail engineering geological investigations for tunneling. [5]



Total No. of Questions : 8]

SEAT No. :

P730

[Total No. of Pages : 3

[5870]-1015

T.E. (Civil)

SOFT COMPUTING TECHNIQUES

(2019 Pattern) (Elective - II) (Semester - II) (301015b)

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) Figures to the right side indicate full marks.
- 3) Your answers will be valued as a whole.
- 4) Assume suitable data, if necessary.

Q1) a) Discuss various statistical parameters for model evaluation. [9]

b) Determine the functional value of the $3 \times 2 \times 1$ neural network in forward pass with the following data. Inputs [6, 6, 8], First layer weights (input to hidden): [0.4 – 0.5 0.6; –0.3 0.8 – 0.7], First layer bias: [3; –3.7], Second layer weights (hidden layer to output layer): [0.35 0.55], Second layer bias: [2]. Use sigmoidal transfer function between the first layer and hidden layer and Linear function between the hidden layer and output layer. [9]

OR

Q2) a) Explain validation of data, data division and overfitting. Discuss Data preprocessing. [9]

b) Determine the functional value of the $3 \times 2 \times 1$ neural network in forward pass with the following data. Inputs [6, 6, 8], First layer weights (input to hidden): [0.4 – 0.5 0.6; –0.3 0.8 – 0.7], First layer bias: [3; –3.7], Second layer weights (hidden layer to output layer): [0.35 0.55], Second layer bias: [2]. Use sigmoidal transfer function between the first layer and hidden layer and hyperbolic tangent function between the hidden layer and output layer. [9]

P.T.O.

Q3) a) Distinguish between Recurrent networks and generalized regression neural networks with suitable example for each. [8]

b) The power developed by a water turbine(P) depends upon the rotational speed N, Operating head(H), Gravitational acceleration(g), diameter(D) and breath(B) of the runner, density(ρ) and viscosity(μ) of water. Design a 3 layered neural network using the above parameters and give the following details : [9]

- i) Input and output parameters
- ii) Architecture with figure
- iii) Size of weight and Bias matrix
- iv) Activation function/s between layers
- v) Performance function/s

OR

Q4) a) Discuss working of self-organized feature maps with a suitable example. [8]

b) 28-day Compressive strength of concrete (in MPa) depends on the quantity (in Kg/m³) of Cement, Fine aggregate, coarse aggregate and water. Design a neural network using the above parameters and give the following details : [9]

- i) Input and output parameters
- ii) Architecture with figure
- iii) Size of weight and Bias matrix
- iv) Activation function/s between layers
- v) Performance function/s

Q5) a) Discuss in detail an application fo Genetic algorithm in Civil Engineering. [9]

b) Discuss the basic principle of Support Vector Regression. What do you mean by generalization error in terms of the SVM? [9]

OR

Q6) a) Discuss the Genetic operators in Genetic algorithm in detail. [9]

b) Explain the basic principle of Support vector Machine. What are hard margin and soft Margin SVMs? [9]

Q7) a) Discuss working of Random Forest and Feature importance in a random forest. [8]

b) The power developed by a water turbine(P) depends upon the rotational speed N, Operating head(H), Gravitational acceleration(g), diameter(D) and breadth(B) of the runner, density(ρ) and viscosity(μ) of water. Design a Model using Random Forest using the above parameters and give the following details : [9]

- i) Input and output parameters
- ii) No. of trees
- iii) Data division
- iv) Out of bag estimates
- v) Performance function

OR

Q8) a) Discuss working of Model Tree with M5 Algorithm. Explain Out of Bag estimate in Random Forest. [8]

b) 28-day Compressive strength of concrete (in-MPa) depends on the quantity (in Kg/m³) of Cement, Fine aggregate, coarse aggregate and water. Design a model using Model Tree, using the above parameters and give the following details : [9]

- i) Input and output parameters
- ii) No. of rules
- iii) Splitting criteria
- iv) Standardization of data
- v) Performance function/s



Total No. of Questions : 8]

SEAT No. :

P731

[Total No. of Pages : 2

[5870]-1016

T.E. (Civil)

ADVANCED SURVEYING (ELECTIVE - II)
(2019 Pattern) (Semester - II) (301015c)

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.
- 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) Determine the azimuth and altitude of a star from the following data: [6]

Declination of star = $20^{\circ}30'N$ Hour angle of star = $42^{\circ}6'$

Latitude of observer = $50^{\circ}N$

- b) Explain the method of locating soundings. [4]
c) Explain the analytical method of determining the position of boat in hydrographic surveying. [8]

OR

Q2) a) Mention the properties of spherical triangle. [6]

b) What are tides? Explain the weight gauge. [4]

c) In order to locate the position of boat, observations were made with a sextant to three points A, B and C on shore. The angles AOB and BOC were found to be $50^{\circ}56'$ and $27^{\circ}23'$ respectively. From the map, AB was scaled as 394 m and BC as 198 m while the angle ABC measured $163^{\circ}18'$. What were the distances of O from A, B & C respectively? [8]

Q3) a) Define relief displacement. Derive an expression for the same. [6]

b) Define vertical photograph, tilted photograph and oblique photograph. [5]

c) The scale of an aerial photograph is $1\text{ cm} = 160\text{ m}$ & the size of the photograph is $20\text{ cm} \times 20\text{ cm}$. If the longitudinal overlap is 65% and side overlap is 35%, determine the number of photographs required to cover an area of 232 sq. Km. [6]

P.T.O.

OR

- Q4)** a) What are the applications of photogrammetry? Explain any one of them in detail. [6]

- b) Define perspective projection, nadir point and tilt. [5]

- c) Determine the minimum number of aerial photographs required to cover an area of $40\text{ km} \times 30\text{ km}$, with the following details: [6]

Size of an aerial photograph = $23\text{ cm} \times 23\text{ m}$

Scale of aerial photograph: $1\text{ cm} = 150\text{ m}$

Longitudinal overlap = 60%

Side overlap = 30%

- Q5)** a) Explain the components of ideal remote sensing system. [5]

- b) Describe the working principle of electronic total station. [8]

- c) Enlist and explain the advantages of LIDAR technology. [5]

OR

- Q6)** a) Explain the components of GIS. [5]

- b) Explain the salient features of Electronic total station. [8]

- c) Explain the interaction of electromagnetic energy with the earth's surface. [5]

- Q7)** a) Explain the working principle of GPS. What are the differences between hand held GPS and differential GPS. [9]

- b) Explain differential GPS survey. [8]

OR

- Q8)** a) Explain the basic principle of GPS and its applications in Civil Engineering. [9]

- b) Explain digital terrain modelling. [8]



[5870]-1017**T.E. (Civil)**

ADVANCED GEOTECHNICAL ENGINEERING
(2019 Pattern) (Semester - II) (Elective - II) (301015d)

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

Q1) a) Differentiate between unconsolidated drained test and a drained test. Under what conditions are these test results used for design purposes? [6]

- b) Write a note on :
- i) Consolidated drained strength from direct shear test
 - ii) Parameters affecting pore water pressure
- c) Explain factors affecting shearing resistance. [6]

OR

Q2) a) Explain the shear characteristics of sand and normally loaded clay. [6]

- b) What is the effect of pore pressure in strength of soils? [6]
- c) A cylindrical specimen of a saturated soil fails under an axial stress 100 km/m² in an unconfined compression test. The failure plane makes an angle of 40° with the horizontal. Calculate the cohesion and angle of internal friction of the soil. [6]

Q3) a) Drained triaxial compression test results are given below. Plot the stress path in $\sigma_a - \sigma_r$. [6]

σ_1 (kPa)	σ_3 (kPa)	u (kPa)
300		
400		
500	300	100
565		
590		

- b) Draw and explain the stress path (t-s.s') for stress produced below foundation due to undrained loading. [6]
- c) What is stress path? state the factors influencing the stress path. [5]

OR

- Q4)** a) Undrained triaxial compression test results are given below. Plot the stress path in $\sigma_a - \sigma_r$. [6]

σ_1 (kPa)	σ_3 (kPa)	u (kPa)
300		100
350		165
380	300	200
396		224
398		332

- b) Draw and explain the stress path ($t - s, s'$) for stress changes near retaining wall. [6]
c) State and explain the variants of MIT plot. [5]

- Q5)** a) What do you mean by soil stabilization? Explain the principle and mechanism of lime stabilization. [6]
b) Explain in detail mechanical stabilization of soils. [6]
c) Explain how the engineering properties of soils are changed by the process of bituminous stabilization. [6]

OR

- Q6)** a) What is the need for stabilization of expansive soils? [6]
b) Discuss the mechanisms of Bituminous stabilization of in-situ soils. [6]
c) Discuss cement and lime stabilization along with its merits and demerits. [6]

- Q7)** a) What is the purpose of sand drain? Also explain functions of vertical sand drain. [6]
b) State the procedure of vibro-flotation technique for ground improvement. [6]
c) Discuss various grouting techniques with their suitability. [5]

OR

- Q8)** a) Explain the steps for vibro-flotation with inserting reinforcement with neat sketch. [6]
b) Explain in detail technique of deep mixing. [6]
c) Discuss any three methods of soil improvement. [5]



Total No. of Questions : 8]

SEAT No. :

P733

[Total No. of Pages : 2

[5870]-1018

T.E. (Civil)

ARCHITECTURE AND TOWN PLANNING

(2019 Pattern) (Elective - II) (Semester - II) (301015e)

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) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Write a brief note on T P Scheme (Sketch is essential). [9]
b) Explain different planning approaches dealt with Neighbourhood with suitable example. [9]

OR

- Q2)** a) Elaborate MRTP Act 1966 in relation with its importance, objectives and chapter wise contents of the same. [9]
b) Mention the steps involved while preparing DP. What are the expected outcomes of DP? [9]

- Q3)** a) Enlist the surveys carried out in relation with a mention of planning level and explain the civic surveys for DP and mention the importance of it. [9]

- b) Draw and explain the organizational structure and responsibilities of different departments of MHADA. [8]

OR

- Q4)** a) Draw and explain the organizational structure and responsibilities of different departments of CIDCO. [8]
b) Write an explanatory note on ITS. (sketch it) [9]

- Q5)** a) What is the use of URDPFI guidelines? What details are mentioned? [9]
b) Write a note on LARR Act with calculations in Rural and Urban areas. [9]

P.T.O.

OR

- Q6)** a) Write an explanatory note on RERA with expected benefits in real estate world. [9]
b) Write an explanatory note on AMRUT guidelines with a mention of case study. [9]

- Q7)** a) Write a detailed note on Special Township with a mention of a case study details. [9]
b) Write an explanatory note on CRZ (sketch is essential). [8]

OR

- Q8)** a) Elaborate the need and strategies in relation with, "Rural development".[9]
b) Mention various applications of each of the following in town planning:
GIS, GPS (Sketches are essential) [8]



Total No. of Questions : 8]

SEAT No. :

P734

[Total No. of Pages : 2

[5870]-1019

T.E. (Civil)

Solid Waste Management

(2019 Pattern) (Elective - II) (Semester - II) (301015F)

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

- Q1)** a) Suggest and justify the criteria adopted for the execution of vermicomposting. [6]
b) Explain with sketch the Bangalore Method of composting. [6]
c) State the terms related to Solid waste management [6]
 i) Segregation
 ii) Recovery
 iii) Recycling

OR

- Q2)** a) Write a note on material recovery facility. [6]
b) Specify the role of transfer station in municipal solid waste management. [6]
c) Explain integrated waste management. [6]

- Q3)** a) What are the factors affecting anaerobic digestion? [6]
b) Write environmental impacts of waste to energy system. [6]
c) What are the different types of incinerators? Explain any one. [5]

OR

- Q4)** a) Describe the incineration technologies and air emissions and its control in detail. Explain the following: [6]
 i) Pyrolysis

P.T.O.

- ii) Refuse derived fuel
- iii) Bio gasification
- b) How to estimate of low and high heating value of any material. [6]
- c) Write working principle, advantages and disadvantages of anaerobic digestion process. [5]

- Q5)** a) Write short note on legacy waste management. [6]
 b) Write methods of slope stability analysis. [6]
 c) Describe the factors which affect production of leachate and landfill gas in the landfill? [6]

OR

- Q6)** a) What is engineered landfill? Why it is essential? Explain in brief different methods of landfilling. [6]
 b) Enlist methods of Biomining and explain any one method of it. [6]
 c) Identify the adverse effects of a landfill leachate and list appropriate control measures? [6]

- Q7)** a) Suggest the appropriate method for disposal of industrial solid waste and need of its recycling. [6]
 b) Write objectives and major provision in construction and demolition (C&D) waste management rules - 2016. [6]
 c) Suggest various management technologies for biomedical waste. [5]

OR

- Q8)** a) Explain any one case study of material recovered from e-waste. [6]
 b) Explain any one case study of processing and reuse of construction & demolition waste. [6]
 c) Write objectives and major provision in plastic waste management rules -2016. [5]



Total No. of Questions : 8]

SEAT No. :

P2317

[Total No. of Pages : 3

[5870]-1020

T.E. (Mechanical/Mechanical (Sandwich))

NUMERICAL AND STATISTICAL METHODS

(2019 Pattern) (Semester - I) (302041)

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) *Figures to the right indicate full marks.*
- 3) *Use of scientific calculator is allowed.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) Evaluate formula. $I = \int_0^{0.8} [\log_e(x+1) + \sin(2x)] dx$ by using Gauss-Quadrature two-point. [9]
- b) Draw Flow Chart for Numerical integration using Simpsons 3/8 Method. [8]

OR

- Q2)** a) That table below gives the Velocity v of moving particle at time t seconds. [8]

t	0	2	4	6	8	10	12
v	4	6	16	34	60	94	136

Find the distance covered by particle in 12 seconds using Simpson's 1/3rd rule.

- b) Find double integration of $f(x,y) = 1/(x+y)$

For $x = 2$ to 3.2 and $y = 1$ to 2.8 taking no. of steps in both x and y as $n_x = n_y = 3$. Use Trapezoidal rule. [9]

P.T.O.

Q3) a) Draw Flow Chart for power equation $y = ax^b$ [9]

b) A set of x values and respective y values are given below. Using lagrange inverse interpolation method, find the value of x at $y = 0.42$ [9]

x	10	20	30	40	50
y	0.1105	0.1985	0.2727	0.4101	0.5123

OR

Q4) a) The values of Nusselt numbers (Nu) and Reynold numbers (Re) found experimentally are given below. If the relation between Nu and Re is of the type $Nu = a \cdot Re^b$. Find the values of a and b for the given values of Nu and Re. [9]

2000	2400	2800	3200	3600	4000
13.0102	13.5091	14.0789	14.4192	15.1297	16.7535

b) Draw a flowchart for Lagrange's inverse interpolation. [9]

Q5) a) Define & Explain with example. [8]

- i) Mean
- ii) Median
- iii) Mode
- iv) Standard Deviation

b) Calculate the first four moments about the mean of the given distribution. Find β_1 and β_2 and comment on skewness and kurtosis. [9]

X	5	7	13	24	29	36	40	45	50
f	4	6	17	25	18	12	9	3	2

OR

- Q6)** a) Arithmetic mean and standard deviation of 30 items are 20 and 3 respectively out of these 30 items, item 22 and 15 are dropped. Find new A.M. and S.D. if item 22 is replaced by 8 and 15 is replaced by 17 [9]
- b) Define and explain the following terms : [8]
- Kurtosis
 - Skewness

- Q7)** a) On an average a box containing 10 articles is likely to have 2 defectives. If we consider a consignment of 100 boxes, how many of them are expected to have three or less defectives [9]

$$p = \text{Probability of box containing defective articles} = \frac{2}{10} = \frac{1}{5}$$

$$q = \text{Probability of non-defective items} = \frac{4}{5}$$

- b) What is probability distribution? [9]
 Explain following terms with illustrations :
- Marginal probability distribution
 - Joint probability distribution

OR

- Q8)** a) Describe Binomial poison, normal distribution in details & solve problem.
 In a certain factory turning out razor blades, there is a small chance of 1/500 for any blade to be defective. The blades are supplied in a pocket of 10. Use poisson distribution to calculate the approximate number of packets containing no defective and two defective blades, in a consignment of 10,000 packets. [9]
- b) Describe joint, conditional and marginal probability in details & solve problem A set of five similar coins is tossed 210 times and the result is [9]

No. of Heads	0	1	2	3	4	5
Frequency	2	5	20	60	100	23

Test the hypothesis that the data follow a binomial distribution.



Total No. of Questions : 8]

SEAT No. :

P998

[Total No. of Pages : 3

[5870]-1021

T.E. (Mechanical)

HEAT AND MASS TRANSFER

(2019 Pattern) (Semester - I) (302042)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve 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) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

Q1) a) A vertical plate is maintained at 40°C in 20°C still air. Determine the height at which the boundary layer will turn turbulent if turbulence sets in at A Gr. Pr = 10⁹. Repeat the problem for water flow at film temperature of 30°C. Comment on the results of solution. [9]

- b) Explain in brief (Any two) [8]
- i) Local and average Heat Transfer coefficient
 - ii) Hydrodynamic and Thermalboundary layer
 - iii) Critical Heat Flux
 - iv) Significance of any 2 non dimensionless numbers

OR

Q2) a) Explain the types of boiling and pool boiling phenomenon in detail with neat sketch of boiling curve. [8]

- b) Air at atmospheric pressure and 40°C flows with velocity of U = 5 m/sec over a 2 m long flat plate whose surface is kept at a uniform temperature of 120°C. Determine the average heat transfer coefficient over 2 m length of plate. Also determine the rate of heat transfer between the plate and air per 1 m width of plate (Air at 1 atm. And 80°C, v = 2.107 × 10⁵ m²/sec, k = 0.03025 W/mk, Pr = 0.695). [9]

Q3) a) The energy received from the sun at the earth's atmosphere has been measured as 1353 W/m². The diameter of the earth = 1.29 × 10⁷m. Diameter of the sun = 1.39 × 10⁹ m. Mean distance = 1.5 × 10¹¹m. Estimate the emissive power of the sun and the surface temperature assuming it to be black. Assuming that the source of energy for the earth is from the sun and earth to be black, estimate the temperature of the earth. [8]

P.T.O.

- b) Explain in brief [10]
- Kirchoffs Law
 - Stefan Boltzmann law
 - Wiens Displacement law
 - Shape Factor
 - Electrical analogy for radiation

OR

Q4) a) Two large parallel plates with $\epsilon = 0.5$ each are maintained at different temperatures and are exchanging heat only by radiation. Two equally large radiation shields with surface emissivity 0.05 are introduced in parallel to the plates; find the percentage reduction in net radiative heat transfer.

[10]

- b) Define shape factor algebra and explain any 4 salient features of shape factor. [8]

Q5) a) Explain Fick's law for mass diffusion. [8]

- b) The molecular weights of the two components A and B of a gas mixture are 24 and 28 respectively. The molecular weight of gas mixture is found to be 30. If the mass concentration of the mixture is 1.2 kgm^{-3} , determine the following [9]

- Molar fractions
- Mass fractions
- Total pressure if temperature of mixture is 290K

OR

Q6) a) Explain in brief convective mass transfer and Explain the term conservation of species. [8]

- b) Hydrogen gas is maintained at pressure of 2.4 bars and 1 bar on opposite sides of a plastic membrane 0.3 mm thick. The binary diffusion coefficient for hydrogen in the plastic is $8.6 \times 10^{-8} \text{ m}^2/\text{s}$ and solubility of hydrogen in the membrane is $0.00145 \text{ kg mole/m}^3\text{-bar}$. (molecular weight of hydrogen - 2kg/kg mole)

Calculate under uniform conditions of 24°C , the following: [9]

- Molar concentration of hydrogen at opposite face of membrane
- Molar and mass diffusion of hydrogen through membrane

- Q7)** a) Derive LMTD for parallel flow heat exchanger. [8]
- b) In a double pipe heat exchanger hot water flows at the rate of 5000kg/h and gets cooled from 95°C to 65°C. At the same time 50000kg/h of cooling water at 30°C enters heat exchanger. The flow conditions are such that overall heat transfer coefficient remains constant at 2270 W/m²K. Determine the heat transfer area required and the effectiveness, assuming two streams are in parallel flow. Assume for both the streams $C_p = 4.2 \text{ kJ/kgK}$. [10]

OR

- Q8)** a) Derive LMTD for Counter flow heat exchanger. [8]
- b) A counter flow double pipe heat exchanger uses superheated steam to heat water at the rate of 10500kg/h. The steam enters the heat exchanger at 180°C and leaves at 130°C. The inlet and exit temperatures of water are 30°C and 80°C, If the overall heat transfer coefficient from steam to water is 814 W/m²°C. Calculate the heat transfer area. What would be the increase in area if the fluid passes are in parallel? [10]



[5870]-1022

**T.E. (Mechanical/Mechanical Sandwich)
DESIGN OF MACHINE ELEMENTS
(2019 Pattern) (Semester - I) (302043)**

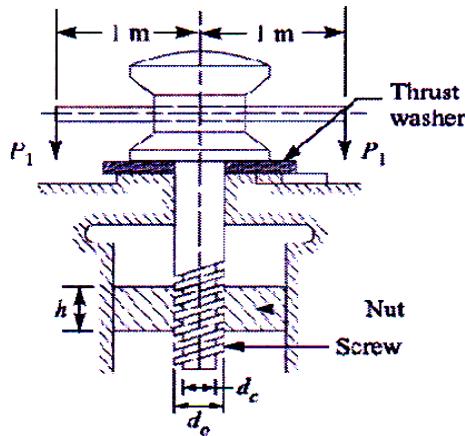
Time : 2½ Hours]**[Max. Marks : 70****Instructions to the candidates:**

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Draw neat labeled diagrams wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable/Standard data if necessary.
- 5) Use of non programmable electronic calculator is permitted.

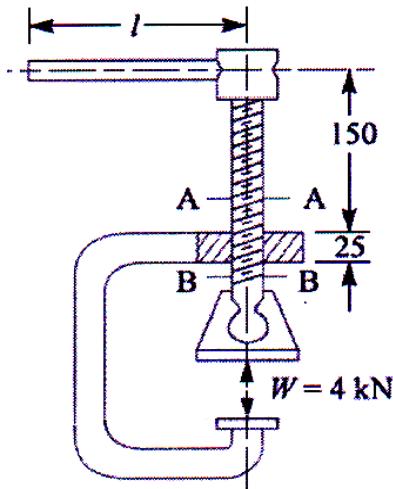
Q1) a) What are the different types of screw threads used for power screw? [4]

b) Derive the expression for the torque required to overcome collar friction. [5]

c) A sluice gate weighing 18 kN is raised and lowered by means of square threaded screws, as shown in Fig. The frictional resistance induced by water pressure against the gate when it is in its lowest position is 4000 N. The outside diameter of the screw is 60 mm and pitch is 10 mm. The outside and inside diameter of washer is 150 mm and 50 mm respectively. The coefficient of friction between the screw and nut is 0.1 and for the washer and seat is 0.12. Find: i) The maximum force to be exerted at the ends of the lever raising and lowering the gate, ii) Efficiency of the arrangement, and iii) Number of threads and height of nut, for an allowable bearing pressure of 7 N/mm². [8]

**OR****P.T.O.**

- Q2)** a) Describe the term: Virtual coefficients of friction. [4]
- b) Explain self-locking and over-hauling property of screw. Prove the condition for screw to be self-locking. [5]
- c) A C-clamp, as shown in Figure, has trapezoidal threads of 12 mm outside diameter and 2 mm pitch. The coefficient of friction for screw threads is 0.12 and for the collar is 0.25. The mean radius of the collar is 6 mm. If the force exerted by the operator at the end of the handle is 80 N, find:
 i) The length of handle;
 ii) The maximum shear stress in the body of the screw and where does this exist; and
 iii) The bearing pressure on the threads. [8]

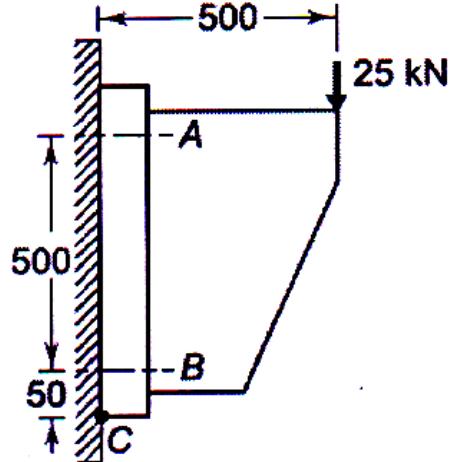


- Q3)** a) Write a short note on; Modified Goodman diagram. [4]
- b) Write a short note on Fatigue Failure. [5]
- c) A spherical pressure vessel, with a 500 mm inner diameter, is welded from steel plates. The welded joints are sufficiently strong and do not weaken the vessel. The plates are made from cold drawn steel 20C8 ($S_{ut} = 440 \text{ N/mm}^2$ and $S_{yt} = 242 \text{ N/mm}^2$). The vessel is subjected to internal pressure, which varies from zero to 6 N/mm². The expected reliability is 50% and the factor of safety is 3.5. The size factor is 0.85. The vessel is expected to withstand infinite number of stress cycles. Calculate the thickness of the plates. Take $K_a = 0.82$, $K_b = 0.85$, $K_c = 1$. [8]

OR

- Q4)** a) Define and explain Notch Sensitivity. [4]
- b) What is the difference between the Gerber curve, Soderberg and Godman lines? [5]
- c) A machine component is subjected to fluctuating stress that varies from 40 to 100N/mm². The corrected endurance limit stress for the machine component is 270 N/mm². The ultimate tensile strength and yield strength of the material are 600 and 450 N/mm² respectively. Find the factor of safety using (i) Gerber theory (ii) Soderberg line (iii) Goodman line Also, find the factor of safety against static failure. [8]

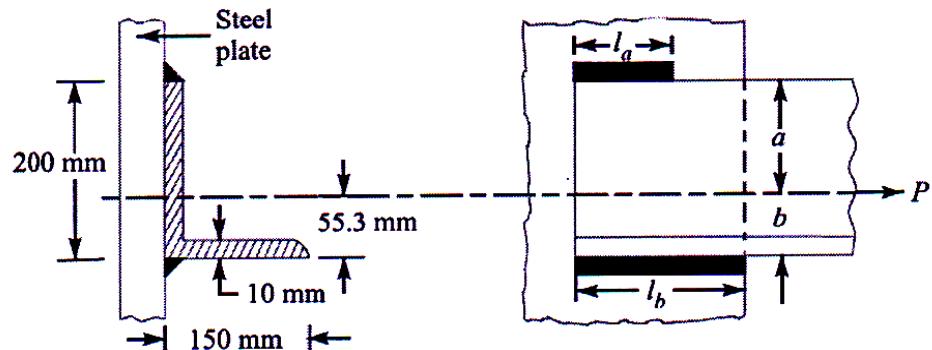
- Q5)** a) What are the assumptions made in the design of welded joint? [4]
- b) Discuss the procedure for designing an eccentric loaded welded joint. [6]
- c) A wall bracket is attached to the wall by means of four identical bolts, two at A and two at B, as shown in Figure. Assuming that the bracket is held against the wall and prevented from tipping about the point C by all four bolts and using an allowable tensile stress in the bolts as 35 N/mm², determine the size of the bolts on the basis of maximum principal stress theory. [8]



OR

- Q6)** a) State the advantages and disadvantages of welded joints. [4]
- b) Explain with neat sketch, following screw fasteners [6]
- i) Through Bolts ii) Tap Bolts iii) Cap Screws

- c) A $200 \times 150 \times 10$ mm angle is to be welded to a steel plate by fillet welds as shown in Figure. If the angle is subjected to a static load of 200 kN, find the length of weld at the top and bottom. The allowable shear stress for static loading may be taken as 75 MPa. [8]



- Q7)** a) Define following terms : [4]
- Solid length
 - Spring index
 - Active and Inactive coils
 - Spring Rate
- b) Explain A.M. Wahl's factor and state its importance in the design of helical springs. [6]
- c) A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 kN/mm², find the axial load which the spring can carry and the deflection per active turn. [8]

OR

- Q8)** a) How will you find whether the given helical spring is a compression spring or tension spring? [4]
- b) Explain with the neat sketch, nipping of leaf spring. [6]
- c) Design a valve spring of a petrol engine for the following operating conditions: Spring load when the valve is open = 400 N; Spring load when the valve is closed = 250 N; Maximum inside diameter of spring = 25 mm; Length of the spring when the valve is open = 40 mm; Length of the spring when the valve is closed = 50 mm; Maximum permissible shear stress 400 MPa. [8]



Total No. of Questions : 8]

SEAT No. :

P2318

[Total No. of Pages : 4

[5870]-1023

**T.E. (Mechanical/Mechanical Sandwich)
MECHATRONICS
(2019 Pattern) (Semester - I) (302044)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to 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. or Q.No.8.
- 2) Figures to the right indicate full marks.
- 3) Use Graph paper for Graphical solution.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Using suitable diagram explain the application of Automotive Engine Management System. [6]
- b) Reduce the block diagram in Fig. (a) And determine the transfer function: $Y(s)/X(s)$. [6]

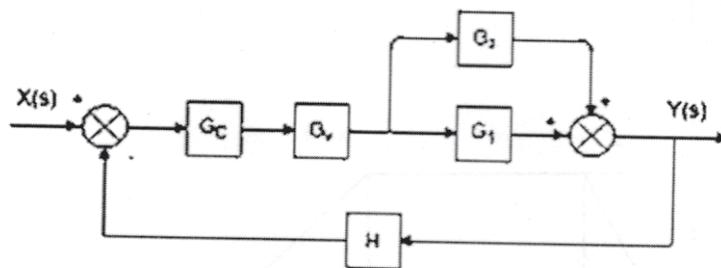


Fig. (a)

- c) Find the poles and zeros of the transfer function
- $$G(S) = \frac{s^2 + 3s + 2}{(s + 4)(s^2 + 6s + 25)}$$
- and sketch pole-zero plot. [6]

OR

P.T.O.

- Q2)** a) Compare open loop and closed loop control system. [6]

b) By using Routh-Hurwitz stability criterion determine the stability of the system represented by the characteristic equation $9S^5 - 20S^4 + 10S^3 - S^2 - 9S - 10 = 0$. Comment on the location of roots of characteristics equation. [6]

c) Define “Transfer Function” and discuss its importance in the context of control of a mechatronic system. [6]

Q3) a) Define the following terms:

i) % Overshoot ii) Steady state errors

- Q3) a)** Define the following terms:

- i) % Overshoot ii) Steady state errors
 iii) Damping Frequency iv) Natural Frequency [8]

- b) Determine the values of delay time, rise time, peak time, settling time and % overshoot when the control system shown in Fig. (b) is subject to a unit step input. [9]

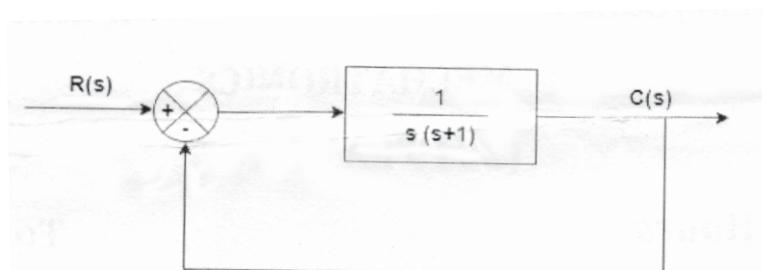


Fig. (b)

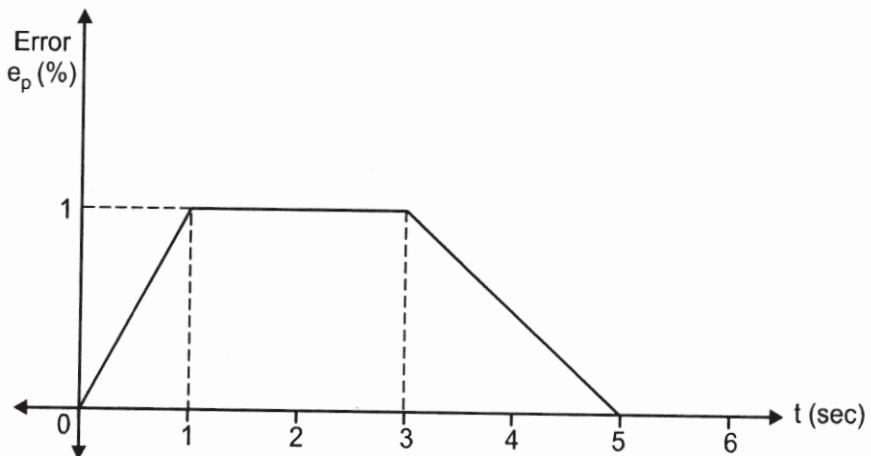
QR

- Q4)** a) Compare time domain and frequency domain techniques for analysis of systems. [8]

b) Write a short note on the following point: [9]

 - i) Gain Margin
 - ii) Phase Margin
 - iii) Bode Plot

- Q5)** a) Using a suitable block diagram explain the working of PID control in parallel form. [8]
 b) Draw the controller response for given error graph as shown in Fig. (c) $K_p = 5$, $K_D = 0.5$ s and $P_o = 20\%$.



[10]

OR

- Q6)** a) Explain Derivation control with a neat diagram and equation. Why derivative controller cannot be used alone? [8]
 b) For a proportional controller, the controller variable is a process temperature with a range of 50°C to 130°C and a set point of 73.5°C . Under nominal conditions, the set point is maintained with an output of 50%. Find the controller output having proportional gain of 2, if the temperature is:
 i) 61°C
 ii) 122°C and
 iii) A ramping temperature of $(82 + 5t)^{\circ}\text{C}$. [10]

- Q7)** a) List the criterion for the selection of a PLC and explain any two criterions in details. [8]
 b) In a certain bank each of three bank officers has a unique key to the vault. The bank rules requires that two out of the three officers be present when the vault is opened. Draw the ladder diagram for a relay logic circuit that will unlatch the door and turn on the light when the three keys are inserted. [9]

OR

- Q8)** a) Using a suitable example, draw a ladder diagram and explain how timer is implemented. [8]
- b) A circuit involves four NO type switches P1, P2, S1 and S2 and a DC motor (M). Draw a ladder diagram such that the said circuit satisfies following objectives:
- i) When P1 is pushed the circuit shall turn ON and shall continue to remain ON until P2 is pushed.
 - ii) When S1 is pushed and S2 is not pushed then Motor is ON in clockwise direction.
 - iii) When S2 is pushed and S1 is not pushed then Motor is ON in anti-clockwise direction.
 - iv) When P2 is pushed the circuit turns OFF. [9]



Total No. of Questions : 8]

SEAT No. :

P2319

[Total No. of Pages : 2

[5870]-1024

T.E. (Mechanical /Automobile)

ADVANCED FORMING AND JOINING PROCESSES

(2019 Pattern) (Semester - I) (302045-A) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to Candidates:

- 1) All questions are compulsory i.e. Solve Que 1 or Que 2, Que 3 or Que 4, Que 5 or Que 6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.

- Q1)** a) Explain in detail, weld thermal cycles and their effects with sketches. [8]
b) Explain in details concept of Heat Affected Zone (HAZ) with sketches and Effects of HAZ on the different properties? [9]

OR

- Q2)** a) Explain in detail importance of effects of pre and post weld heat treatments processes? [8]
b) Explain in detail concept of weldability & its assessment; explain the importance of weldability. [9]

- Q3)** a) Explain with sketch, Cold pressure welding process with advantages and limitations. [9]
b) Explain in detail with sketch, Ultrasonic welding process features and applications. [9]

OR

- Q4)** a) Explain in detail with sketch, Explosive welding process with features and advantages. [9]
b) Explain in detail with sketch, Forge welding process with advantages and limitations. [9]

P.T.O.

- Q5)** a) Analyze with the sketch, working of Electroslag welding process and its applications. [8]
b) Explain with sketch, working principle of Electron beam welding and its applications. [9]

OR

- Q6)** a) Analyze with the sketch, working of Laser Beam welding process and its applications. [8]
b) Explain the role of welding automation in aerospace, nuclear and surface transport vehicles. [9]

- Q7)** a) Explain in detail, sustainability and drivers for sustainable development and sustainable manufacturing. [9]
b) Explain the importance of Safety norms in forming and welding also explain Socio-economic aspects related to forming and welding. [9]

OR

- Q8)** a) Explain one case study on waste recycling and one on material recycling. [9]
b) Explain various Environment protection norms and recycling techniques. [9]



Total No. of Questions : 8]

SEAT No. :

P2320

[Total No. of Pages : 2

[5870] - 1025

T.E. (Mechanical /Automobile)

MACHINING SCIENCE AND TECHNOLOGY

(2019 Pattern) (Semester - I) (302045 - B) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) All questions are compulsory i.e. 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 wherever necessary.
- 3) Figures to the right indicate full marks.

Q1) a) Demonstrate the lapping process with heat sketch. [8]

b) Classify in details different grinding machines with sketches? [9]

OR

Q2) a) Demonstrate the honing process with neat sketch. [8]

b) Categorized the various abrasives and types of bonds. [9]

Q3) a) Analyze the concept of degrees of freedom with 3-2-1 principle of location with sketch. [9]

b) Selection procedure for the Box type of Jig, explain in detail with sketch. [9]

OR

Q4) a) Categorized the various elements of Jigs and Fixtures with sketches. [9]

b) Analyze the design considerations in fixtures. [9]

Q5) a) Analyze the various methods of process planning. [8]

b) Materials selection process and evaluation methods of materials, explain in detail. [9]

P.T.O.

OR

- Q6)** a) Process selection factors and Process selection methods, explain in details. [8]
b) Factors involved in Production equipment selection and various documents required in the Process planning, explain in detail. [9]

Q7) a) Formulate the importance of word address format in CNC programming. [9]

- b) Generate CNC part programming for G-75 Grooving cycle (Canned cycle) on Lathe Machine with neat sketch. [9]

OR

Q8) a) Explain the various types of G-Codes and M-Codes used in CNC part programming. [9]

- b) Explain with example, the various steps in developing CNC part program with sketch. [9]



Total No. of Questions : 8]

SEAT No. :

P735

[Total No. of Pages : 3

[5870]-1026

T.E. (Mechanical)

**ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
(2019 Pattern) (Semester - II) (302049)**

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) *Use of calculator is allowed.*
- 4) *Assume suitable data wherever necessary.*

Q1) a) Explain following terms in decision tree : [6]

- i) entropy
- ii) information gain
- iii) Gini index

b) What is the difference between KNN and K means? Also state advantages and limitations of KNN and K means? [5]

c) How does the Bayes algorithm differ from decision trees? [6]

OR

Q2) a) What is Support Vector Machine? How does the SVM work? [6]

b) Define pruning. What are various types of pruning? Explain any one type of pruning. [5]

c) Differentiate between logistic regression and linear regression. [6]

Q3) a) What are different hyperparameter tuning algorithms? Elaborate using an example. [8]

b) Why data pre-processing is required? Explain the techniques in pre-processing. [6]

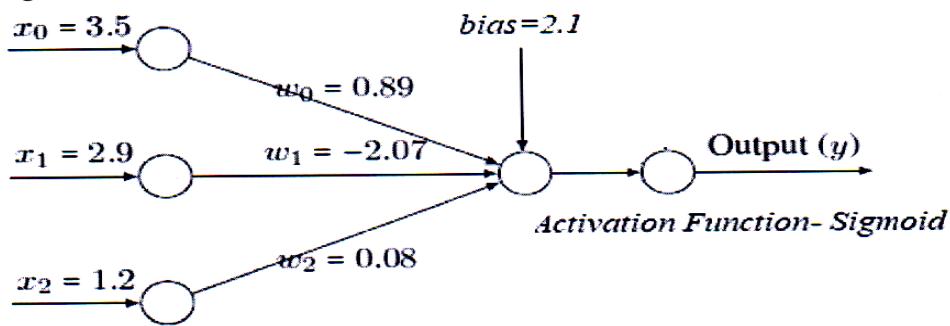
c) State advantages and disadvantages of random forest. [4]

P.T.O.

OR

- Q4)** a) Explain the difference between training data and Testing data in a Dataset? How it is useful in a Machine Learning Model? [8]
- b) Explain the following terms : [6]
- Over fitted model
 - Underfitted model
 - Good model
- c) Define following terms [4]
- ACCURACY
 - PRECISION
 - RECALL
 - F1SCORE

- Q5)** a) What do you understand from on policy and off policy algorithm in reinforcement learning? Explain SARSA algorithm for Reinforcement learning. [8]
- b) Explain with neat diagramme quivalence of biological neuron and artificial neuron? [6]
- c) Compute the output of the following neuron if the activation function is sigmoid. Assume bias to be 2.1. [4]



OR

- Q6)** a) What are different activation functions? Explain any one in details. [8]
- b) Explain [6]
- Positive Learning
 - Negative Learning with respect to Reinforcement learning
- c) What are applications of Reinforcement learning in Mechanical engineering? [4]

- Q7)** a) Write short note on use of AIML in material inspection. [8]
b) What are the advantages of using fault detection in Automobile cars.[5]
c) What are the different applications of AIML in health care. [4]

OR

- Q8)** a) Explain in detail different applications of AIML. [8]
b) Write short note on use of AIML in traffic control. [5]
c) What are the different types of sensors used in Human machine interactions? [4]



Total No. of Questions : 8]

SEAT No. :

P736

[Total No. of Pages : 3

[5870] - 1027

T.E. (Mechanical)

**COMPUTER AIDED ENGINEERING
(2019 Pattern) (Semester - II) (302050)**

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 the suitable data, if necessary.

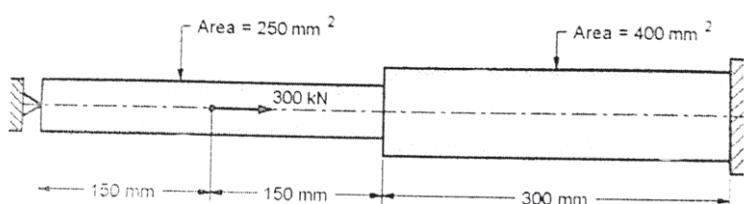
Q1) a) An axial load $P = 300 \text{ kN}$ is applied on a stepped steel bar as shown Figure 1. $A_1 = 250 \text{ mm}^2$; $A_2 = 400 \text{ mm}^2$; $E = 200 \text{ GPa}$. [12]

Formulate:

- i) Element stiffness matrix $[k_1], [k_2], [k_3]$.
- ii) Global stiffness matrix $[K]$.

Determine using elimination approach:

- i) Nodal displacement vectors $[u_1], [u_2], [u_3], [u_4]$,
- ii) Element Stresses $[\sigma_1], [\sigma_2]$



b) State and explain the principle of minimum potential energy. [6]

OR

Q2) a) For the two-bar truss shown in Figure 2 below. All the elements have $E = 200 \text{ GPa}$ and $A = 600 \text{ mm}^2$. [12]

P.T.O.

Formulate:

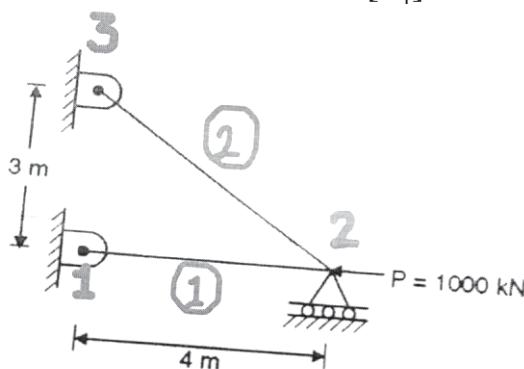
i) Element stiffness matrix $[k_1]$, $[k_2]$

ii) Global stiffness matrix $[K]$

Determine using elimination approach:

i) Nodal displacement vectors at node 2 $[u_3]$.

ii) Element Stresses in element 1 $[\sigma_1]$.



b) Formulate an expression of temperature effects of bar element. [6]

- Q3)** a) Explain what is meant by Plane Stress and Plane Strain condition and how it is used for conversion of 3D problem into 2D problem. [9]
b) What is CST element? Explain in details natural coordinate and shape function for CST element. [8]

OR

- Q4)** a) In Post-processing of Computer Aided Engineering (CAE). [10]
i) How to validate and check accuracy of the result in Computer Aided Engineering.
ii) How to view and interpret results.
b) Write down the special tricks for Post Processing. [7]

- Q5)** a) What is Non-linear analysis? Write down the comparison of linear and non-linear finite element analysis. [9]
b) Explain Geometric Nonlinearity and Material Nonlinearity related to non-linear problems. [8]

OR

- Q6)** a) What is Dynamic analysis? Write down the comparison of static and dynamic finite element analysis. [9]
b) Explain the following terms in dynamic analysis [8]
i) Time domain
ii) Frequency domain
iii) Simple harmonic motion
iv) Free vibrations

- Q7)** a) Illustrate the applications of Computer Aided Engineering (CAE) in Noise, Vibration and Harness with examples. [10]
b) Elaborate the CAE based applications in casting and sheet metal simulations. [8]

OR

- Q8)** a) Elaborate the durability analysis used in finite element method. Explain in detail FEA based fatigue analysis using: [10]
i) Stress - life approach
ii) Strain - life approach
b) Illustrate the applications of Computer Aided Engineering in Computational Fluid Dynamics in different sectors. [8]



Total No. of Questions : 8]

SEAT No. :

P1000

[Total No. of Pages : 3

[5870]-1028

T.E. (Mechanical)

DESIGN OF TRANSMISSION SYSTEM

(2019 Pattern) (Semester - II) (302051)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Four questions from the following.
- 2) Draw neat labeled diagrams wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of non programmable electronic calculator is permitted.
- 5) Assume Suitable/Standard data if necessary.

Q1) a) Explain design and performance variables of hydrodynamic journal bearing? [5]

b) Derive the Petroff's equation for hydrodynamic bearing. Also state its limitation? [6]

c) A single row deep groove ball bearing subjected to 30 second work cycle that consist Part-I: Radial load 45 kN; Axial Load 12.5 kN; duration 10 second; speed 720 rpm. Take X=1 and Y=0 Part II: Radial load 15kN; Axial Load 6.25 kN; duration 20 second; speed 1440 rpm, take X=0.56 and Y=1.42. Take $C_0 = 50$ kN; C = 68. Find Expected life of the bearing in hours. [6]

OR

Q2) a) A single row deep groove ball bearing is subjected to $F_r = 8$ kN, $F_a = 3$ kN, $X = 0.56$, $Y = 1.4$ and $N = 1200$ rpm. Diameter of shaft is 75 mm, Bearing number 6315 with $C = 112000$ N Find : [5]

- i) L_{10} for 90% reliability;
- ii) reliability for $t = 20000$ hrs.

b) Derive the Stribecks equation for basic static capacity of bearings. State the assumption made. [6]

c) Explain the procedure for selection of the ball bearing from manufacturing catalogue. [6]

P.T.O.

- Q3)** a) Explain self-energizing block brake and self-locking block brake. [4]
b) Draw a diagram for pivoted Block brake with long shoe'? Write the equation for reaction on pivot points and Braking torque. [6]
c) Draw neat sketch diagram of Cone clutch and explain construction and working. Why is the semi-cone angle of a cone clutch made 12.5° ? [7]

OR

- Q4)** a) What are the two theories applied to friction plates? Why clutches are usually designed on the basis of uniform wear? [4]
b) Draw neat sketch diagram, explain construction and working of single plate clutch and multi plate clutch. [6]
c) What is the condition of self-locking in differential band brake? Why should it be avoided in speed-control brakes? What are the advantages and disadvantages of band brake? [7]

- Q5)** a) What is the need of multi-speed gear box in drive system of a machine tool? [4]
b) Explain the following parameters considered in kinematic design of multi-speed gear box; [4]
i) Range Ratio
ii) Geometric Progression Ratio
iii) Number of spindle speed steps
iv) Number of stages of gear box
c) A 9 speed gear box is to be connected to a motor running at 720 rpm through a belt drive. The gear box is to have a minimum speed of 31.5 rpm and a maximum speed of 500 rpm. Using standard spindle speeds. [10]
i) Draw the structure and speed diagram for the arrangement;
ii) Draw the gear box;
iii) Select suitable standard pulley diameter for connecting the motor to the gear box shaft. The standard pulley diameters are based on R20 series with a diameter starting from 80 mm.

OR

- Q7)** a) Classify the Hybrid Electric Vehicle? Explain any one in detail from Series or Parallel Configuration of Hybrid Electric Vehicles. [6]

b) Explain The basic modes of operations used of Hybrid Electric Vehicles? Define Degree of Hybridization. [6]

c) Explain any six components of Hybrid Electric Vehicles? [6]

OR

- Q8)** a) Explain how the performance analysis carried in Series and parallel Hybrid Electric Vehicles? [6]
b) What are the advantages and disadvantages of Hybrid Electric Vehicles? [6]
c) Explain Power Split Device with neat sketch? [6]



Total No. of Questions : 8]

SEAT No. :

P2321

[Total No. of Pages : 2

[5870]-1029

T.E. (Mechanical/Automobile)
COMPOSITE MATERIALS

(2019 Pattern) (Semester - II) (302052-A) (Elective - 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, Q. 7 or Q. 8.
- 2) Figures to the right indicate full marks.
- 3) Use of a calculator is allowed.
- 4) Assume suitable data, if necessary.

Q1) a) Describe the *in-situ* process of fabrication of a metal matrix composite. [6]

- b) Explain interfaces and wettability of a metal matrix composite. [6]
- c) List three kinds of metal matrix composites and write typical reinforcements used in particle type metal matrix composites. [6]

OR

Q2) a) Explain with neat sketch the stir-casting process of fabrication of a metal matrix composite in detail. [6]

- b) Describe liquid infiltration process with a neat sketch. [6]
- c) Give the names of important metallic matrices used as matrix materials and the broad categorization of processes for fabricating metal matrix composites. [6]

Q3) a) Derive an expression for longitudinal and transverse Young's modulus and in plane shear modulus of unidirectional composite using mechanics of material approach. [6]

- b) Write a short note on [6]
- i) Unidirectional continuous fiber
 - ii) Discontinuous fiber
 - iii) Woven reinforcements.
- c) Calculate longitudinal and transverse Young's modulus of the composite with 30% fibers by volume. Elastic moduli of glass fibers. And epoxy resin are 70 and 3.5 GPa. respectively. [5]

OR

P.T.O.

- Q4)** a) Derive an expression for volume and weight fraction of composite. [6]
b) Explain five ultimate strength parameters of unidirectional lamina. [6]
c) Consider a unidirectional reinforced glass fiber/epoxy composite. The fibers are continuous and 60% by volume. The tensile strength of glass fibers is 1 GPa and the Young's modulus is 70 GPa. The tensile strength of the epoxy matrix is 60 MPa and its Young's modulus is 3 GPa. Compute the tensile strength of the composite in the longitudinal direction. [5]

- Q5)** a) Explain double-cantilever beam test method for measurement of fracture toughness of composite. [6]
b) Describe tensile testing of unidirectional composites according to ASTM standard. [6]
c) Explain inter-laminar shear strength of composite material in detail. [6]

OR

- Q6)** a) What is the significance of bond strength and adhesion in composite? Explain in detail ASTM F904 for comparison of bond strength or ply adhesion. [6]
b) Describe shear testing of unidirectional composites according to ASTM standard. [6]
c) What are test standards used in composite materials? State any six test standards. [6]

- Q7)** a) Explain "Multimaterial" concept used in automobile industry with example? [6]
b) List and describe the applications of composite for marine applications? [6]
c) Write a short note: Eco-friendly prime mover. [5]

OR

- Q8)** a) Write down various applications of composite material in the Aerospace sector and explain use of composite in manufacturing light combat aircraft (LCA) and Light Combat Helicopter LCH? [6]
b) Justify the use of Composites in sports equipment and discuss any two applications of composites used for protection of players. [6]
c) Elaborate on the applications of Composite for the Transportation Sector. [5]



Total No. of Questions : 8]

SEAT No. :

P737

[Total No. of Pages : 2

[5870]-1030

T.E. (Mechanical)

SURFACE ENGINEERING

(2019 Pattern) (Semester - II) (Elective - II) (302052B)

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 side indicate full marks.

Q1) a) Compare Carburizing and Nitriding processes. [6]

b) Define Case Depth. List techniques of case depth measurement. Explain any two techniques with suitable sketches. [6]

c) Explain Induction Hardening with neat and labeled diagram. State limitations and at least two applications of Induction Hardening. [6]

OR

Q2) a) State Ficks law of diffusion. List two applications of Ficks law of diffusion. [6]

b) Comment with clarification on suitability of Plain Carbon Steels and Alloy Steels for Nitriding process. [6]

c) Describe laser hardening process. List advantages and applications. [6]

Q3) a) Describe electro less coating? State advantages, limitations and applications of electro less coatings. [6]

b) What is the necessity of Ion Implantation? State advantages and limitations. [6]

c) Write in brief principle of Sol gel coating technology. List applications of Sol gel coating technology. [5]

OR

Q4) a) Discuss conversion coatings for corrosion resistance with at least two examples. [6]

b) Describe method of dielectric coatings of Si-C alloy films. [6]

c) Write short note on laser alloying. [5]

P.T.O.

- Q5)** a) List techniques for applying PVD coatings. Describe any two techniques of applying physical vapour deposition techniques. [6]
b) Explain steps of Hot dipping operations? [6]
c) What is the purpose of Hardfacing? Explain thermal spray technique of Hardfacing with neat diagram and suitable example. [6]

OR

- Q6)** a) Categories clad metal systems. Write short note on any two clad metal systems. [6]
b) Write at least two examples of Metal Coating, Inorganic coating and Organic coating each. [6]
c) Describe with neat diagram application of inorganic coatings by spraying. [6]

- Q7)** a) Describe with neat diagram microscopy for surface imaging by force. [6]
b) Discuss various methods of surface roughness measurement. [6]
c) Describe any one method of residual stress measurement. [5]

OR

- Q8)** a) List coatings defects. Describe any three along with corrective measures. [6]
b) List methods of coating thickness measurement. Write steps of coating thickness measurement by any one method. [6]
c) Compare scanning probe microscopy and atomic force microscopy. [5]



Total No. of Questions : 8]

SEAT No. :

P1001

[Total No. of Pages : 3

[5870]-1035

T.E. (Mechanical SW)

**FUNDAMENTALS OF COMPUTER - AIDED
ENGINEERING**

(2019 Pattern) (Semester - I) (302061)

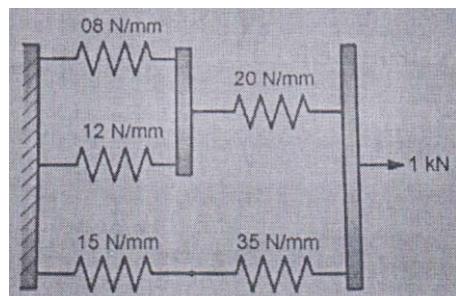
Time : 2½ Hours]

[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) Figures to the right indicate full marks.
- 3) Draw neat figures wherever necessary.
- 4) Assume suitable data if required.
- 5) Use of a non-programmable scientific calculator allowed.

Q1) a A cluster of five springs is shown in the below figure. One end of the assembly is fixed while a force of 1 kN is applied at the other end. Using the finite element method, determine the deflection of each spring. [12]



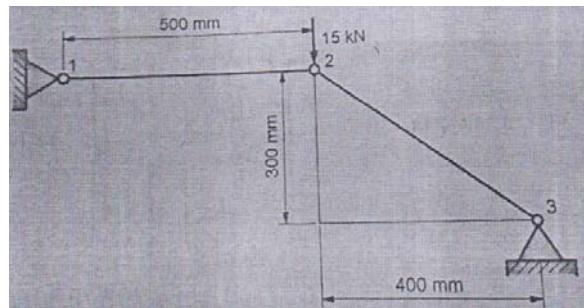
b) Explain temperature effect in 1D elements and write the equation for thermal stress. [5]

OR

Q2) a The arrangement of a two bar truss is shown in the below figure. The modulus of elasticity for material is 70×10^3 N/mm² and the cross section area of each element is 200 mm². Using the finite element method, determine: [12]

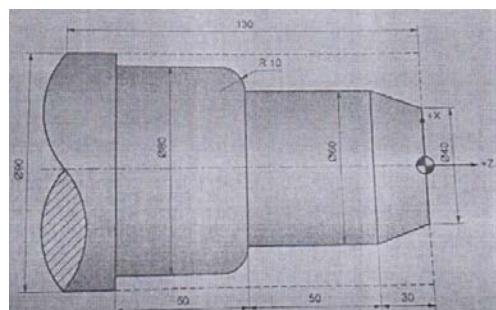
- i) Nodal displacements
- ii) Stress in each element
- iii) Reaction force at the support.

P.T.O.



- b) The CST element is defined by three nodes located at (1,1), (6,3) and (4,5). For a point P located inside the element, the shape functions N_1 and N_2 are 0.2 and 0.3 respectively. Determine X and Y coordinates of point P. [5]

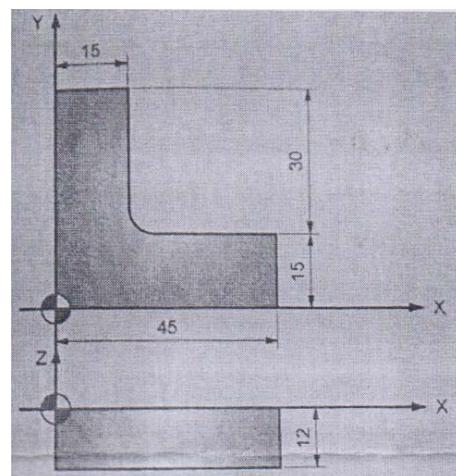
Q3) a) Develop a part program using G and M code to turn mild steel job of size $\phi 80 \times 120 \text{ mm}$ length, as shown in below figure. Assume suitable cutting parameters and various canned cycles to turn the final shape from the raw material of size $\phi 90 \times 130 \text{ mm}$. [12]



- b) Explain DNC machine tools with block diagram. [5]

OR

Q4) a) Write a NC part using G and M code to cut a slot for the component shown in the below figure by using an end mill of 10mm. Assume suitable data for machining parameters. [12]



- b) Compare absolute and incremental method of CNC programming. [5]

- Q5)** a) Define robots and explain the basic architecture of industrial robots. [9]
b) Define Automation and explain different types of Automation. [9]

OR

- Q6)** a) List various types of flexible manufacturing systems. Explain types of FMS based on the type of layout in detail. [9]
b) Explain different generations of robots and state the advantages and limitations of robots in industry. [9]

- Q7)** a) How the CAE results are validated and checked for accuracy? Explain in brief. [7]
b) Describe the three dimensions of fluid dynamics. [7]
c) Explain the Stress life (S-N) approach for durability analysis. [4]

OR

- Q8)** a) What are the common mistakes made by CAE Engineers? [7]
b) Explain the implicit integration scheme for crash analysis. [7]
c) Write a short note on CAE Reports. [4]



Total No. of Questions : 8]

SEAT No. :

P3833

[Total No. of Pages : 3

[5870]-1036

T.E. (Automobile)

**NUMERICAL & OPTIMIZATION METHODS
(2019 Pattern) (Semester - I) (316481)**

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) Assume suitable data if necessary.

- Q1)** a) Use Taylor's series method solve equation $dy/dx = x^2 + y^2$. Given initial conditions are $x = 0$, $y = 1$ estimate $y(0.5)$ take $h = 0.25$. [6]
- b) An object having surface area of 0.1m^2 is initially at 0°C is dipped in hot water bath. Water is at 95°C . Find the temperature of object after 10 sec., taking $dt = 2$ sec. Take mass of the object 1.2 kg . $C_p = 450 \text{ J/Kg K}$, Heat transfer co-efficient $= 1200 \text{ W/m}^2 \text{ K}$. $dT/dt = H.A(T-T_f)/m.C_p$. [6]
- c) Using 'Runge-Kutta method of order 4', find y for $x = 0.1, 0.2, 0.3$. Given that $dy/dx = xy + y^2$, $y(0) = 1$. [6]

OR

- Q2)** a) Solve for $\partial u/\partial t = \partial^2 u/\partial x^2$ the following explicit finite scheme, given by, [10]

- i) $u = \sin(\pi x)$ for $t = 0$ where $0 \leq x \leq 1$,
 - ii) $u = 0$ for $x = 0$ and $x = 1$ for $t = 0$ to 0.06 , and
 - iii) Increment in t is $k = 0.02$ and in x is $h = 0.2$ Calculate values of u for $t = 0$ to 0.06 at $x = 0$ to 1 .
- b) A steel plate of $750 \times 750 \text{ mm}$ has its two adjacent sides maintained at 100°C . While the two other sides are maintained at 0°C . What will be the steady state temperature at interior assuming a grid size of 250 mm . [8]

P.T.O.

- Q3)** a) Find the integration $x^3 + x - 1$ with limits 1 to 4 using Gauss 2 point formula. [5]
- b) A body is in the form of solid of revolution. The diameter D in cms of its sections at distance x cm from one end is given below. Estimate volume of the solid by Simpson's 3/8th rule. [7]

x	0	2.5	5.0	7.5	10.0	12.5	15.0
D	5	5.5	6.0	6.75	6.25	5.5	4.0

- c) A curve is drawn to pass through the points given by the following table: [5]

x	1	1.2	1.4	1.6	1.8	2
y	2	2.2	2.7	2.8	3	2.6

Find the area under the curve using Trapezoidal rule.

OR

- Q4)** a) Find double integral of $f(x, y) = x^2 y^2 dx dy$ for $x = 0$ to 1 and $y = 0$ to 1 taking step length in x and y as 0.25 using Trapezoidal rule. [7]
- b) Find double integral of $f(x, y) = x^2 + y^2 + 5$ for $x = 0$ to 2 and $y = 0$ to 2 taking increment in both x and y as 0.5. Applying Simpson's 1/3rd rule. [10]

- Q5)** a) Explain classification of optimization problem. [5]
- b) Determine the maximum value of root of Equation $f(x) = 0.51x - \sin x$ by Newton's method. Take initial guess as 2. Do 4 iterations. [7]
- c) Explain Golden-section search method. [5]

OR

- Q6)** a) Maximize $Z = 6x_1 + 4x_2$ [10]

Subjected to condition,

$$2x_1 + 3x_2 \leq 100$$

$$4x_1 + 2x_2 \leq 120$$

$$x_1, x_2 \geq 0$$

Use simplex method to calculate x_1, x_2 and maximize profit Z.

- b) What is optimization and explain Engineering applications of optimizations. [7]

- Q7)** a) Write short note on Simulated annealing. [9]
b) Write short note on Particle swarm optimization. [9]

OR

- Q8)** a) Explain in detail: Ant colony optimization. [9]
b) Explain modern method of optimization : Genetic algorithm. [9]



Total No. of Questions : 8]

SEAT No. :

P1003

[Total No. of Pages : 3

[5870]-1037

**T.E. (Automobile Engineering)
HEAT TRANSFER**

(2019 Pattern) (Semester - I) (316482)

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 whenever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of logarithmic tables, sliderule, electronic pocket calculator is allowed.

Q1) a) Explain the following non dimensional Numbers [8]

- | | |
|---------|--------|
| i) Nu | ii) Pr |
| iii) Re | iv) Pe |

b) When 0.6 kg of water per minute is passed through a tube of 2cm diameter, it is found to be heated from 20°C to 60°C. The heating is achieved by condensing steam on the surface of the tube and subsequently the surface temperature of the tube is maintained at 90°C. Determine the length of the tube required for fully developed flow.(Use Data book for correlation). [9]

OR

Q2) Write short notes on :

- a) Thermal & Hydrodynamic Boundary Layer [6]
- b) Temperature response [6]
- c) Bulk mean temperature and mean film temperature. [5]

Q3) a) Explain the following with diagram :Film wise and drop wise condensation in detail with diagrams. [8]

b) A vertical pipe 80 mm diameter and 2 m height is maintained at a constant temperature of 120°C. the pipe is surrounded by still atmospheric air at 30°C. Find heat loss by natural convection.

Use correlation $Nu = 0.10 (GrPr)^{0.333}$

[10]

OR

P.T.O.

Q4) a) Plot and explain Boiling curve for saturated water at atmospheric pressure [8]

b) A horizontal cylinder of 0.4 m dia. at a surface temperature of 40°C is placed in air at 80°C. Compare the heat gain by the cylindrical surface with that of a [10]

vertical plate of height $\frac{\pi \times 0.4m}{2}$ under the same conditions.

Use correlation for Cylinder $Nu = 0.53 (Gr Pr)^{1/4}$

And for plate $Nu = 0.59 (Gr Pr)^{1/4}$

Q5) a) Explain the concept of overall Heat transfer coefficient used for heat exchange. [4]

How fouling factor affects the performance of heat exchanger. Explain with illustration. [4]

b) A counter flow heat exchanger is employed to cool 0.55 kg/s ($C_p = 2.45$ kJ/kg°C) of oil from 115°C to 40°C by the use of water. The inlet and outlet temperature of cooling water are 15°C and 75°C respectively. The overall heat transfer coefficient is expected to be 1450 W/m²°C. [9]

Using NTU method, calculate the following :

- i) The mass flow rate of water.
- ii) The effectiveness of heat exchanger.
- iii) The surface area required

OR

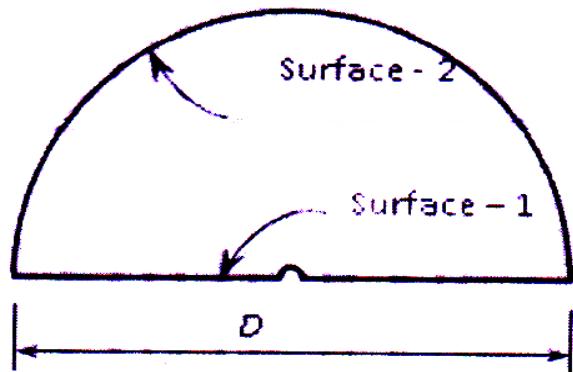
Q6) a) Explain the concept of LMTD and derive the expression for counter flow heat exchanger. [8]

b) In a counter flow double pipe heat exchanger, water is heated from 25°C to 65°C by oil with specific heat of 1.45 kJ/kg K and mass flow rate of 0.9 kg/s. The oil is cooled from 230°C to 160°C. If overall Heat transfer coefficient is 420 Wm⁻² °C.

Calculate following : [9]

- a) The rate of heat transfer
- b) The mass flow rate of water, and
- c) The surface area of heat exchanger

- Q7) a)** The flat floor of a hemispherical furnace is at 800 K and has emissivity of 0.5. The corresponding values for the hemispherical roof are 1200K and 0.25. Determine the net heat transfer from roof to floor. Take $\sigma = 5.67 \times 10^{-8}$. [9]



- b)** Define : [3×3]
- Monochromatic emissive power and total emissive power.
 - What is shape factor obtain the expression for it.
 - Explain what do you mean by absorptivity, reflectivity and Transmissivity

OR

- Q8) a)** Two large parallel planes with emissivities of 0.3 and 0.5 are maintained at temperatures of 527°C and 127°C respectively. A radiation shield having emissivities of 0.05 on both sides is placed between them. Calculate. [9]

- Heat transfer rate between them without shield.
 - Heat transfer rate between them with shield
- b)** Explain the following : [3×3]
- Wein's Displacement law
 - Kirchhoff's law
 - Radiation resistances



Total No. of Questions : 8]

SEAT No. :

P738

[Total No. of Pages : 2

[5870] - 1038

T.E. (Automobile Engineering)
DESIGN OF MACHINE COMPONENTS
(2019 Pattern) (Semester - I) (316483)

Time : 2½ Hours]

[Max. Marks : 70]

Instructions to the candidates:

- 1) Answer Four questions from the following.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicates full marks.
- 4) Use of electronic pocket calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Explain the different forms of threads. [8]

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. [10]

OR

Q2) a) Explain the types of fastenings. [6]

b) A double riveted lap joint is made between 15 mm thick plates. If the ultimate stresses are 400 MPa in tension, 620 MPa in crushing and 330 MPa in shear. Take the factor of safety 4. Design the joint. [12]

Q3) a) A steel connecting rod is subjected to a reversed axial loading 180 KN. Determine the required diameter of rod using factor of safety 2. Take ultimate stress = 363 MPa, yield shear stress = 216 MPa, yield stress = 470 MPa, fatigue stress concentration factor = 1, correction factor = 0.7, surface finish factor = 1, size factor = 0.89. [10]

b) The brasses of an automobile engine connecting rod have worn so as to allow play which gives shock loading equivalent to a weight 6000 N falling through a height 0.2 mm. The connecting rod is 250 mm long and has a cross-sectional area 300 mm². Determine the maximum stress induced in connecting rod, resilience in tension or compression. Take E = 200000 MPa. [7]

OR

P.T.O.

- Q4) a)** A hot rolled steel rod is subjected to torsional load varying from -110 N-m to 440N-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 = 470MPa, 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 Modified Goodman diagram. [7]

- Q5) a)** Explain the classification of gears. [6]
- b)** Design a pair of helical gears are to transmit 15 KW at 10,000rpm of the pinion with PCD 80mm. 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. $Y = \pi (0.154-0.912/Z_e)$, $C_v = 5.55/5.55+V^{0.5}$. [12]

OR

- Q6) a)** Design spur gear set to transmit 20 KW at 900rpm of pinion. The transmission ratio is 3. Take 20° FDI, $Z_1 = 18$, $\sigma_d = 193.2$ MPa, BHN = 250 for pinion and $\sigma_d = 47.1$ MPa, BHN = 200 for gear. Check only tangential tooth load. Form factor $Y = \pi(0.154-0.912/Z)$, $C_v=3.05/3.05+V$ [12]
- b)** Derive Lewis equation for beam strength. [6]

- Q7) a)** Compare involute and cycloidal teeth profile. [5]
- b)** Two shafts are right angles to each other are connected by 20° full depth involute teeth bevel gears. The velocity ratio is 3:1. The pinion transmits 37.5 KW at 750 rpm. Assume number of teeth on pinion is 20. Design the gear set. Take $\sigma_d=233.4$ MPa, BHN=200 for pinion and $\sigma_d=172.6$ MPa, BHN=150 for gear. Form factor $Y = \pi (0.154-0.912/Z_e)$, $C_v=6.1/6.1+V$ [12]

OR

- Q8) a)** What are the advantages and disadvantages of worm gear drive? [5]
- b)** A worm gear drive is to connect two shafts to transmit 10 KW. The transmission ratio is 20:1 and worm shaft rotates at 1440 rpm. Design the gear set. Assume single start square thread. Take $\sigma_d=207$ MPa, for worm and $\sigma_d = 82.4$ MPa, for worm wheel. Form factor $Y = \pi (0.154-0.912/Z)$ [12]



Total No. of Questions : 8]

SEAT No. :

P739

[Total No. of Pages : 2

[5870]-1039

T.E. (Automobile)

AUTOMOBILE ELECTRICAL AND ELECTRONICS

(2019 Pattern) (Semester - I) (316484)

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.

Q1) a) What are the different types of battery tests? Explain any one in brief. [6]

b) What is use of current regulator? Explain any one type of current regulator. [6]

c) Discuss the selection of cranking motor with the help of performance curve. [6]

OR

Q2) a) Explain principle and construction of lead acid battery and also state the reaction for charging and discharging. [8]

b) Explain working of Fuel gauge. [10]

Q3) a) Enlist the different types of battery tests. [5]

b) What is use of Voltage regulator? [5]

c) Explain working of Oil pressure gauge. [7]

OR

Q4) a) What are the different types of sensors? Explain any one. [5]

b) Explain with neat sketch Solenoid Actuators. [5]

c) Write short note on cold and warm start system. [7]

P.T.O.

- Q5)** a) What are the different types of actuators? Explain any one. [5]
b) Explain with neat sketch MAP Sensor. [5]
c) Write down the difference between Group and sequential injection system. [7]

OR

- Q6)** a) Explain CRDI system with neat sketch. [5]
b) Explain Collision avoidance system with layout. [5]
c) Write short note on Smart Parking Assist System (SPAS). [7]

- Q7)** a) Explain Radar warning system. [6]
b) What is Driver State monitoring? Explain in brief. [6]
c) Explain MPFI system with neat sketch. [6]

OR

- Q8)** a) Explain ABS System with layout. [6]
b) Explain Global Positioning System (GPS). [6]
c) What is Adaptive Cruise Control? Explain in brief. [6]



Total No. of Questions : 8]

SEAT No. :

P740

[Total No. of Pages : 3

[5870]-1042

T.E. (Automobile)

**AUTOMOTIVE REFRIGERATION AND AIR CONDITIONING
(2019 Pattern) (Semester - II) (316485)**

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 wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*
- 5) *Use of steam table and psychrometric chart is allowed.*

Q1) a) Explain Human Comfort. [6]

b) Explain Effective temperature. [6]

c) Explain air distribution modes (any three). [6]

OR

Q2) a) Explain temperature control systems. [6]

b) Explain Cool-down Performance of A/c system of vehicle. [6]

c) Explain AC ducts in brief. [6]

Q3) a) Define following Psychrometric properties. [8]

i) DBT

ii) DPT

iii) Specific humidity

iv) Relative humidity

b) A sample of moist air has a DBT of 43°C and WBT of 29°C. Determine the following without using psychrometric chart. [9]

i) Partial pressure of water vapour

ii) Sp. humidity

iii) Relative humidity

iv) DPT

v) Sp. Enthalpy of moist air

P.T.O.

OR

- Q4)** a) Explain in detail bypass factor of cooling coil. [7]
- b) Moist air at 32°C DBT and 50% RH enters a cooling coil at 10000 cubic meter per hour. It is desired that the air leaving the coil has a DBT of 20°C and WBT of 18°C . Determine following: [10]
- ADP of cooling coil
 - BPF of coil
 - SHF of coil
 - Total heat removed
 - Mass of water vapour removed

- Q5)** The following data refer to summer air conditioning of a building: [18]

Outside design condition:- 43°C DBT, 27°C WBT

Inside design condition:- 25°C DBT, 50% RH

Room sensible heat gain : 84000 kJ/hr

Room latent heat gain : 21000 kJ/hr

By-pass factor of cooling coil used = 0.2

The return air from the room is mixed with the outside air before entry to cooling coil in the ratio of 4:1 by mass. Determine :

- ADP of cooling coil
- Supply air temperature
- Fresh air mass flow rate
- Refrigeration load on cooling coil

OR

- Q6)** An AC system is to be designed for a restaurant with following data; [18]

Outside design condition :- 40°C DBT, 28°C WBT

Inside design condition:- 25°C DBT , 50% RH

Solar heat gain through walls, roofs ,floor = 5.87 kW

Solar heat gain through glass = 5.52 kW, No. of occupants = 25

SH gain per person = 58 W, LH gain per person = 60W

Internal lighting load = 15 lamps of 100W and fluorescent tubes of 80W.

SH gain from other sources = 11.60 kW.

SH gain from infiltration = 4.6 kW, LH gain from infiltration = 6.97 kW

If 25% fresh air and 75% recirculated air is mixed and passed through cooling coil, By assuming BPF of cooling coil as 0.2, Find following;

- a) Dew point temperature of cooling coil
- b) Condition of supply air to room
- c) Amount of total air required in cubic meter per hour
- d) Capacity of plant

Q7) a) Explain Refrigerant retrofitting. [6]

b) Explain Leak detection methods in AC. [6]

c) Explain refrigerant charging. [5]

OR

Q8) a) Explain Automotive AC systm flushing. [6]

b) Explain Odour rmoval in AC. [6]

c) Explain initial vehicle inspection. [5]



Total No. of Questions : 8]

SEAT No. :

P741

[Total No. of Pages : 2

[5870]-1043

T.E. (Automobile Engineering)

AUTOMOTIVE CHASSIS AND TRANSMISSION

(2019 Pattern) (Semester - II) (316486)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer four questions from the following.
- 2) Figures to the right side indicate full marks.
- 3) Draw the neat sketches wherever required.

Q1) a) List out the major components of Tyre construction & Explain in detail each component. [10]

b) Explain in detail Tyre performance parameters. [8]

OR

Q2) a) Explain in detail Hydraulic Brake system component & write importance of air bleeding. [10]

b) Differentiate between radial & bias ply tyre. [8]

Q3) a) Write the requirements of clutch & explain the Diaphragm spring clutch. [10]

b) Explain in detail Centrifugal clutch. [7]

OR

Q4) a) Draw & explain about the synchromesh gear box. [10]

b) Explain the performance characteristics of typical gear box. [7]

Q5) a) Write the need of differential & Explain about locking of Differential. [10]

b) List out the types of Axle & Explain Semi-Floating axle. [8]

OR

P.T.O.

Q6) a) Draw & explain real axle with types of load acting on rear axle. [10]

b) Explain Hotchkiss Drive with neat sketch. [8]

Q7) a) Explain in detail about Automatic Transmission. [10]

b) Discuss the construction and working of fluid flywheel. [7]

OR

Q8) a) Explain Continuous Variable Transmission with advantages & disadvantages. [10]

b) Explain the construction and working of Torque convertor. [7]



Total No. of Questions : 8]

SEAT No. :

P742

[Total No. of Pages : 4

[5870]-1044

T.E. (Automobile Engineering)

DESIGN OF ENGINE COMPONENTS

(2019 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, Q.7 or Q.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, electronic pocket calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) Explain Procedure for Design of lubricating system. [10]

b) Explain the function of valve mechanism in Engine. [7]

OR

Q2) a) Explain the design procedure of rocker arm of valve mechanism. [7]

b) Explain the design Procedure for Poppet valves with neat diagram.[10]

Q3) a) Explain with the turnig moment diagram of multi-cylinder engine, the Coefficient of Fluctuation of Energy of flywheel. [7]

b) A single cylinder dobule acting steam engine develops 150 kW at a mean speed of 80 r.p.m. The coefficient of fluctuation of energy is 0.1 and the fluctuation of speed is $\pm 2\%$ of mean speed. If the mean diameter of the flywheel rim is 2 metres and the hub and spokes provide 5 percent of the rotational inertia of the wheel, find the mass of the flywheel and cross-sectional area of the rim. Assume the density of the flywheel material (which is cast iron) as 7200 kg/m^3 . [10]

OR

P.T.O.

Q4) a) Discuss the various types of stresses induced in a rim of rimmed flywheel. [7]

b) The intercepted areas between the output torque curve and the mean resistance line of a turning moment diagram for a multicylinder engine, taken in order from one end are as follows: $-35, +410, -285, +325, -335, +260, -365, +285, -260 \text{ mm}^2$. The diagram has been drawn to a scale of $1 \text{ mm} = 70\text{N}\cdot\text{m}$ and $1 \text{ mm} = 4.5^\circ$. The engine speed is 900 r.p.m. and the fluctuation in speed is not to exceed 2% of the mean speed. Find the mass and cross-section of the flywheel rim having 650 mm mean diameter. The density of the material of the flywheel may be taken as 7200 kg/m^3 . The rim is rectangular with the width 2 times the thickness. Neglect effect of arms, etc. [10]

Q5) a) Explain the procedure for selection of roller bearing from manufacturer's catalogue. [7]

b) A single-row deep groove ball bearing is subjected to a pure radial force of 3 kN from a shaft that rotates at 600 rpm. The expected life L_{10h} of the bearing is 35000 h. The minimum acceptable diameter of the shaft is 45 mm. Select a suitable ball bearing for this application. Dimensions and static and dynamic load capacities of single-row deep groove ball bearings are as below. [7]

Principal dimensions (mm)			Basic load ratings(N)		Designation
<i>d</i>	<i>D</i>	<i>B</i>	<i>C</i>	<i>C₀</i>	
40	52	7	4160	3350	61808
	68	9	13300	7800	16008
	68	15	16800	9300	6008
	80	18	30700	16600	6208
	90	23	41000	22400	6308
	110	27	63700	36500	6408
	45	58	7	6050	3800
		75	10	15600	9300
		75	16	21200	12200
		85	19	33200	18600
		100	25	52700	30000
		120	29	76100	45500

c) Enlist the elements of roller contact bearing. [4]

OR

Q6) a) Enlist the selection of parameters for bearing design. Explain in detail any one parameter. [6]

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

radial load = 10 KN

journal speed = 1440 rpm

unit bearing pressure = 1000 kPa

clearance ratio (r/c) = 800

viscosity of lubricant = 30 milli Pa s

Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing, calculate :

- | | |
|-----------------------------|-----------------------------|
| i) dimensions of bearing | ii) coefficient of friction |
| iii) Power lost in friction | iv) total flow of oil |
| v) side leakage; and | vi) Temperature rise |

$\left(\frac{l}{d}\right)$	ε	$\left(\frac{h_0}{c}\right)$	S	ϕ	$\left(\frac{r}{c}\right)f$	$\left(\frac{Q}{rcn_s l}\right)$	$\left(\frac{Q_s}{Q}\right)$	$\left(\frac{p}{p_{\max.}}\right)$
∞	0	1.0	∞	(70.92)	∞	π	0	-
	0.1	0.9	0.240	69.10	4.80	3.03	0	0.826
	0.2	0.8	0.123	67.26	2.57	2.83	0	0.814
	0.4	0.6	0.0626	61.94	1.52	2.26	0	0.764
	0.6	0.4	0.0389	54.31	1.20	1.56	0	0.667
	0.8	0.2	0.021	42.22	0.961	0.760	0	0.495
	0.9	0.1	0.0115	31.62	0.756	0.411	0	0.358
	0.97	0.03	-	-	-	-	0	-
	1.0	0	0	0	0	0	0	0
1	0	1.0	∞	(85)	∞	π	0	-
	0.1	0.9	1.33	79.5	26.4	3.37	0.150	0.540
	0.2	0.8	0.631	74.02	12.8	3.59	0.280	0.529
	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.680	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152
	1.0	0	0	0	0	0	1.0	0

- Q7)** a) Explain different types of IC Engines with applications. [8]
b) State and explain in detail the different types of cylinder arrangements. What are their relative advantages and disadvantages as per the design considerations? [10]

OR

- Q8)** Write Short Note : [18]
- a) Cylinder power balance.
 - b) Distributor dwell angle.
 - c) Mechanical fuel pump testing.



Total No. of Questions : 8]

SEAT No. :

P743

[Total No. of Pages : 2

[5870]-1045

T.E. (Automobile)

**AUTOMOTIVE AERODYNAMICS AND BODY
ENGINEERING**

(2019 Pattern) (Semester - II) (Elective - II) (316488A)

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) What is meant by Lift and pitching? [6]
b) What is meant by Aerodynamic Stability? [6]
c) What is the design Factors to remove water and dirt accumulation on body? [6]

OR

- Q2)** a) Draw a Neat Sketch of a car showing air flow pattern on it. [8]
b) Explain Full scale Open type Wind Tunnel with neat sketch. [10]

- Q3)** a) What is meant by Blind Spot? Give two Examples. [5]
b) Explain the term “Pressure Drag” on vehicle. [5]
c) What are the methods of improving space in cars? Discuss. [7]

OR

- Q4)** a) What is meant by Wind - Rush Noise? [5]
b) Differentiate between conventional and integral type construction of bus body. [5]
c) Explain different types of Bus Body Layouts with sketch. [7]

- Q5)** a) Explain dimensions of driver seat in relation to control. [5]
b) What is Importance of Downward Visibility? [5]
c) What is the Commercial type construction of bus body? [7]

OR

P.T.O.

- Q6)** a) Explain types of Light construction vehicle body. [5]
b) Explain driver cabin design. [5]
c) Explain the design of chassis frame. [7]

- Q7)** a) Explain Ergonomics and aesthetics. [6]
b) Explain symmetric & asymmetric vertical loads in cars. [6]
c) Explain longitudinal load and load distribution on vehicle structure. [6]

OR

- Q8)** a) Explain Types of seat used in automobiles. [6]
b) Explain Types of safety belts. [6]
c) Write a short on Importance of Bumper in automobile. [6]



Total No. of Questions : 8]

SEAT No. :

P1004

[Total No. of Pages : 2

[5870]-1046

T.E. (Automobile)

AUTOMOTIVE MATERIALS

(2019 Pattern) (Elective - II) (Semester - II) (316488-B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve 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) What is composite? Explain the various types of composites used in making the car bodies, bonnet and Alloy wheels. [9]

b) Explain Injection moulding process with neat sketch. [9]

OR

Q2) a) Explain the processing of polymer matrix composites in detail. [9]

b) Write short notes on: [9]

- i) Hand lay-up process.
- ii) Spray lay-up process.
- iii) Reinforcement of fibres in composites.

Q3) a) Explain the importance of Nano-particle in paint technology. [7]

b) What is automotive paint? Explain the basic types of automotive paint and its recent trends in automotive industry. [10]

OR

Q4) a) What is tempering of glass? Explain the various approaches used to improve toughness and shatter resistance. [9]

b) What are the components of a paint. Write a typical formulations. [8]

Q5) a) Explain the working of fuel injector with neat sketch. [9]

b) Write short notes on: [8]

- i) Fuel Injector materials
- ii) Magneto-Rheological suspension system.

P.T.O.

OR

- Q6)** a) Explain the Powder metallurgy process for making disc brake pads. [8]
b) Explain the various Automotive smart materials used in the automobile industry. [9]

- Q7)** a) Explain the classification of various types of materials used in making the different systems in automobiles. [8]
b) Explain the importance of Ashby charts in automotive industry with neat sketch. [10]

OR

- Q8)** a) Explain the case study of Ferrari for material development process. [9]
b) Explain the steps involve in material selection process in automotive industry. [9]



Total No. of Questions : 8]

SEAT No. :

P744

[Total No. of Pages : 2

[5870]-1047

T.E. (Electrical)

INDUSTRIAL AND TECHNOLOGY MANAGEMENT

(2019 Pattern) (Semester - I) (303141)

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 indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) What do you understand by patent? Describe patent's format and structure. [8]

b) What is human resource planning? Explain importance of H.R. planning for efficient working of the organization. [9]

OR

Q2) a) Describe the criteria for the grant of a patent in India. [8]

b) Explain the role of HR in the training and development process. [9]

Q3) a) Explain poka-yoke in detail. How does it help in mistake proofing? [10]

b) What are quality standards? Explain its importance in maintaining quality. [8]

OR

Q4) a) Explain six sigma in detail. Discuss it's limitations. [10]

b) Explain different quality management system standards. [8]

P.T.O.

Q5) a) Explain with example the different types of markets and their characteristics. [8]

b) What is product development? Explain different phases of product life cycle. [9]

OR

Q6) a) What is financial management? Explain the need and scope. [8]

b) Elaborate on causes and significance of depreciation. Explain one method of calculation of Depreciation. [9]

Q7) a) Write a short note on: [10]

i) Herzberg's two factor theory

ii) McClelland's three needs theory

b) Explain Decision making under certainty, uncertainty and risk [8]

OR

Q8) a) Explain the following: [10]

i) McGregor's theory X and theory Y.

ii) Types of leadership

b) Explain the group dynamics on the basis of types and interactions of groups, stages of group dynamics. [8]



Total No. of Questions : 8]

SEAT No. :

P745

[Total No. of Pages : 3

[5870]-1048

T.E. (Electrical)

POWER ELECTRONICS

(2019 Pattern) (Semester - I) (303142)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve 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) *Use of calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

- Q1)** a) Explain working of single phase semi controlled bridge converter connected to R Load with neat circuit diagram and waveforms. [6]
- b) Derive the equation for average and rms output voltage of single phase fully controlled converter connected to RL Load. [6]
- c) The semi controlled converter with RL Load is connected to a 120 V, 60 Hz supply. The load current I_L is assumed to be continuous and ripple free. If delay angle is 90 degrees, calculate average output voltage, rms voltage, DF and PF. [6]

OR

- Q2)** a) Explain working of single phase fully controlled bridge converter connected to R Load with neat circuit diagram and waveforms. [6]
- b) Derive the equation for average and rms output voltage of single phase semi controlled converter connected to RL Load. [6]
- c) A single phase fully controlled bridge converter is connected to R Load of 10Ω . The input voltage to the bridge is 230 V. Calculate. [6]
- i) Average and RMS load voltage
 - ii) Average and RMS load voltage
- Firing angle is 60 degrees.

P.T.O.

- Q3)** a) Explain working of single phase AC Voltage regulator with R Load. Draw output voltage waveforms. [5]
- b) A three phase full converter operating from 3 phase 415 V, 50 Hz supply with Resistive load. Determine average output voltage for $\alpha = 30$ degrees & $\alpha = 90$ degrees. [5]
- c) Explain working of Three phase fully controlled converter connected to R Load with neat circuit diagram and waveforms. Consider firing angle $\alpha = 60$ degrees. [8]

OR

- Q4)** a) Explain working of two stage AC Voltage regulator with RL Load. Draw output voltage waveforms. [5]
- b) Compare Three phase Semi converter and Three phase fully controlled converters based on Number of SCRs, Quadrant of Operation, Modes of Operation, Energy feedback, Average load voltage for RL Load. [5]
- c) Explain working of Three phase semi controlled converter connected to R Load with neat circuit diagram and waveforms. Consider firing angle $\alpha = 30$ degrees. [8]

- Q5)** a) Explain working of single phase full bridge voltage source Inverter connected to RL load with neat circuit diagram. Draw output voltage and current waveforms. [7]
- b) What is need of controlling output voltage in an inverter? Explain any one method in detail. [5]
- c) Compare current source inverter and voltage source Inverter. [5]

OR

- Q6)** a) Explain working of single phase full bridge voltage source inverter connected to R load with neat circuit diagram. Draw output voltage and current waveforms. [7]
- b) Explain working of single phase current source inverter with neat circuit diagram. Draw output voltage and current waveforms. [5]
- c) What is need of UPS? Explain working of UPS with neat circuit diagram. [5]

- Q7)** a) What are different harmonic elimination techniques in inverter? Explain any one method. [5]
- b) What is necessity of using Multilevel Inverters? Draw circuit diagram of H bridge multilevel Inverter. [5]
- c) Explain working of three phase inverter with 180 degree conduction mode with neat diagram and switching sequence of switches. [7]

OR

- Q8)** a) Compare multi-pulse and multilevel inverters. [5]
- b) Draw circuit diagram of three level flying capacitor converter and explain its principal of operation. [5]
- c) Explain working of three phase inverter with 120 degree conduction mode with neat diagram and switching sequence of switches. [7]



[5870] - 1049

T.E. (Electrical Engineering)
ELECTRICAL MACHINES - II
(Semester - I) (2019 Pattern) (303143)

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) Assume suitable data, if necessary.
- 4) Figures to the right indicate full marks.
- 5) Use Electronic pocket calculator is allowed.

- Q1)** a) Explain following methods of starting 3 phase synchronous motor.
- i) Use of Damper winding
 - ii) Use of Pony motor
- [8]
- b) The input to 11kV, 3 phase star connected synchronous motor is 50A. The effective resistance and synchronous reactance per phase are 1Ω and 3Ω respectively. Calculate
- i) the power supplied to the motor at 0.8 p.f lagging
 - ii) induced emf for a power factor of 0.8 leading
 - iii) the induced emf for a power factor of 0.8 lagging.
- [10]

OR

- Q2)** a) Describe the phenomenon of hunting in synchronous motor. Explain how it can be reduced?
- [8]
- b) With neat phasor diagrams, explain the operation of synchronous motor at constant local & variable excitation.
- [10]

- Q3)** a) Draw the torque-speed characteristics of 3 phase induction motor showing clearly the motoring and generating region. Hence explain the operation of 3 phase Induction motor as induction generator. State applications of Induction generator.
- [8]
- b) State different methods of controlling speed of 3 phase induction motor with neat diagram explain cascade connection method.
- [9]

OR

- Q4)** a) With neat diagram, explain construction and working of permanent magnet stepper motor. [8]
b) With neat diagram, explain construction and working of permanent magnet D.C. motor. State its applications. [9]

- Q5)** a) Explain operation of D.C. series motor on A.C. supply. Hence explain the problems associated with a.c. operation. [10]
b) Compare compensated a.c. series motor with uncompensated A.C. series motor. [7]

OR

- Q6)** a) A universal motor has resistance of 20Ω and inductance of $0.4H$. When connected to 220V D.C. supply, it takes 1.0 Amp and runs at 2000rpm. Determine the speed, torque and power factor when connected to 220V a.c. supply at 50Hz and taking same current of 1.0Amp. [10]
b) Discuss the different modifications necessary in design and construction of D.C. series motor so that it can work satisfactorily on A.C. supply as a universal motor. [7]

- Q7)** a) State the applications of Capacitor start Induction motor. [4]
b) Draw constructional diagram of capacitor start induction motor. Explain its working. Draw its torque-speed characteristics. [6]
c) With neat diagram explain double revolving field theory. Hence draw torque - speed characteristics of single phase induction motor. [8]

OR

- Q8)** a) Draw the equivalent circuit diagram of single phase induction motor and explain how to find total impedance & current. [8]
b) Draw the circuit diagram to conduct no load and blocked roter test on capacitor start 1 phase induction motor. Write down the procedure for the same. [10]



Total No. of Questions : 8]

SEAT No. :

P747

[Total No. of Pages : 3

[5870]-1050

T.E. (Electrical)

**ELECTRICAL INSTALLATION, DESIGN AND CONDITION
BASED MAINTENANCE**

(2019 Pattern) (Semester - I) (303144)

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) Which are the causes of failure of on line Tap Changer. [4]

b) Explain following Terms: [6]

- i) Polarization Index
- ii) Dielectric absorption ratio

c) Explain Motor Current Signature Analysis. [8]

OR

Q2) a) What is maintenance? State its importance and its advantages. [4]

b) Explain following Terms: [6]

- i) Role of thermography in electric field
- ii) State the basic causes of insulation degradation

c) Explain Dissolved Gas Analysis. [8]

P.T.O.

- Q3)** a) Write short notes on Price catalogue. [3]
b) What are the essentials of estimating and costing? [6]
c) State the general factors to be considered in estimation of LT lines. [8]

OR

- Q4)** a) Write short notes on Guidelines for inviting tenders. [3]
b) Write short notes on the following: [6]
i) Schedule of rates
ii) Labour rates
c) What are the qualities of good estimator? [8]

- Q5)** a) Write down all rules for residential wiring work [4]
b) Write short notes on the following: [6]
i) Current carrying capacity
ii) Voltage drop
c) Explain the procedure of installation of underground LT service line. [8]

OR

- Q6)** a) Write short note on Minimum permissible size of the conductor. [4]
b) How to determine size of conductor for lines. [6]
c) Explain various residential wiring methods. [8]

- Q7)** a) Explain about Danger arising due to failure of insulation of the equipment. [3]
b) Write short note on: [6]
i) Contents of first aid box
ii) Precautions to be taken to avoid accidents.
c) List out various objectives of electrical safety. [8]

OR

- Q8)** a) Explain different methods of artificial respiration. [3]
- b) Write short note on: [6]
- i) PAT Tester
 - ii) Procedures for first aid
- c) Classify hazardous areas and how they can be prevented. [8]



Total No. of Questions : 8]

SEAT No. :

P748

[Total No. of Pages : 3

[5870]-1051

T.E. (Electrical)

ADVANCED MICROCONTROLLER AND EMBEDDED SYSTEM

(2019 Pattern) (Semester - I) (Elective - I) (303145A)

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) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Draw CCP1CON and list the steps involved in programming PIC18F458 microcontroller in capture mode. [9]
- b) Find PR2 value for the following PWM frequencies. Assume XTAL = 10MHz and prescalar = 1 a) 10kHz b) 25kHz. [8]

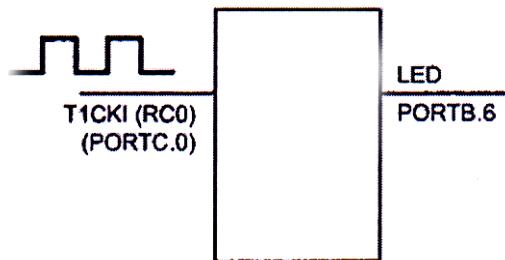
OR

- Q2)** a) How DC motor speed control is achieved using PWM mode of CCP module of PIC18F458. [9]
- b) Use PWM mode of CCP module, write a program in C for PIC18F458 to create a 2.5 MHz PWM waveform with 75% duty cycle on CCP1 pin. Assume XTAL = 10MHz. [8]

- Q3)** a) Write a note on enabling and disabling interrupts and steps to enable interrupts in PIC 18. [9]

P.T.O.

- b) Write a C Program for PIC18 toggle the LED connected to pin7 of the PORT B every time INT1 is activated by a pulse generator connected at INT1(RB1). The program will toggle the LED on falling edge of the pulse. Assume XTAL = 10MHz. [9]



OR

- Q4)** a) Enlist and explain various Interrupt Priority Registers. Also explain Timer 0 Interrupts Programming. [9]
- b) Assuming crystal frequency = 10MHz, write a program in C language to generate square wave form with a frequency of 25kHz on PORTB.4. Use timer 0 in 8 bit mode. [9]

- Q5)** a) With neat diagram explain measurement of power using PIC microcontroller. [8]
- b) With the help of interfacing diagram and flow chart, explain how PIC microcontroller can be used to measure temperature using LM35 sensor. [9]

OR

- Q6)** a) Explain features of on-board ADC of PIC18F458. Also explain in detail the functions of ADIF and ADFM bits. [8]
- b) Draw interfacing diagram of 16×2 LCD with PIC18 microcontroller and explain the functions of various pins of LCD. [9]

- Q7)** a) Draw and explain the block diagram of USART transmitter in PIC18.[9]
b) Write a note on Modbus communication protocol. [9]

OR

- Q8)** a) List the steps for programming PIC18 to transfer the data serially. [9]
b) Explain the SPBRG register functions and uses. Also find the value to be loaded in SPBRG register to have baud rate of 4800 and $F_{osc} = 10\text{MHz}$. Assume asynchronous mode and low baud rate. [9]



Total No. of Questions : 8]

SEAT No. :

P749

[Total No. of Pages : 3

[5870]-1052

T.E. (Electrical)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - I) (Elective - I) (303145B)

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) Use of Calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) State and prove following properties of DTFT. [8]

- i) Time shifting
- ii) Frequency shifting

b) For the sequence given below find the frequency response, plot magnitude

and phase response for $\omega = -\pi$ to π with step size of $\frac{\pi}{3}$

$$h(n) = \frac{1}{2} \delta(n-1) + \delta(n) + \frac{1}{2} \delta(n+1) \quad [9]$$

OR

Q2) a) Explain frequency response of first order system. [8]

b) Find the discrete time fourier transform of [9]

$$\text{i)} \quad \left(\frac{1}{2} \right)^{n-1} u(n-1)$$

$$\text{ii)} \quad \delta(n+2) - \delta(n-2)$$

P.T.O.

- Q3)** a) Prove the relation between : [8]
 i) Z-transform and DTFT
 ii) Z-transform and DFT
 b) Find the DFT of the sequence $x(n) = \{1, 1, -2, -2\}$ [9]

OR

- Q4)** a) State and prove following properties of DFT [8]
 i) Linearity
 ii) Time reversal
 b) Find linear and circular convolution of following two sequences. [9]
 $x_1(n) = \{4, 3, 2, 1\}$ and $x_2(n) = \{1, 1, 1, 1\}$

- Q5)** a) State following statements are true or false with justification. [6]
 i) To get correct information of any signal sampling frequency must be equal to maximum frequency present in the signal.
 ii) In filter realization, number of memory location required in direct form-II structure are greater than direct form-I structure.
 b) For the analog transfer function $H(s) = \frac{2}{(s+2)(s+1)}$. Determine H(z) using impulse invariance method. Assume T = 1 sec. [6]
 c) Explain realization of IIR digital filters using cascade structure. [6]

OR

- Q6)** a) Obtain direct form-I realization for the system described by difference equation. [6]

$$y(n) = \frac{1}{2}y(n-1) - \frac{1}{4}y(n-2) + x(n) + \frac{2}{5}x(n-1)$$

- b) Explain impulse invariance method used in design of digital filters from analog filters. [6]
 c) Write any six points which support the statement “Digital filters are superior over analog filters”. [6]

Q7) a) Design ideal band pass filter with frequency response [12]

$$H_d(e^{j\omega}) = \begin{cases} 1 & \text{for } 0 \leq |\omega| \leq \frac{\pi}{4} \\ 0 & \text{otherwise} \end{cases}$$

Find the value of $h(n)$ for $N = 7$. Use rectangular window.

b) Explain any one method used to speed control of induction motor using DSP. [6]

OR

Q8) a) Obtain direct form realization of system function [6]

$$H(z) = 1 + z^{-1} + 3z^{-2} + 5z^{-4} + 8z^{-5}$$

b) Compare FIR and IIR filters. [6]

c) Write short note on “Application of DSP for protective relaying”. [6]



[5870]-1054
T.E. (Electrical)
POWER SYSTEM - II
(2019 Pattern) (Semester - II) (303148)

*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.
- 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) Take base MVA=20MVA and base kV=6kV on motor load in figure 1 and draw per-unit impedance diagram to these base values. [8]

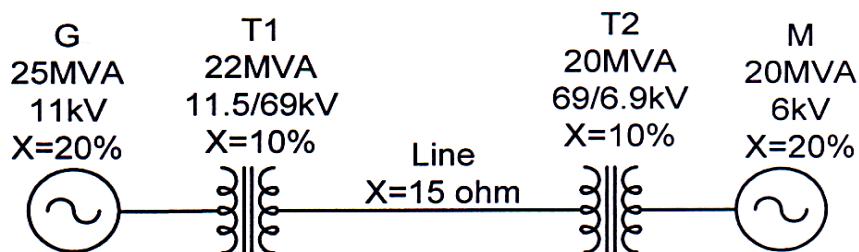


Figure 1

- b)** Justify the following statements. [9]
- i) Y-bus is preferred instead of Z-bus in power system analysis.
 - ii) Per unit system is preferred over actual system parameters.
 - iii) The decoupled load flow method is faster than the Newton-Raphson load flow method.

OR

Q2) a) Determine the unknown elements from the following Y_{BUS} matrix. [10]

$$Y_{BUS} = \begin{bmatrix} ? & ? & ? & ? \\ -j2 & ? & -j5 & ? \\ -j4 & ? & ? & -j4 \\ 0 & -j7 & ? & ? \end{bmatrix}$$

- b)** Prove that per unit impedance of transformer on both sides are same.[7]

P.T.O.

Q3) a) What are the different types of current limiting reactor? With circuit diagram, elaborate operation of each type. [9]

b) Two 11kV, three phase 3MVA generators having sub-transient reactance of 15% operates in parallel. The generator is connected to a transmission line through a transformer of 6 MVA 11/22kV with leakage reactance of 5%. Choose the base MVA=6MVA and base kV = 11kV on the generator, convert circuit into per unit diagram. Determine fault MVA and fault current in kA, if the three-phase fault is on [9]

- i) HT side
- ii) LT side of transformer

OR

Q4) a) In case of three phase fault at the terminal of an unloaded alternator, prove that $x_d'' < x_d' < x_d$ and $I_f'' < I_f' < I_f$ with mathematical relation and diagram. (where I_f is fault current) [9]

b) The generating station at Koyna power plant is rated at 11kV with short circuit capacity of 1000MVA. The generating station at Radhanagar is also rated at 11kV with short circuit capacity of 670MVA. If these two generating stations are connected with interconnector of reactance $j0.4\Omega$, calculate possible short circuit MVA at each station. Take 1000MVA as base (Hint: Short circuit MVA=Base MVA/reactance in pu, Take base MVA=1000MVA and base kV=11kV). [9]

Q5) a) In case of LLG fault, show that fault current [9]

$$I_f = \frac{-3E_{al}Z_2}{Z_1Z_2 + Z_2Z_0 + Z_0Z_1}$$

b) A three phase 100MVA synchronous generator with line to line voltage of 11kV is subjectd to a line to ground fault. The sequence reactance are $x_1 = j0.3pu$, $x_2 = j0.1pu$ and $x_0 = j0.05pu$. If the generator neutral is grounded through a reactance of $x_n = j0.05pu$, determine fault current and fault voltages. Also determine line currents and phase voltages of other phases if the fault is on phase a. [9]

OR

- Q6)** a) An unsymmetrical loaded transmission line is given in following figure 2. Show that $Z_0 = Z_s + 2Z_m + 3Z_n$ and $Z_1 = Z_2 = Z_s - Z_m$ [9]

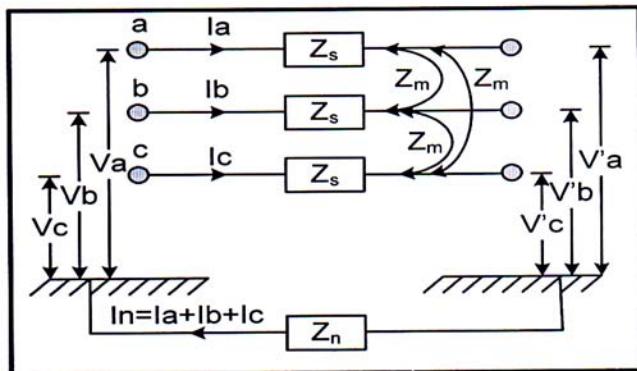


Figure 2

- b) The potential difference to the neutral of a three phase, four wire systems are $-36V$, $j48V$ and $64V$ respectively. The currents in corresponding line wires are $(-1 + j2)$ Amp, $(-1 + j5)$ Amp and $(-j3)$ Amp. Calculate negative sequence power. [9]

- Q7)** a) Compare HVDC and EHVAC transmission system based on following points with due justification [8]
- Insulation requirement
 - Power transfer capability
 - Conductor size
 - Short circuit fault level
- b) Draw the complete single line diagram of HVDC system showing all components and elaborate any three components in detail. [9]

OR

- Q8)** a) Write short note on : [8]
- Homopolar HVDC link
 - Back-to-Back HVDC link
- b) Explain Constant current control in HVDC lines [9]



Total No. of Questions : 8]

SEAT No. :

P751

[5870] - 1055

[Total No. of Pages : 2

T.E. (Electrical)

**COMPUTER AIDED DESIGN OF ELECTRICAL MACHINES
(2019 Pattern) (Semester -II) (303149)**

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*
- 2) *Figures to the right side indicate full marks.*
- 3) *Neat diagram must be drawn whenever necessary.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Explain the procedure to estimate the no load current of three phase transformer. [6]
b) Calculate the percentage regulation at full load 0.8pf lag for a 300kVA, 6600/440v, delta-star, 3 phase, 50Hz, core type transformer having cylindrical coils of equal length with the following data. Height of coils=4.7 cm, thickness of HV coil=1.6 cm, thickness of LV coil=2.5 cm, insulation between LV&HV coils=1.4 cm, Mean diameter of the coils=27 cm, volt/turns=7.9 V, full load copper loss=3.75Kw [8]
c) State & explain the measures to overcome the mechanical forces under short circuit conditions [4]

OR

- Q2)** a) Discuss mechanical forces developed under short circuit condition in a transformer. [6]
b) Draw and explain generalized flow chart for design of transformer. [6]
c) State the assumptions made while calculating leakage reactance of transformer. [6]
Q3) a) Discuss the various factors to be considered for selection specific magnetic loading (B_{av}) and specific electric loading (ac). [10]
b) What are the various types of AC windings for three phase induction motor? Explain in brief any two. [7]

OR

- Q4)** a) Derive the output equation of a 3 phase induction motor in terms of its specific loadings. Also indicate the significance of terms involved. [7]
b) Estimate the main dimensions for 3φ, 50Hz, 10kW, 400V, 4 pole squirrel cage induction motor. Assume full load efficiency of 0.85, full load power factor of 0.9 and winding factor 0.96. The specific magnetic loading is 0.6 wb/m² and the specific electric loading=22000A/m. Take rotor peripheral speed as 25 m/s at synchronous speed. [10]

- Q5)** a) Explain the factors should be considered when estimating the length of air gap of three phase induction motor. Why the air gaps should be as Small as possible? [10]
- b) Discuss the design of wound rotor w.r.t the following [8]
- i) no. of rotor slots
 - ii) no.of rotor turns
 - iii) area of rotor conductors
 - iv) rotor windings.

OR

- Q6)** a) Discuss the various factors which decide selection of number of stator slots in case of 3 phase induction motor [8]
- b) A 15KW, 3 ϕ , 50Hz, 400V, 4 pole, star connected squirrel cage induction motor has 60 slots, each containing 7 conductors. The rotor slot's are 50. Assume full load efficiency as 0.85 full load Power factor as 0.9 and rotor mmf is 80% of stator mmf. Calculate the value of bar and end ring current. Also find the area of each bar and each end ring, if current density is 5A/mm² [10]

- Q7)** a) Derive the equation for No Load Current of 3 ϕ induction motor. [10]
- b) Draw and explain generalized flow chart for design of three phase induction motor. [7]

OR

- Q8)** a) State and explain with neat sketches different types of leakage fluxes in an induction motor and estimate slot leakage reactance in an induction motor. [10]
- b) Explain the effect of ducts on the calculation of magnetizing current of 3 ϕ induction motor. [7]



Total No. of Questions : 8]

SEAT No. :

P752

[Total No. of Pages : 2

[5870]-1056

T.E. (Electrical Engineering)
CONTROL SYSTEM ENGINEERING
(2019 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, Q.7 or Q.8.
- 2) Use of electronic calculator is permitted.
- 3) Assume suitable data, if necessary.

Q1) a) What is angle and magnitude criterion for a point to be on root locus. Explain any five rules for sketching of root locus. [9]

b) The OLTF of a unity feedback system is given by
$$G(s) = \frac{K}{(s+2)(s+4)(s^2 + 6s + 25)}$$
. By applying routh criterion determine stability of system. Find value of K which will cause sustained oscillations. Determine frequency of sustained oscillations. [8]

OR

Q2) a) Explain routh Hurwitz criterion for stability. Explain special cases of routh's criterion. [8]

b) Sketch the root locus, for unity feedback system determine range of values of K and comment on stability.
$$G(s) = \frac{K}{s(s+2)(s^2 + 2s + 2)}$$
. [9]

Q3) a) Explain different frequency domain specifications. [7]

b) Sketch Polar plot for the system given. Also determine GM and PM.[10]

$$G(s) = \frac{K}{s(s+2)(s+5)}$$

OR

P.T.O.

- Q4)** a) Explain co relation between frequency domain and time domain. [7]
 b) Sketch the nyquist plot, for given system and comment on stability

$$G(s) = \frac{50}{s(s+4)(s+6)}. \quad [10]$$

- Q5)** a) State advantages of Bode plot. [6]
 b) Draw bode plot for a unity feedback system with $G(s)$ given as. Also find GM,PM and comment on stability of system. [12]

$$G(s) = \frac{10(s+10)}{s(s+2)(s+5)}$$

OR

- Q6)** a) Explain terms gain cross over frequency, phase cross over frequency, gain margin and phase margin in Bode plot. [6]
 b) Draw bode plot for a unity feedback system with $G(s)$ given as. Also find GM,PM and comment on stability of system. [12]

$$G(s) = \frac{20(s+2)}{s(s+10)}$$

- Q7)** a) Derive transfer function of armature controlled DC servo motor. [9]
 b) Using Ziegler Nicholas method design a PID controller for a system

with unity feedback and $G(s) = \frac{1}{s(s+1)(s+5)}.$ [9]

OR

- Q8)** a) Explain Lead network, its pole zero plot and transfer function. [9]
 b) Explain P, PI, PID controller. [9]



Total No. of Questions : 8]

SEAT No. :

P753

[Total No. of Pages : 2]

[5870]-1057

T.E. (Electrical)

IOT AND ITS APPLICATIONS IN ELECTRICAL ENGINEERING

(2019 Pattern) (Elective - II) (Semester - II) (303151(A))

Time : 2½ Hours]

[Max. Marks : 70]

Instructions to the candidates:

- 1) *Solve 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) *Use of calculator is allowed.*
 - 5) *Assume suitable data if necessary.*

- Q1)** a) A switch is connected to digital pin 7 and a LED is connected to digital pin 13 of Arduino UNO board. Write a program in C to glow the LED when the switch is closed. [9]
b) Explain with syntax and example, following control statements in Python. [9]

OR

- Q3)** a) Explain in detail LM35 sensor. Also, with a neat diagram, show interfacing of LM35 sensor with NodeMCU. [9]
b) Write a short note on Ultrasonic sensors. [8]

OR

P.T.O.

Q4) a) Write a program to read data from DHT11 sensor and display it on serial monitor using Arduino IDE. Sensor is connected to D4 pin of NodeMCU. [9]

b) Explain with a neat diagram, interfacing of stepper motor with NodeMCU. [8]

Q5) a) Write a short note on Wi-Fi communication technology. [9]

b) Write a short note on Zigbee communication technology. [9]

OR

Q6) a) Write a short note on Bluetooth communication technology. [9]

b) Write a short note on Z-Wave communication technology. [9]

Q7) a) Explain the steps in sending the sensor data to cloud platform. [9]

b) What is API in IoT Cloud ? Explain in short, its 4 types. [8]

OR

Q8) a) Write a short note on Thing Speak cloud platform. [9]

b) What is meant by Data Visualization ? Explain in short, any 4 techniques of data visualization. [8]



Total No. of Questions : 8]

SEAT No. :

P754

[Total No. of Pages : 2

[5870]-1058

T.E. (Electrical)

ELECTRICAL MOBILITY

(2019 Pattern) (Elective - II) (Semester - II) (303151B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve 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) *Use of calculator is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Draw block diagram of Battery Management System and explain it. [8]
b) Explain Constant current charging algorithm used in battery charging. [9]

OR

- Q2)** a) Explain functions of battery management system. [8]
b) Explain Coulomb Counting method used in SOC estimation. [9]

- Q3)** a) Draw block diagram for vehicle speed control system and explain it. [10]
b) Draw schematic diagram of series HEV drive train and explain its working. [8]

OR

- Q4)** a) Draw Control Architecture of HEV and all electronic control systems. [10]
b) Draw schematic diagram of parallel HEV drive train and explain its working. [8]

- Q5)** a) Draw charger Architecture and explain it. [8]
b) Explain Advantages of PMSM drives for HEV. [9]

OR

P.T.O.

Q6) a) Write KW rating of AC. Fast Charger of type A,B,C,D and state applications. [8]

b) Write short note on battery swapping. [9]

Q7) a) Draw and explain block diagram of interactive operation between EVs and Power grid. [10]

b) Draw block diagram of Home control and Vehicle control in V2H and explain it. [8]

OR

Q8) a) Draw Flowchart for EV Charging Infrastructure and explain it. [10]

b) Explain V2G concept and state advantages of V2G. [8]



Total No. of Questions : 8]

SEAT No. :

P755

[Total No. of Pages : 2

[5870]-1059

T.E. (Electrical)

CYBERNETICS ENGINEERING

(2019 Pattern) (Semester - II) (Elective - II) (303151-C)

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) Figures to the right side indicate full marks.

- Q1)** a) Define transfer function, poles, zero and pole-zero plot. [6]
b) What do you meant by optimal control system? [6]
c) What do you mean by nonlinear system? What are the different types of nonlinearities? [6]

OR

- Q2)** a) Explain the concept of adaptive control system with block diagram. [6]
b) Explain different types of control systems. [6]
c) Explain the concept of multivariable control system with example. [6]

- Q3)** a) Why mathematical modeling is required? How mathematical modeling is carried out? [6]
b) How the linearization of the nonlinear system is carried out? [6]
c) Obtain the representation of separately exited DC motor using linear ordinary differential equations. [5]

OR

- Q4)** a) List out various simulation tools for mathematical modeling of the system and explain any two tools. [6]
b) How to get the solution of ordinary differential equation using ODE solver? [6]
c) What is the significance of the differential equations of the physical system? [5]

- Q5)** a) Write short note on computer architecture. [8]
b) How data communication is carried out in the industrial environmental. [10]

P.T.O.

OR

- Q6)** a) What are various analog and digital interface? [8]
b) Explain system components for embedded and industrial applications.[10]

- Q7)** a) Define optimization. List out at least five applications of optimization.[7]
b) Explain Genetic Algorithm using example. [10]

OR

- Q8)** a) Write statement of an optimization problem. [7]
b) Explain particle swarm optimization method using example. [10]

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. :

P756

[Total No. of Pages : 2

[5870]-1060

T.E. (Electrical)

ENERGY MANAGEMENT

(2019 Pattern) (Elective - II) (Semester - II) (303151D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve 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) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data if necessary.*

- Q1)** a) Discuss in detail the avenues under supply side management. [9]
b) Explain role of tariff in energy management. Discuss tariff structures used for energy management. [9]

OR

- Q2)** a) Explain with suitable examples role of renewable energy in energy management. [9]
b) With suitable flow graph explain implementation of demand side management for industrial consumers. [9]

- Q3)** a) What is energy audit? Explain steps in detailed energy audit. How it is different from preliminary energy audit? [9]
b) In a process industry data of energy consumption and production is given below. Use Cusum technique to estimate energy saving in plant. Also plot Cusum graph. The specific energy consumption of plant being 800 kCal/T. Fixed consumption of the plant is 3000kCal. [8]

Month	Production (MT)	Actual Energy Consumption (kCal)
1	1000	750000
2	900	720000
3	1100	800000
4	1400	900000
5	1200	800000
6	1300	850000

P.T.O.

OR

- Q4)** a) Discuss use of various instruments for energy audit. [9]
b) Discuss clustering techniques used in data analytics. What information can be obtained from it? [8]

- Q5)** a) A paper mill has investment option for energy saving projects:
Option: A Investment envisaged Rs. 40 lakhs, annual return is Rs.8 lakhs, life of the project is 10 years, discount rate 10% . Calculate economic feasibility by calculating net present value method. [9]
b) Explain Time value of Money. How it affects financial appraisal? How appraisal criteria will change in lending and borrowing condition. [9]

OR

- Q6)** a) 100 numbers of fused 60 Watt incandescent light bulbs (ILB) are replaced by same numbers of 12 Watt CFL instead of new ILB. Calculate the following for 4000 hours of operation per year. [9]
i) The annual “kWh saved”
ii) The annual “kVAh saved” if the power factor of the CFL is 0.6.
iii) The annual reduction in electricity costs if Rs. 4 per kWh is the energy charge and Rs. 250 per kVA per month is the demand charge.
iv) The simple payback period if the ILB costs Rs. 10 and the CFL costs Rs. 100 (assume life of ILB and CFL as 1000 hours and 4000 hours respectively).
b) Explain energy conservation options in sugar industry. [9]

- Q7)** a) Explain energy conservation measures in compressors and blowers. [8]
b) Discuss energy management options in T & D sectors. [9]

OR

- Q8)** a) Discuss energy saving options in pumps and piping systems. [8]
b) Discuss different cogeneration systems. [9]



Total No. of Questions : 8]

SEAT No. :

P757

[Total No. of Pages : 3

[5870]-1061

T.E. (Electronics & Telecommunication)

DIGITAL COMMUNICATION

(2019 Pattern) (Semester - I) (304181)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answers Q1 or Q2, Q3 or Q4, Q5 or Q6, and Q7 or Q8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.

Q1) a) Explain how eye pattern can be used to study ISI. [4]

b) Find the maximum value of error probability Pe for 16-PSK, 16-FSK (orthogonal) and 16-QAM if energy per bit duration is 5×10^{-5} J and double sided power spectral density (PSD) of AWGN is 10^{-9} W/Hz. [6]

Given :

$$\operatorname{erfc}(3.1622) = 0.00000774819$$

$$\operatorname{erfc}(1.9634375) = 0.00549$$

$$\operatorname{erfc}(7.0710678) = 1.5239709 \times 10^{-23}$$

c) Describe with the help of block diagram, MSK transmitter along with waveforms. Mention the bandwidth requirement. [8]

OR

Q2) a) Compare MSK & QPSK. [4]

b) With the help of neat block diagram explain OFDM transmitter and receiver system. [8]

c) Write short note on : Raised cosine function: a solution to Inter Symbol Interference (ISI) and mention its limitations. [6]

P.T.O.

Q3) a) A BPSK-DSSS system using coherent detection is used to transmit data at 250bps & system has to work in a hostile jamming environment with minimum error performance of one error in 20000 bits. Determine the minimum chipping rate if the jamming signal is 300 times stronger than the received signal. [9]

b) Write a short note on : [8]

- i) PN sequence Generator
- ii) Frequency hop Spread spectrum

OR

Q4) a) Information bit duration of DS-BPSK SS system is 1 MHz. Assuming an average error probability of 10^{-5} . Calculate jamming margin if $Q(4.25) = 10^{-5}$. [9]

b) Explain DSSS based CDMA. [8]

Q5) a) Given the messages X_1, X_2, X_3, X_4, X_5 with respective probabilities of 0.4, 0.19, 0.16, 0.15 and 0.1. Construct codeword by minimum variance Huffman code. Compute source entropy, codeword length, efficiency, redundancy and variance. [10]

b) Calculate the capacity of an AWGN channel whose bandwidth is 1 MHz and S/N ratio of 40 dB. [4]

c) State and explain channel coding theorem. [4]

OR

Q6) a) Compute Shannon Fano code for following message ensemble. [10]

Symbols	X_1	X_2	X_3	X_4
Probabilities	0.4	0.3	0.2	0.1

Compute average codeword length, Entropy and coding efficiency.

b) State and explain Information Capacity theorem. [4]

c) Compare between source coding and Channel coding. [4]

Q7) a) For a systematic (7, 4) LBC parity matrix is given as : **[9]**

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

- i) Construct a generator matrix.
 - ii) Find code vectors for messages [1 1 0 0] and [0 0 1 1]
 - iii) If the received code vector is $R = [0 1 1 1 1 0 1]$, find the corrected codeword
- b) Explain the generation of systematic and non systematic cyclic code. **[8]**

OR

Q8) a) Define following terms for LBC **[9]**

- i) Code vector
 - ii) Code rate
 - iii) Hamming distance
 - iv) Hamming weight
 - v) Systematic code
- b) What are Turbo codes? Explain its bit error performance for uncoded transmission. **[8]**



Total No. of Questions : 8]

SEAT No. :

P758

[Total No. of Pages : 2

[5870] - 1062
T.E. (E & TC)
ELECTROMAGNETIC FIELD THEORY
(2019 Pattern) (Semester - I) (304182)

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 wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.*

Q1) a) Derive the boundary condition between two perfect dielectric. [10]

b) Electric field intensity $\bar{E} = 60\bar{ax} + 20\bar{ay} - 30\bar{az}$ V/m at a point on the interface between air and a conducting surface. Find \bar{D} & ρ_s at that point. [8]

OR

Q2) a) The two concentric spherical shells having inner radius is 0.1m and its potential is 0 Volts. The outer radius is 0.2m and its potential is 100 Volts. The medium between them is a free space. Find \bar{E} and \bar{D} using spherical coordinate system. [10]

b) Derive Poisson's and Laplace equation. [8]

Q3) a) Derive an expression for magnetic vector potential in the region surrounding an infinitely long straight current carrying conductor along z-direction. [9]

b) Explain motional e.m.f. and transformer e.m.f. [8]

OR

Q4) a) In free space $\bar{E} = 20 \cos(wt - 50x)\bar{a}_y \frac{V}{m}$, Calculate current density and magnetic field intensity. [9]

b) Write Maxwell's equation in differential and integral form for good conductor. [8]

P.T.O.

- Q5)** a) Derive electromagnetic wave equation E & H in phasor form. [9]
 b) A uniform plane wave is travelling at a velocity of $3.5 \times 10^5 \text{ m/s}$ having wavelength 0.35mm in a non-magnetic good conductor. Find the frequency of wave and the conductivity of a medium. [9]

OR

- Q6)** a) What is polarization of uniform plane wave? Explain the different types of polarization. [9]
 b) Find the reflected and transmitted electric and magnetic field intensity at the interface between $\epsilon_r = 8.5, \mu_r = 1, \sigma = 0, E_i = 1.5V$ and in free space. [9]

- Q7)** a) Write the primary and secondary parameters of transmission line and derive the relationship between Z_0 in terms of primary constant. [9]

- b) A line has zero dissipation has $R = 0.006\Omega/\text{m}$, $L = \frac{2.5\mu\text{H}}{\text{m}}$, $C = 4.45\mu\text{F/m}$. If the line is operated at 10MHz. Calculate characteristics impedance, propagation constant, Velocity of propagation, and wavelength. [8]

OR

- Q8)** a) The characteristic impedance of a high frequency line is 100Ω . It is terminated in an impedance of $100 + j100 \Omega$. Using smith chart find the impedance at 0.125 wavelength away from the load end. [9]
 b) Derive the relationship between standing wave ratio and reflection coefficient. [8]



Total No. of Questions : 8]

SEAT No. :

P759

[Total No. of Pages : 2

[5870] - 1063

**T.E. (Electronic and Telecommunications/Electronic)
DATABASE MANAGEMENT
(2019 Pattern) (Semester - I) (304183)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 from following questions.
- 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 how constraints are defined in SQL-Primary key, Foreign key, Unique key. [7]
b) Explain with example, aggregate function. [5]
c) What are stored procedures and stored functions? [5]

OR

- Q2)** a) Explain what do you mean by DDL, DML and DCL in SQL. [7]
b) Explain in short use of groups in SQL. [5]
c) What are transaction control commands in SQL? [5]

- Q3)** a) Explain basic concept of transaction and properties of transaction. [7]
b) Explain concept of schedule. What is serial schedule? [5]
c) Explain with example, deadlock handling in concurrency control. [5]

OR

- Q4)** a) Explain with example, transaction management. [7]
b) Explain serializability with respect to conflict and view. [5]
c) What is need of locking method? Explain types of locking methods in short. [5]

- Q5)** a) Explain with schematic diagram, multi-user DBMS architecture. [6]
b) What are performance parameters for parallel database? [6]
c) Explain with example, evaluating parallel query in parallel databases.[6]

OR

- Q6)** a) Explain with schematic diagram, Oracle architecture. [6]
b) Explain with example, types of parallel database architectures. [6]
c) With suitable schematic diagram, explain virtualization on Multicore processors. [6]

- Q7)** a) Explain with suitable example, distributed database management system. [6]
b) With suitable schematic diagram, explain architecture of distributed database. [6]
c) Explain, how distributed database is stored. [6]

OR

- Q8)** a) What are factors encouraging DDBMS and advantages of distributed databases. [6]
b) Explain with example, concurrency control in distributed database. [6]
c) Explain with example, what are types of distributed databases. [6]



Total No. of Questions : 8]

SEAT No. :

P760

[Total No. of Pages : 2

[5870]-1064

T.E. (E & TC)

MICROCONTROLLERS

(2019 Pattern) (Semester - I) (304184)

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) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary

Q1) a) Explain in depth the programming model of PIC 18Fxxxx microcontroller. [6]

- b) Explain the power down modes of PIC 18Fxxxx. [6]
- c) Enlist features of PIC 18Fxxx Microcontroller. [6]

OR

Q2) a) Draw and explain the Reset functional diagram of PIC 18Fxxxx. [6]

- b) Explain with example functioning of ALU in PIC 18Fxxxx. [6]
- c) Draw and explain the program memory of PIC 18Fxxxx. [6]

Q3) a) Enlist specifications of ADC used, also draw the interfacing diagram of temperature sensor with PIC 18Fxxxx with initialization program. [9]

- b) Explain interrupt structure of PIC 18Fxxxx with reasons. [8]

OR

P.T.O.

- Q4)** a) Draw and explain the Timer 1 operation of PIC 18Fxxxx in details, compare the Timer 0,1 and 2. [9]
b) Write a program for 1 KHz and 10% duty cycle PWM generation with Fosc = 10MHz. [8]

- Q5)** a) Write an embedded C program to blink LED connected to port B of PIC 18Fxxxx with delay of 1 msec using Timer 0, 16 bit [9]
b) Design a PIC 18Fxxxx test board with facility of status indication on LED, Buzzer, and lamp connected PIC 18Fxxxx through relay, write embedded C program [9]

OR

- Q6)** a) Draw and explain port structure of PIC 18Fxxxx Microcontroller with different registers used in Programming. [9]
b) Interface 2 lines, 16 characters LCD to PIC 18Fxxxx microcontroller, write embedded C program to display a message “HELLO” on LCD at second line. [9]

- Q7)** a) Explain with block diagram I2C mode of MSSP structure in detail. [9]
b) State features of RTC and draw an interfacing diagram with PIC 18Fxxxx. [8]

OR

- Q8)** a) Explain the use of BRG register for calculation for baud rate with UART receiver block diagram. [9]
b) Draw an interfacing diagram of EEPROM with PIC 18Fxxxx using SPI protocol with initialization program. [8]



Total No. of Questions : 8]

SEAT No. :

P761

[Total No. of Pages : 3

[5870] - 1065

T.E. (Electronics & Telecommunication Engineering)
DIGITAL SIGNAL PROCESSING (Elective - I)
(2019 Pattern) (Semester - I) (304185)

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) Compute DFT of $x[n] = \{1,2,0,1\}$ using direct computation method and matrix method. [8]

b) Compute FFT of $x[n] = \{1,1,0,0\}$ using decimation in time (DIT) FFT algorithm and decimation in frequency (DIF) FFT algorithm. [10]

OR

Q2) a) Compute circular convolution of $x_1[n] = \{1,2,3,4\}$ and $x_2[n] = \{1,2,3\}$ using graphical method and matrix method. [8]

b) Derive decimation in time FFT algorithm for 8 point DFT and explain how butterfly structure is used in FFT. [10]

Q3) a) Design analog Butterworth filter to have magnitude of 0.9 at 100 Hz and magnitude of 0.2 at 300 Hz. [8]

b) Write transfer function of second order analog Butterworth low pass filter with cutoff frequency 0.8 rad/sec and convert it into digital Butterworth filter using bilinear transformation method with sampling period of 0.1 second. [5]

c) Realize the following IIR filter using direct form I and direct form II

$$H(z) = \frac{1 + 2z^{-1} + 3z^{-2}}{1 + 4z^{-1} + 5z^{-2} + 7z^{-3}}$$
 [5]

P.T.O.

OR

- Q4) a)** Design digital Butterworth filter to meet the following specifications using bilinear transformations with sampling period of 0.5 seconds. [14]

$$0.8 \leq |H(e^{jw})| \leq 1 , \quad 0 \leq w \leq 0.3\pi$$

$$|H(e^{jw})| \leq 0.1 , \quad w \geq 0.7\pi$$

- b)** Realize the following IIR filter using cascade realization [4]

$$H(z) = \frac{1 + 3z^{-1} + 2z^{-2}}{1 + 1.2z^{-1} + 0.32z^{-2}}$$

- Q5) a)** Design FIR filter with order 10 to meet the following specifications using Hamming window. [9]

$$|H(e^{jw})| = 1 , \quad |w| \leq 0.5\pi$$

$$|H(e^{jw})| = 0 , \quad |w| > 0.5\pi$$

- b)** Design FIR filter to meet following specifications using Hamming window. [8]

$$H_d(e^{jw}) = e^{-3jw} , \quad |w| \geq 0.4\pi$$

$$H_d(e^{jw}) = 0 , \quad |w| < 0.4\pi$$

OR

- Q6) a)** Design FIR filter to meet following specifications using Blackmann window. [9]

$$\begin{aligned} H_d(e^{jw}) &= e^{-4jw} , \quad 0.2\pi \leq |w| \leq 0.5\pi \\ &= 0 , \quad \text{otherwise} \end{aligned}$$

- b)** Design FIR filter to meet following specifications using rectangular window. [8]

$$\begin{aligned} H_d(e^{jw}) &= e^{-5jw} , \quad 0 \leq |w| \leq 0.3\pi , \quad 0.5\pi \leq |w| \leq \pi \\ &= 0 , \quad \text{otherwise} \end{aligned}$$

Q7) a) Draw the diagram of human speech production system and explain the role of vocal cords, velum and vocal tract. [8]

b) What is artifact ? What are different artifacts in ECG? State their reasons and suggest methods to suppress these artifacts. [9]

OR

Q8) a) Draw the diagram of standard ECG signal and explain different waves and segments in ECG signal with reference to heart activity. [8]

b) Explain ZCR and autocorrelation methods for pitch detection of speech signal. [9]



Total No. of Questions : 8]

SEAT No. :

P762

[Total No. of Pages : 2

[5870] - 1066

T.E. (Electronics & Telecomm.)

ELECTRONIC MEASUREMENTS (Elective - I)
(2019 Pattern) (Semester - I) (304185)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to right side indicate full marks.*
- 3) *Assume suitable data, if necessary.*

- Q1)** a) With help of diagram, explain frequency selective wave analyser. [9]
b) Define synthesizer. Describe the frequency synthesis technique in detail. [9]

OR

- Q2)** a) With diagram, explain conventional standard signal generator. [9]
b) Draw the block diagram & explain function generator. [9]

- Q3)** a) Using diagram, explain function of each block of CRO. Write applications of CRO. [9]
b) Illustrate the z - modulation and x-y mode operation. List and explain the measurements on CRO. [8]

OR

- Q4)** a) Explain power scope with diagram. Write functions and application of it. [9]
b) Compare CRO and DSO on the basis of specifications. [8]

- Q5)** a) Explain internal and external acquisition cards. [9]
b) With block diagram, explain OLED Display. [9]

OR

P.T.O.

- Q6)** a) With the help of diagram explain LCD display. Explain functional pins. [9]
b) What is universal counter? How it is used? Write down the specification of EIA/ TIA 232, 423, 422 and 488? [9]

- Q7)** a) Explain in detail industrial revolution and their impact on industrial automation. [9]
b) With the help of diagram, describe all functional blocks of Microwave measurements using network analyzer. [8]

OR

- Q8)** a) With the help of neat diagram, describe the all functional blocks of Spectrum Analyzer. [9]
b) Describe in detail EMI/ EMC test instruments. Illustrate the OTDR. [8]



Total No. of Questions : 8]

SEAT No. :

P1005

[5870] - 1068

[Total No. of Pages : 2

T.E. (Electronic & Telecommunication)

COMPUTER NETWORKS

(2019 Pattern) (Semester - I) (304185 (D) (Elective-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.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Assume suitable data, if necessary.

Q1) a) Explain the various performance parameters of network layer. [6]

b) Explain the services provided by Network Layer. [6]

c) Compare datagram switching and virtual circuit switching [6]

OR

Q2) a) Explain error reporting messages, informational messages, neighbour discovery messages and group membership messages related to ICMPv6. [6]

b) Explain the network id and host id. [6]

c) What is the difference between classless addressing and classful addressing? Concepts related to IPv4 addresses. [6]

Q3) a) Explain the unicast routing and multicast routing protocol [8]

b) What is routing? Explain the distance vector routing algorithm [9]

OR

Q4) a) What is routing? Explain the link state routing algorithm [8]

b) Explain inter-domain and intra-domain routing. [9]

PTO.

- Q5)** a) Explain TCP Connection establishment, TCP data transfer and TCP connection termination. [9]
b) What are the duties of Transport Layer? List the services provided by Transport Layer to upper layers. [9]

OR

- Q6)** a) What is congestion control? Explain the leaky bucket algorithm with suitable diagram. [9]
b) Draw TCP header and explain function of each field. [9]

- Q7)** a) Explain the DNS in detail. [8]
b) Explain the architecture of E-mail. [9]

OR

- Q8)** a) Explain the telnet protocol and FTP Protocol with diagram. [8]
b) Explain BOOTP and DHCP Protocol. [9]



Total No. of Questions : 8]

SEAT No. :

P764

[Total No. of Pages : 2

[5870]-1069

T.E. (E & TC)

CELLULAR NETWORKS

(2019 Pattern) (Semseter - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any 4 questions form Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.
- 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 neat diagram, describe co-channel and adjacent channel interference in cellular network. [8]

b) Draw and explain following Hand-off mechanism [9]
i) Mobile controlled Hand-off
ii) Network controlled Hand-off

OR

Q2) a) Discuss the path-loss exponent effect on frequency Reuse for a cellular system with total 500 duplex voice channel without frequency reuse. The service area is divided into 152 cells. The required signal to co-channel interference ratio is 17 dB. Considering path loss exponent is 3 to calculate : [9]

i) Cell cluster size
ii) No of cell cluster in the service Area
iii) Maximum no of users in service at any instant.
b) Explain the following terms with diagram : [8]
i) Macro cell ii) Micro cell
iii) Pico cell iv) Femto cell

P.T.O.

- Q3)** a) Define Blocking probability. With neat diagram and assumptions, explain Teletraffic system model. [9]
b) Derive an expression to measure required transmitted power at station with link budget expression. [8]

OR

- Q4)** a) Each side of hexagon cell is $\frac{2}{\sqrt{3}}$. A cellular system has $N = 48$ channels/cell with blocking probability of 0.02. Further, traffic per user is 0.04E. the cell radius is 1km. With neat diagram, Calculate no. of users supported in a area of 900 km^2 . Total traffic is 38.4E. [9]

b) Define and explain : [8]

 - i) Grade of service
 - ii) Offerred Traffic
 - iii) Delay system
 - iv) Loss system

- Q5)** a) Describe with neat diagram wireless LAN. Compare Infrastructure and Adhoc based wireless LAN. [9]
b) Draw and explain Radio protocol Architecture for LTE - Advanced system [9]

OR

- Q6)** a) Draw and explain in detail LTE Architecture. [9]
b) Compare 3G and 4G with respect to following : [9]

 - i) Data Rate supported
 - ii) Modulation Technique
 - iii) Frequency Band
 - iv) Technology used

- Q7)** a) With neat diagram, use of network coding for Content distribution in a multi - Hop network. [9]
b) Classify Schedulers & Explain in brief. [9]
i) Weighted Round Robin Scheduling
ii) Weighted Fair Queuing.

OR

- Q8)** a) Explain following terms with reference to Scheduler Design : [8]
i) Classifier ii) Channel Quality
b) List various Design forces for link Adoption Schemes at physical and MAC layers. [10]



Total No. of Questions : 8]

SEAT No. :

P765

[5870] - 1070

[Total No. of Pages : 2

**T.E. (Electronics & Telecommunication)
PROJECT MANAGEMENT
(2019 Pattern) (Semester - II) (304193)**

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) Assume suitable data, if necessary.

- Q1)** a) Explain the importance of Team Management. [6]
b) What are different organisational structures. [6]
c) Write a short note on Diversity Management. [6]

OR

- Q2)** a) Explain the need of project management in detail. [6]
b) Derive an equation for Break Even Point. [6]
c) List out various project team member responsibilities. [6]

- Q3)** a) Explain the two important methods of Project planning in brief. [6]
b) What is AOA network and AON network? Explain with suitable example. [6]
c) Define Free Float and bring out its importance. How is it determined. [6]

OR

- Q4)** a) What do you understand by Bar Chart? With suitable example, describe the process of construction of Gantt's chart. [6]
b) Describe the different types of activities in a network and explain the use of dummy activity of updating decided. [6]
c) What information is necessary for updating the project during execution? How is frequency of updating decided? [6]

- Q5)** a) What is risk management? [6]
b) What are the different method to control risk in projects? [5]
c) Explain the role of risk management in a project? [6]

OR

- Q6)** a) Explain various risk management tools. [6]
b) Enlist various steps in risk management. [5]
c) Explain the process of project Financial Management. [6]

- Q7)** a) Write a short note on Entrepreneurship. [6]
b) What are the factors affecting emerging entrepreneurship? [5]
c) Explain project development and its steps. [6]

OR

- Q8)** a) Write a short note on Patents, Copyright, Trademark. [6]
b) Explain Product Planning. [5]
c) What are the Characteristics of Successful Entrepreneurs? [6]

❖ ❖ ❖

[5870]-1071

T.E. (E & TC Engineering)
POWER DEVICES & CIRCUITS
(2019 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, Q.7 or Q.8.
- 2) Neat diagrams and wave forms must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of nonprogrammable calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) a) What are PWM techniques in inverter? Explain Multiple PWM technique with waveforms. [5]

b) Give the classification of inverters? Draw Three Phase voltage source inverter for balanced star R load? [5]

c) Explain working of single phase full bridge inverter for R load with input & output waveforms. Derive an expression for rms o/p voltage. [7]

OR

Q2) a) Draw a three phase inverter for balanced star R load? Explain its operation of 120° mode with gate signals & output waveforms. [12]

b) What is mean by harmonics in inverters? Explain effects of harmonics. [5]

Q3) a) Explain with neat diagram the operation of 4 quadrant chopper with dc motor as a load. [8]

b) Explain operation of step up chopper with circuit diagram and derive an

expression for its o/p voltage : $V_o = \frac{Vs}{(1-D)}$ where D is duty cycle. [6]

c) A step down DC chopper has a resistive load of $R = 15 \Omega$ and input voltage $E_{dc} = 200V$. The chopper frequency is 1KHz. If the duty cycle is 50%, determine [4]

- i) Average output voltage
- ii) rms output voltage

OR

Q4) a) A step up chopper is used to deliver load voltage is 660V from 220V DC source. If the blocking period of thyristor is 500 μ s, compute the turn on time. [4]

b) What are various types of choppers? Explain operation of type C chopper with circuit diagram. [8]

c) Explain with block schematic working of SMPS. [6]

Q5) a) What are different over voltage protection techniques in power electronics? Explain any one in detail. [7]

b) Explain ZCS resonant converter with circuit & waveforms. [6]

c) For a thyristor, Maximum junction temperature is 110°C. The thermal resistances are $\theta_{JC} = 0.16$, $\theta_{CS} = 0.08\text{ }^{\circ}\text{C/W}$. For heat sink temperature of 60°C, calculate total average power loss in thyristor - sink combination.

If heat sink temperature is reduced to 50°C, find new total average power loss in thyristor - sink combination. [4]

OR

Q6) a) What is EMI? Explain various sources & minimizing techniques of EMI. [7]

b) Compare resonant converters: ZVS with ZCS. [5]

c) Explain with neat diagram working of snubber circuit used in power devices. [5]

Q7) a) Explain with neat diagram BLDC drive. [6]

b) Explain operation of On-line & off-line UPS with block schematic. [12]

OR

Q8) a) Explain with neat diagram variable voltage type three phase induction motor drive. [5]

b) Explain with diagram architecture of EVs battery charger. [5]

c) Draw & explain single phase full wave ac voltage controller has a resistive load with following waveforms : [8]

i) Gate signals for both SCRs

ii) Output rms voltage & current

iii) Voltage waveform across first SCR



Total No. of Questions : 8]

SEAT No. :

P2322

[Total No. of Pages : 2

[5870]-1072

T.E. (E & TC)

DIGITAL IMAGE PROCESSING

(2019 Pattern) (Semester - II) (304195A) (Elective - II)

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) *Your answers will be valued as a whole.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Explain any one line detection mask in all directions. [6]
b) What is first order and second order derivative for edge detection? Compare performance of both. [6]
c) Explain region growing & region split & merge w.r.to image segmentation. [6]

OR

- Q2)** a) Explain in brief adaptive thresholding & how it is achieved through Otsu's method. [6]
b) Explain edge detection using Prewitt and Sobel operator. [6]
c) What is Hough Transform. How it is used for edge linking. [6]

- Q3)** a) Draw & explain block diagram of image compression model. [6]
b) Explain Quantitative & Qualitative fidelity criteria in image compression. [6]
c) What is motion estimation. Explain any one algorithm in detail. [5]

OR

- Q4)** a) What is data redundancy. Explain any two redundancies in detail. [6]
b) Explain image compression using JPEG with suitable block diagram. [5]

P.T.O.

- c) Generate Huffman code for the following data. Calculate efficiency of Huffman code. [6]

Gray Level	Probability
a ₁	0.2
a ₂	0.3
a ₃	0.06
a ₄	0.1
a ₅	0.04
a ₆	0.3

- Q5)** a) Draw and explain in detail image degradation model. [6]
 b) Explain in detail Weiner filter for image restoration. [6]
 c) Explain any three types of noise models. [6]

OR

- Q6)** a) Define image enhancement & image restoration. Compare both in detail. [6]
 b) Write short note on estimating the degradation function in image restoration. [6]
 c) Explain any three geometric transforms in image restoration. [6]

- Q7)** a) Explain pattern and pattern classes. [6]
 b) Explain any one algorithm of content based image retrieval in object recognition. [6]
 c) Explain object recognition using structural methods. [5]

OR

- Q8)** a) Explain any one image classification algorithm. [6]
 b) Explain in detail character recognition with suitable block diagram. [6]
 c) Write short note on deep learning using CNN. [5]



[5870]-1073**T.E. (E&TC)****SENSORS IN AUTOMATION****(2019 Pattern) (Semester - II) (Elective - II) (304195(B))***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 side indicate full marks.
- 3) Draw neat diagrams wherever necessary.
- 4) Assume suitable data, if necessary.

Q1) a) Define Sensor, explain Role of Sensors in Automation. [4]

b) Explain working principle and one application of Piezoelectric Transducer. [6]

OR

Q2) a) What is thermo emf, explain seeback effect? [4]

b) Explain in detail about operating principle of differential Pressure Transducer (With neat sketch diagram). [6]

Q3) a) Explain in detail Solid - State Pressure Sensors. [5]

b) What is Fiber optic sensing? How does Fiber sensing work? [5]

OR

Q4) a) Explain LVDT? Write applications of LVDT sensors? [5]

b) What is Pressure Sensor? Explain it working principle along with types? [5]

Q5) a) What are the different selection criteria for Solid state flow sensors? Explain with example. [8]

b) Distinguish between piezoelectric sensors and sensors based on strain gauges. [4]

c) Write a short note on a) YF-S201 2) E8FC-25D (Solid state 1C) [4]

OR

- Q6)** a) Which transducer measure changes in acceleration, strain, pressure and temperature? Justify answer with example. [8]
b) List out advantages and disadvantages of strain gauge transducer. [4]
e) Describe flow and force sensors with neat diagrams. [4]

- Q7)** a) List out advantages and disadvantages of RFID Sensor. [8]
b) Write a short note on Camera sensor and Colour Sensor. [4]
c) How LDR works give in detail. [4]

OR

- Q8)** a) Explain in detail about working principle of Light Sensors and RFID Sensor with application. [8]
b) How the Ultrasonic proximity detector works for motion detection. [4]
c) What do you mean by Ph Measurement? [4]

- Q9)** a) What is Data acquisition system? Explain the single and multichannel DAC with the help of block diagram. [10]
b) Explain the IOT based Greenhouse system with the help of block diagram. [4]
c) What are different types of sensors in IOT? [4]

OR

- Q10)**a) Explain the IOT based healthcare system with the help of block diagram. [10]
b) Explain UART Interface with the help of block diagram. [4]
c) Write a note on : Internet of things. [2]
d) State various applications of IOT. [2]



[5870]-1074**T.E. (E & TC & Electronics)****ADVANCED JAVA PROGRAMMING****(2019 Pattern) (Elective - II) (304195C) (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, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data if necessary.

Q1) a) What is ArrayList in Java? Explain with example. [6]

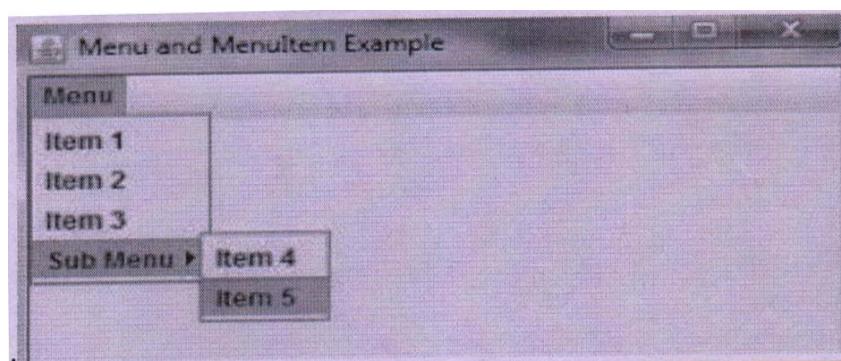
b) Write a short note on : [6]

- i) Border Layout
- ii) Grid Layout

c) What are AWT component? Explain some AWT component. [6]

OR

Q2) a) Write a program to add Three Menu Item and One Sub Menu to Menu, add two MenuItem to SubMenu and add these components to Menubar. [10]



b) Write a short note on : [8]

- i) Hashing in java
- ii) Java.util Package

- Q3)** a) What is JDBC? Explain driver types of JDBC. [9]
b) Give the details of the Executing SQL commands. [8]

OR

- Q4)** a) What is database connection? Explain how to connect any java application with the database using JDBC. [9]
b) Give a brief explanation for executing queries. [8]

- Q5)** a) Define RMI and explain the architecture of RMI with suitable diagram. State the goals of RMI. [9]
b) Explain the concept of stub, skeleton, parameter marshalling and unmarshalling in the context of RMI. [9]

OR

- Q6)** a) Compare between Stub and Skelton? Explain with neat diagram the RMI Architecture. [9]
b) Write a java program to perform addition of two numbers with Client/ Server Application using RMI. [9]

- Q7)** a) Difference between Servlet and JSP. [5]
b) Explain in brief what are cookies. [4]
c) Explain Datagram, Datagram Socket and Datagram packet. [8]

OR

- Q8)** a) Write a simple Java socket programming where client sends a text and server receives and prints it. [10]
b) What is TCP/IP client socket in JAVA? Discuss some methods of TCP/ IP client socket class. [7]



Total No. of Questions : 8]

SEAT No. :

P769

[Total No. of Pages : 2

[5870]-1075

T.E. (E&TC)

EMBEDDED PROCESSORS

(2019 Pattern) (Semester - II) (304195(D)) (Elective - 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, Q.7 or Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Write algorithm or flowchart to generate triangular waveform using DAC of LPC2148 [4]
- b) List the features of ON chip ADC of LPC2148. [6]
- c) Draw and Explain interfacing of EEPROM using I2C communication to LPC2148. Draw flowchart to read and write data in EEPROM. [8]

OR

- Q2)** a) Write features of DAC in LPC2148. [6]
- b) Write down the features of VART of LPC2148 write algorithm to transmit character ‘P’ to PC. [8]
- c) Compare ARM cortex M3 with ARM7TDMI. [4]

- Q3)** a) Explain CMSIS standard. [8]
- b) Write features of STM32F4XX processor. [5]
- c) Compare ARM Cortex A, M and R. [5]

OR

- Q4)** a) Explain different peripherals in STM32F4XX. [8]
- b) Enlist different clocks of STM32F4XX. [5]
- c) Compare ARM Cortex M3 with ARM cortex M4. [5]

P.T.O.

- Q5)** a) Enlist various registers required to configure serial communication of STM32F4XX Microcontroller. Explain any two registers with suitable example. [9]
- b) Explain an algorithm to send “SPPU” serially via STM32F4XX controller to desktop PC with baudrate 9600. [8]

OR

- Q6)** a) Write note on a different types of registers of STM32F4XX. [5]
- b) Draw an interfacing diagram and algorithm to interface push button and LED using STM32F4XX. [7]
- c) Write an algorithm to display 0 to 9 on 7 segment display. [5]

- Q7)** a) Enlist the features of CAN bus. [4]
- b) Draw an interfacing diagram of STM32F4XX with accelerometer MPV 6050. [5]
- c) Interface 7 segment with STM32F4XX. Write algorithm to display “3”. [8]

OR

- Q8)** a) Advantages & Disadvantages of ultrasonic proximity sensor. [4]
- b) Explain how PWM is used to control speed and direction of DC motor. [8]
- c) Explain CAN bus & its application. [5]



Total No. of Questions : 8]

SEAT No. :

P770

[Total No. of Pages : 2

[5870]-1076

T.E. (E&TC)

NETWORK SECURITY

(2019 Pattern) (Semester - II) (304195(E)) (Elective - 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, Q.7 or Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Compare symmetric key encryption and Asymmetric key encryption. [6]

b) Explain Diffie-Helman key exchange algorithm with example. [6]

c) What is Block cipher? Discuss Block cipher modes of operation. [6]

OR

Q2) a) Discuss RC4 Stream Cipher with an example. [6]

b) Draw and Explain Feistal Cipher structure in detail. [6]

c) Using RSA algorithm encrypt plain text “03”, with $p = 11$, $q = 3$, & $e = 13$. [6]

Q3) a) Explain Knapsack algorithm. [6]

b) Write a note on Digital Signature algorithm. [6]

c) What is authentication? Explain various methods of authentication. [5]

OR

Q4) a) Discuss x. 509 authentication service. [6]

b) Elaborate the characteristics needed in secure Hash function. [6]

c) What is message digest? Compare MAC with SHA1 [5]

P.T.O.

- Q5)** a) Explain in detail, working of PGP algorithm. [6]
b) Describe IPsec security services. [6]
c) What is security association and what are the fields of SAD. Discuss in brief. [6]

OR

- Q6)** a) What is S/MIME? State its operation in detail. [6]
b) Discuss Authenticati Header and Encapsulation in email security. [6]
c) Draw the IPsec security architecture and explain in detail. [6]

- Q7)** a) What are the types of firewall? Explain any two in detail. [6]
b) Discuss nature of viruses and the types of viruses. [6]
c) List and briefly define three classes of intruders. [5]

OR

- Q8)** a) Explain SSL protocol in detail. [6]
b) Write a note on secure Electronic Transaction. [6]
c) Enlist four techniques used by firewalls to control access and enforce a security policy. [5]



Total No. of Questions : 8]

SEAT No. :

P771

[Total No. of Pages : 2

[5870]-1077

T.E. (Electronics)

POWER AND INDUSTRIAL ELECTRONICS

(2019 Pattern) (Semester - I) (304201) (Theory)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answers 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) Explain the difference between SCR based conventional rectifiers and IGBT based rectifiers. [9]

b) Give an Overview of applications of controlled rectifiers in DC drives. [9]

OR

Q2) a) Draw and explain single phase full converter for R load. [9]

b) Draw the circuit diagram, waveforms and explain operation of 3 phase semi converter for RL Load. [9]

Q3) a) Explain single phase AC voltage controller with R load. [9]

b) A chopper circuit is operating on TRC principle at a frequency of 2kHz on a 220V d.c. supply. If a load voltage is 170V, compute the conduction and blocking period of thyristor in each cycle. [8]

OR

Q4) a) Explain with circuit diagram and waveforms, working of 2 Quadrant and 4 Quadrant chopper. [9]

b) A step-up chopper has input voltage of 220V and output voltage of 660V. If the non-conducting time of thyristor chopper is 100 Micro seconds, compute the pulse-width of output voltage. In case the pulse-width is halved for constant frequency operation, find the new output voltage. [8]

P.T.O.

Q5) a) Explain voltage control of Inverters using PWM. [9]

b) Draw and explain Three Phase Inverter for R Load. 120 degree conduction mode. [9]

OR

Q6) a) Explain Design of control circuit for three phase inverters. [9]

b) Elaborate Variable frequency and Voltage control of inverters. [9]

Q7) a) Draw and explain monopolar HVDS transmission system. Also state its advantages. [9]

b) Explain application of power electronics in induction heating. [8]

OR

Q8) a) Explain the applications of Power Electronics in Electric Vehicles & Traction applications. [9]

b) Write a short note on UPS: On-line and Off-line. [8]



Total No. of Questions : 8]

SEAT No. :

P772

[Total No. of Pages : 2

[5870] - 1078

T.E. (Electronics Engineering)

**ELECTROMAGNETIC WAVES AND PROPAGATION
THEORY**

(2019 Pattern) (Semester - I) (304202)

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 side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) A circular loop conductor lies in plane $z = 0$ and has a radius of 0.1 m and resistance of 5Ω . Given $\bar{B} = 0.2 \sin 10^3 t \bar{a}_z$ T, determine the current in the loop. [9]
b) Explain the Boundary conditions for time varying fields. [8]

OR

Q2) a) If the magnetic field $\bar{H} = [3x \cos \beta + 6y \sin \alpha] \bar{a}_z$, find current density \bar{J} if fields are invariant with time. [9]
b) Calculate the displacement current through parallel plate air filled capacitor having plates of area 10 cm^2 separated by a distance 2 mm connected to 300 V, 1 MHz source. [8]

Q3) a) Explain the terms propagation constant, attenuation constant and phase constant in relation with uniform plane wave. [9]
b) If a wave with 100 MHz frequency propagates in free space. Calculate the propagation constant. [8]

OR

Q4) a) A Uniform plane wave in air has, $\bar{E} = 10 \cos(2\pi \times 10^6 t - \beta z) \bar{a}_y$. Calculate β and λ . [9]
b) Enlist and explain the different modes of propagation of electromagnetic waves. [8]

P.T.O.

- Q5) a)** A line with zero dissipation has $R = 0.006 \Omega/m$, $L = 2.5\mu H/m$ and $C = 4.45 pF/m$. If the line is operated at 10 MHz. Find [10]
- Characteristics impedance (R_0),
 - Propagation constant (γ)
 - Attenuation constant (α)
 - Phase constant (β)
 - Wavelength (λ)
- b)** What is reflection on transmission line? What are the disadvantages of reflection? Explain the reflection coefficient? [8]

OR

- Q6) a)** A telephone line has $R = 30\Omega/km$, $L = 10mH/km$, $G = 0$, $C = 20\mu F/km$ at $f = 1 \text{ kHz}$ find, [10]
- A characteristics impedance of the line
 - Propagation constant
 - Phase Velocity
- b)** Explain the Characteristic Impedance and Voltage Standing Wave Ratio (VSWR). [8]

- Q7) a)** Explain the Microwave Frequency Bands. Give the Advantages and Applications of Microwaves. [10]
- b)** Explain the following parameters of rectangular waveguide, [8]
- Cutoff Frequency
 - Cutoff Wavelength
 - Guide Wavelength
 - Phase Velocity

OR

- Q8) a)** What is waveguide? Explain the TE mode and TM mode of Rectangular waveguide. [10]
- b)** Give the brief comparison between the stripline and microstripline. [8]



Total No. of Questions : 8]

SEAT No. :

P2323

[Total No. of Pages : 2

[5870]-1080

T.E. (Electronics Engineering)

MICROCONTROLLER AND APPLICATIONS

(2019 Pattern) (Semester - I) (304204)

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) Figures to the right indicate full marks.

Q1) a) Sate the features of DAC 0808 and draw an interfacing diagram of DAC with 8051. [10]

b) Write an embedded C Program to rotate stepper motor clock wise with a delay of 1sec using Timer 1, mode 1. [8]

OR

Q2) a) Draw an interfacing diagram of DAC 0808 and write embedded C program to generate ramp wave continuously. [10]

b) Write embedded C Program and draw interfacing diagram for interface buzzer to 8051. The buzzer should sound when key connected to P1.1 is pressed. [8]

Q3) a) Compare PIC 10, PIC12, PIC 16 and PIC 18 families. [8]

b) State the features of PIC18. Draw and explain the block schematic of PIC 18FXXX. [10]

OR

Q4) a) Draw and explain the program memory map and stack of PIC 18 microcontroller. [10]

b) Explain with example the functioning of ALU in PIC 18 for transfer of data. [8]

P.T.O.

- Q5)** a) List and describe in brief different interrupt sources of PIC 18. [8]
b) Explain the compare and capture mode of PIC 18 in detail. [10]

OR

- Q6)** a) Write an embedded C program for reading single analog input from 0 to 5 V and display on LCD. [8]
b) Draw and explain the port structure of PIC 18 microcontroller with different registers used in programming. [10]

- Q7)** a) Design a DAS for indicating excess temperature on LED connected to PORT 1 along with indication by use of buzzer. Draw the flowchart. [8]
b) Draw interfacing diagram and write embedded C program for water level monitoring and controlling using PIC 18FXX. [8]

OR

- Q8)** a) What is DAS? Draw block diagram of generalised DAS. [8]
b) Draw interfacing diagram and write embedded C program for environment monitoring and controlling using PIC 18FXX. [8]



Total No. of Questions : 8]

SEAT No. :

P773

[Total No. of Pages : 2

[5870] - 1081

**T.E. (Electronics Engineering)
INSTRUMENTATION SYSTEMS**

(2019 Pattern) (Semester - I) (Elective - I) (304205)

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) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Define flow and flow rate. Explain different types of flows. Explain basic principle of flow meter. [6]
b) Draw neat diagram of float type liquid level sensor and explain it in detail. [6]
c) Define differential flow meter / obstruction type flow meter. Explain Orifice, venturi and flow nozzle type differential transducer for flow measurement. [8]

OR

- Q2)** a) With the help of neat diagram explain working of Electromagnetic flow meter. [6]
b) Draw neat diagram Ultrasonic type liquid level sensor and explain it in detail. [6]
c) With the help of neat diagram explain Capacitance Level Sensor for the following [8]
i) Conductive liquid
ii) Non-conductive liquid

- Q3)** a) With the help of neat diagram explain Rotary/Angular absolute optical encoder. Compare absolute optical encoder and incremental optical encoder. [8]
b) Explain structure of CMOS image sensor cell. Explain CMOS Pixel Architecture. [8]

P.T.O.

OR

- Q4)** a) Explain working principle of ultrasonic transducer. With the help of neat diagram explain ultrasonic transducer for distance measurement. [8]
b) Draw neat construction diagram of LVDT. Explain working and characteristics of LVDT. Sate its advantages and disadvantages of LVDT. [8]

- Q5)** a) With the help of neat construction diagram explain Magneto-Resistive Elements (MRE) and Magneto transistors. [8]
b) Draw neat block diagram Smart sensor and explain functioning of each block. [8]

OR

- Q6)** a) Define MEMS. State application Areas of MEMS Technology. With the help of neat construction diagram explain Hall Effect Magnetic field sensors. [8]
b) Explain bulk micromachining process with the help of neat diagram. [8]

- Q7)** a) With the help of neat diagram explain solenoid operated spool valve. [6]
b) Explain poppet bidirectional Control Valve. Compare finite position valve and infinite position valve. [6]
c) Draw construction of a DC motors and explain its operating principle. [6]

OR

- Q8)** a) Explain the following w.r.t valve characteristics. [6]
i) Linear flow characteristic
ii) Equal percentage
iii) Quick opening
b) Explain single acting cylinder and double acting cylinder with suitable diagram and compare them. [6]
c) Draw relay driver circuit using transistor and explain design of relay driver circuit using transistor. [6]



Total No. of Questions : 8]

SEAT No. :

P774

[Total No. of Pages : 2

[5870] - 1082

T.E. (Electronics Engg./E & TC)

FUNDAMENTALS OF JAVA PROGRAMMING (Elective - I)

(2019 Pattern) (Semester - I) (304185)

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 whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain inheritance and types of inheritance in Java. [8]
b) With the help of proper example, explain use of super keyword. [5]
c) Write a program to calculate the length of a string. [5]

OR

- Q2)** a) What are the wrapper classes? Explain autoboxing and unboxing in wrapper class. [8]
b) Write a program using command line arguments to add two numbers. [5]
c) Write a program to compare elements in two arrays. [5]

- Q3)** a) What is a difference between interface and class? [4]
b) What is a package ? Explain with the help of simple example. [8]
c) How do we add class or interface to a package? Explain with suitable example. [5]

OR

- Q4)** a) Design a package containing a class which defines a method to find area of circle. Import it in Java application to calculate area of a circle. [9]
b) What is an interface in Java? How do we create it? Give example to create and to implement the interface. [8]

P.T.O.

- Q5)** a) Differentiate between multithreading and multi tasking. [5]
b) Explain life cycle of an applet. [8]
c) Explain try and catch block. [5]

OR

- Q6)** a) Write a program to handle arithmetic exception. [5]
b) Write a program to create an applet. [5]
c) Explain life cycle of a thread. [8]

- Q7)** a) List the difference between swing and AWT in Java. [5]
b) Write a Java program using swing to create text field. [8]
c) Explain the classes associated with file handling. [4]

OR

- Q8)** a) Explain the hierarchy of AWT. [8]
b) Explain how to read and write a sentence in a file with the help of program. [9]



Total No. of Questions : 8]

SEAT No. :

P6515

[Total No. of Pages : 2

[5870]-1083

**T.E. (Electronics Engg.)
MACHINE LEARNING**

(2019 Pattern) (Semester - I) (Elective - I) (304205)

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) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) What is first-order logic in artificial intelligence? Which are the parts of first-order logic.? With the help of suitable example draw the model for first-order-logic. [8]

b) What is knowledge Engineering in First Order Logic? Which are the steps required in knowledge Engineering projects? [9]

OR

Q2) a) What is Hidden Markov Model? List the steps required for simplified matrix algorithm. [8]

b) Explain the following terms: [9]

- i) Forward Chaining
- ii) Backward Chaining

Q3) a) What is Natural Language Processing? Which Components play the role to implement Natural Language Understanding? [9]

b) Define the term Parsing. Show syntactic parsing using Bottom Up parsing. Compare Top-Down and Bottom-Up Parsing. [9]

OR

P.T.O.

- Q4)** a) What is probabilistic language processing? Which are the Probabilistic Language Models? [9]
- b) Which parsing approach/procedure is used in Augmented Transition Networks? How Augmented Transition Networks can be used in Natural Language understanding? [9]

- Q5)** a) Which are different learning paradigms? In short explain supervised learning. [9]
- b) What is Reinforcement learning? Distinguish between passive and active reinforcement learning. [8]

OR

- Q6)** a) How different nodes of decision trees are represented? Explain the structure of a decision tree. [9]
- b) Explain generalizations in reinforcement learning. [8]

- Q7)** a) Discuss - any four properties and operations of fuzzy sets. [9]
- b) Explain in short Fuzzy' logic based induction motor speed control with neat diagram. [9]

OR

- Q8)** a) What do you mean by membership function? Explain the features of the membership function. [9]
- b) Explain in short neural network based PWM controller with neat diagram. [9]



Total No. of Questions : 8]

SEAT No. :

P775

[Total No. of Pages : 3

[5870] - 1084

T.E. (Electronics Engineering)

DATA COMMUNICATION (Elective - I)
(2019 Pattern) (Semester - I) (304205D)

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 whenever 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 ARQ in detail. [4]
b) Explain hardware implementation of block codes for encoder & syndrome decoder. [4]
c) The generator matrix of a (6,3) systematic Block Code is given by [10]

$$[G] = \begin{matrix} 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{matrix}$$

- i) Find all code vectors.
- ii) Find the parity check matrix.
- iii) Find the error syndrome.

OR

- Q2) a)** The parity check bits of a (7, 4) block code are generated by [8]
- $$\begin{aligned} C_5 &= d_1 + d_2 + d_3 \\ C_6 &= d_1 + d_2 + d_3 \\ C_7 &= d_2 + d_3 + d_4 \end{aligned}$$
- Where d_1, d_2, d_3 and d_4 are the message digits.
-Find the generated matrix and parity check matrix for this code.
-Find the minimum weight of this code.
-Find error detecting capability of this code.

P.T.O.

- b) A rate 1/3 convolution encoder has generating vectors as $g_1 = (100)$, $g_2 = (111)$, $g_3 = (101)$ [10]
- Sketch the encoder configuration.
 - Draw the code tree, state diagram and trellis diagram.

Q3) a) Apply Huffman binary coding procedure for the following message ensemble. Also determine its efficiency. [9]

x	x_1	x_2	x_3	x_4	x_5	x_6	x_7
p	1/3	1/27	1/3	1/9	1/9	1/27	1/27

- b) A continuous signal is band limited to 1 kHz. The signal is quantized to 4 level of PCM system with probabilities 1/8, 1/8, 3/8 and 3/8. Calculate the rate of information. [8]

OR

Q4) a) The voice frequency modulating signal of a PCM system is quantized in 16 levels with the following probabilities : [9]

$$p_1 = p_2 = p_3 = p_4 = 0.1$$

$$p_5 = p_6 = p_7 = p_8 = 0.005$$

$$p_9 = p_{10} = p_{11} = p_{12} = 0.075$$

$$p_{13} = p_{14} = p_{15} = p_{16} = 0.25$$

Calculate the entropy and information rate. Assume $f_m = 3$ kHz.

- b) Apply Shannon – fano coding procedure for the following message ensemble. Also determine its efficiency. [8]

x	x_1	x_2	x_3	x_4	x_5	x_6
p	0.4	0.2	0.12	0.08	0.08	0.04

Q5) a) Explain the generation and reception of BFSK with the help of neat block diagram. [6]

b) Explain QPSK modulation and demodulation in details. [6]

c) Explain BPSK spectrum and bandwidth of BPSK. [6]

OR

Q6) a) Explain principle and block diagram of OFDM. [6]

b) Write short note on BPSK. [6]

c) Explain the generation and reception of ASK with the help of neat block diagram. [6]

- Q7)** a) Explain the operation of DS-SS transmitter with the help of block diagram. [6]
- b) The information bit duration in DS-BPSK spread spectrum communication system is 10msec while the chipping rate is 1MHZ .Assuming an average error probability is 10^{-6} for proper detection of message signal . Calculate the jamming margin. [6]
- c) Write a short note on CSMA. [5]

OR

- Q8)** a) Write short note on FH-SS communication. [6]
- b) Compare FDMA, TDMA and CDMA. [6]
- c) Write short note on pure ALOHA and slotted ALOHA. [5]



Total No. of Questions : 8]

SEAT No. :

P776

[Total No. of Pages : 2

[5870] - 1085

**T. E. (Electronics Engineering)
COMPUTER NETWORKS**

(2019 Pattern) (Semester - I) (304205E) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates: .

- 1) Attempt all the Questions out of 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 side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) What are the responsibilities of data link layer? [9]

b) What are the issues in data link layer? [9]

OR

Q2) a) What is Flow Control & Error Control? [9]

b) What are the ways to address the framing problem? [9]

Q3) a) What are the responsibilities of Network Layer? [9]

b) Explain, what is DHCP & its benefits? [8]

OR

Q4) a) Explain the duties of transport layer. [9]

b) Explain distance vector routing and link state routing. [8]

Q5) a) What are the responsibilities of Application Layer? [9]

b) Explain the functions of SMTP. [9]

OR

:

P.T.O.

Q6) a) Explain the Fundamental HTML Elements. [9]

b) What is DNS? Explain detail about Domain Name System. [9]

Q7) a) Explain basics of Network administration. [9]

b) Explain protocol analyzer. [8]

OR

Q8) a) Explain Cisco packet tracer. [9]

b) Explain leased line & dial up. [8]



Total No. of Questions : 8]

SEAT No. :

P777

[Total No. of Pages : 2

[5870]-1086

T.E. (Electronics)

FUNDAMENTALS OF HDL

(2019 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, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.

Q1) a) Differentiate between CPLD and FPGAS ? [7]

b) Describe in brief types of FPGA technologies. [7]

c) Explain macrocell with neat diagram. [6]

OR

Q2) a) With neat schematic explain the architectural building block of FPGA.[7]

b) Explain the following terms related to CPLD [7]

i) Functional Blocks / PAL Blocks

ii) I/O Blocks

c) List the basic types of programmable logic Devices. [6]

Q3) a) Explain different verilog operators with example in detail. [8]

b) Find the value of following expressions if the two unsigned variables A = 4'b 1101 and B = 4'b1001. [8]

i) {A & & B} ii) (A || B) iii) {4{A}, 2{B}} iv) B>>2

OR

Q4) a) Write down short notes on following : [8]

i) Arrays

ii) Variables & constant declaration

b) Explain verilog modeling styles. [8]

P.T.O.

- Q5)** a) Implement 4 bit synchronous counter using behavioral modeling in verilog HDL. [8]
b) Implement 2:4 decoder using dataflow modeling in verilog HDL. [6]
c) Write verilog code for half adder in dataflow modeling. [4]

OR

- Q6)** a) Write verilog code for the following flipflops using behavioral modeling in verilog HDL. [8]
i) D flip flop
ii) JK flip flop
b) Implement 2:1 multiplexer using case statement in verilog HDL. [6]
c) Write verilog code for full adder in dataflow modeling. [4]

- Q7)** a) Explain procedure syntax with example. [8]
b) What do you understand by a subprogram? What is subprogram overloading? Explain with VHDL example. [8]

OR

- Q8)** a) Write HDL description of a full adder using Procedure and Task. [8]
b) Explain difference between Task and Function. [8]



Total No. of Questions : 8]

SEAT No. :

P778

[Total No. of Pages : 2

[5870] - 1087

T.E. (Electronics Engineering)
EMBEDDED PROCESSORS AND APPLICATIONS
(2019 Pattern) (Semester - II) (304213)

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) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Interface LED's to P1.24 to P1.31 port pins of LPC2148. Write an embedded C program to blink LED's. [6]
- b) For configuring the PLL0 system design for FOSC = 10MHz and requires CCLK=60MHz, find value of M (PLL Multiplier value) and P (PLL Divider value). [6]
- c) State the features of LPC2148 Microcontroller. Explain the function of IOSET, IOCLR and IODIR registers of LPC2148. [8]

OR

- Q2)** a) Draw block diagram of timer of LPC2148. Explain functions of Timer Counter Register and Timer Control Register. [6]
- b) Explain steps in PLL programming of LPC 2148. Explain with neat diagram the relation between CCLK and PCLK with the help of VPB/APB divider. [6]
- c) Interface LCD to LPC2148 and write an Embedded C program to display string "WELCOME" along with flowchart and algorithm. [8]

- Q3)** a) List the features of UART0 of LPC2148. Draw and explain architecture of UART0 of LPC2148. [8]
- b) List the features of on chip ADC of LPC2148. Write an Embedded C program for temperature monitoring using on chip ADC including interfacing diagram. [8]

OR

PTO.

Q4) a) Draw and explain interfacing of 12C EEPROM with LPC2148. Write an algorithm and draw flowchart for reading and writing data from EEPROM. [8]

b) List features DAC of LPC2148. Write an Embedded C program for generation of triangular waveform using on chip DAC of LPC2148 with its flowchart and interfacing diagram. [8]

Q5) a) List the features of CORTEX M3 Processor. Draw the block diagram of CORTEX M3 Processor and explain functions of each block. [8]

b) Explain the advantages of ARM Cortex M-3 for embedded application. Compare ARM7 with CORTEX M series. [8]

OR

Q6) a) State the features of Cortex A, Cortex R, Cortex M series processors. Compare ARM Cortex A, Cortex R, Cortex M Series processors. [8]

b) Explain need of operating system in developing complex applications in embedded system What are the desired functions of operating system for embedded system? [8]

Q7) a) Define Embedded System. Explain the characteristics of Embedded System. [6]

b) Draw and explain the block diagram of Embedded system with IoT. [6]

c) Explain case study of Smart Home Automation using IoT with detailed diagram. [6]

OR

Q8) a) Define Internet of Things. What is importance and benefits of Internet of Things. [6]

b) Explain case study of Smart Parking system using IoT with detailed diagram. [6]

c) Define Sensors and Actuators with suitable examples. Compare Sensors and Actuators. [6]



Total No. of Questions : 8]

SEAT No. :

P779

[Total No. of Pages : 2

[5870]-1088

T.E. (Electronics)

INDUSTRIAL MANAGEMENT

(2019 Pattern) (Semester - II) (Theory) (304214)

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 side indicate full marks.

- Q1)** a) Discuss in details - The ISO - Quality Management System Standard. [9]
b) Elaborate Quality Management Assistance Tools. [9]

OR

- Q2)** a) Illustrate types of quality - quality of design, conformance and performance, phases of quality management. [9]
b) Elaborate Six sigma Quality Management Standards. [9]

- Q3)** a) Illustrate Social Responsibility of Business in details. [9]
b) Explain Business Ethics with suitable examples. [8]

OR

- Q4)** a) What do you mean by Changing Concepts and Objectives of a Business? [9]
b) Elaborate Social Audit in details. [8]

- Q5)** a) Write a short note on Services sector. [9]
b) Differentiate between Private sector and Cooperative Sector in details. [9]

P.T.O.

OR

- Q6)** a) Differentiate between Sole Proprietorship and Partnership firms in details. [9]
b) Illustrate Joint stock companies - their features, relative merits, demerits & suitability. [9]
- Q7)** a) Explain Concept of Entrepreneurship, Identification of business opportunities in details. [9]
b) Illustrate Preparation of business proposal with suitable example. [8]

OR

- Q8)** a) What are Government policies and incentives for a Business? [9]
b) Explain a Business plan in details. [8]



Total No. of Questions : 8]

SEAT No. :

P3834

[Total No. of Pages : 2

[5870] - 1089

T.E. (Electronics)

PLC & AUTOMATION

(2019 Pattern) (Semester - II) (304215 A) (Elective - 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, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

Q1) a) Compare Digital Gate logic vs Relay logic. [6]

b) Develop a ladder diagram to fulfil the following conditions, [6]

- i) When the start switch is ON the motor is ON.
- ii) When the stop switch is ON the motor is OFF.
- iii) When the motor is ON the green light is ON.
- iv) When the motor is OFF the red light is ON.

c) Explain in details Timers and Counter used in PLC. [8]

OR

Q2) a) What is Micro PLCs? Explain its functions in details? [6]

b) Explain Relay type instructions, Instruction addressing, Branch Instructions. [6]

c) Design ladder logic for a system using comparisons instructions, [8]

Motor 1 starts as soon as the PLC starts as soon as PLC starts. After 10 seconds, Motor 1 goes OFF and Motor 2 starts. After 5 seconds Motor 2 goes OFF and Motor 3 Starts. After another 10 seconds Motor 2 restarts and after 5 seconds it stops and Motor I starts and cycle is repeated?

P.T.O.

- Q3)** a) List the parameters need to be check while PLC installation? How will you protect PLC from Electrical noise and Voltage variation & Surge? [8]
b) Which are the preventive maintenance tasks should be carried for PLC systems? [8]

OR

- Q4)** a) Extend your view on Troubleshooting of a PLC system for following sections, [8]
i) Processor module,
ii) Input & Output malfunctions
b) What do you mean by Program Editing & Commissioning of PLC? List general steps followed when commissioning a PLC system? [8]

- Q5)** a) Explain with block diagram SCADA system. [9]
b) What is RTU & MTU? Explain its functions with diagram. [9]

OR

- Q6)** a) What is HMI'? Explain Interfacing technique of PLC with HMI. [9]
b) Illustrate MTU operating interfaces & applications? [9]

- Q7)** a) List the Types of communication interface? Explain Serial communication with its advantages? [8]
b) Explain working of Modbus and Fieldbus with diagram? [8]

OR

- Q8)** a) What is CAN? Explain working principle of it in detail? [8]
b) Which Types of networking channels used in PLC? Discuss any one in brief? [8]



Total No. of Questions : 8]

SEAT No. :

P1006

[Total No. of Pages : 2

[5870]-1090

**T.E. (Electronics Engineering)
DIGITAL SIGNAL PROCESSING**

(2019 Pattern) (Elective - II) (Semester - II) (304215)

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) Figures to the right side indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain Gibb's Phenomenon and how it can be overcome. [4]
b) Explain the steps to design butterworth low pass digital filter using bilinear transformation. [6]
c) List any 5 windows used in FIR filter design. Write the mathematical equation and draw the window shape of any 2 windows. Compare them for bandwidth. [8]

OR

- Q2)** a) Obtain $H(Z)$ if $H_a(s)=1/(S+1)^2$ if $T=0.1$ Sec using bilinear transformation. [10]
b) Explain the impulse invariance technique in detail. What is drawback of it? How Bilinear transformation removes it? [8]

- Q3)** a) The transfer function of discrete causal system is given as follows. [6]
$$H(z) = (1-Z^{-1})/(1-0.2Z^{-1} -0.15Z^{-2})$$
 - i) Find the difference equation
 - ii) Draw cascade realization
b) Obtain direct form I and II realisation of a system described by. [12]
$$Y(n)+0.81 Y(n-1) + 0.75y(n-2)=X(n)+0.25X(n-1)$$

OR

P.T.O.

Q4) a) What is the effect of quantization on FIR filter coefficient? How to minimize this error? [8]

b) Draw parallel realization of [10]

$$H(z) = (1 - Z^{-1}) / (1 - 0.2Z^{-1} - 0.15Z^{-2})$$

Q5) a) Draw a block diagram of interpolator. Explain the working of an interpolator with the help of waveforms. Explain the role of anti-imaging filter. [8]

b) Design a two stage decimator that down samples an audio signal by a factor of 30, satisfying the following constraints : [10]

Input sampling frequency : 240KHz

Highest frequency of interest : 3.4KHz

Passband ripple : 0.05 dB

Stopband attenuation : 0.01dB

Highest frequency of interest : 3KHz

OR

Q6) a) Draw a block diagram of decimator. Explain the working of decimator with the help of waveforms. Explain the role of anti-aliasing filter. [8]

b) What do you understand by Multirate DSP? What is need for multirate DSP? Explain types of multirate DSP based on sampling rate. [10]

Q7) a) Draw neat block diagram and explain general architecture of DSP. [8]

b) List various applications of DSP in speech processing. Explain any one application in detail by drawing a neat block diagram and appropriate waveforms. [8]

OR

Q8) a) Describe any 5 important features of digital signal processor. [8]

b) Compare a microprocessor and DSP processor. Write any 6 differences. [8]



Total No. of Questions : 8]

SEAT No. :

P780

[Total No. of Pages : 3

[5870]-1092

T.E. (Electronics Engg.)

FIBER OPTIC COMMUNICATION

(2019 Pattern) (Semester - II) (304215D) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve question 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) *Assume suitable data, if necessary.*
- 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

- Q1)** a) List the advantages of optical communication systems. **Explain** the important factors responsible for power loss in optical fiber. [8]
b) ‘Optical signal distortion limits the information carrying capacity of the fiber’ **Justify** the comment with an elaborate analysis. [10]

OR

- Q2)** a) State the various types of misalignment losses and losses due to mismatch of fiber parameters and bending losses.

Solve :

The mean optical power launched into an optical fiber link is 1.5 mW and the fiber has an attenuation of 0.5 dB km^{-1} . **Determine** the maximum possible link length without repeaters (assuming lossless connectors) when the minimum mean optical power level required at the detector is $2 \mu\text{W}$. [8]

- b) **Explain** by writing short notes on : [10]
- i) Dispersion shifted fiber (DSF)
 - ii) NZDSF
 - iii) Dispersion flattened and
 - iv) Polarization maintaining fiber

P.T.O.

Q3) a) **Describe** with the aid of suitable diagrams the mechanism giving the emission of light from an LED. **Discuss** the effects of this mechanism on the properties of the LED in relation to its use as an optical source for communications. [9]

b) **Compare** between the photodiodes: p-n, pi-n, APD and phototransistor. **Comment** on their usefulness from link design perspective. [8]

OR

Q4) a) **Explain** the important performance and compatibility requirements for detectors used in optical fiber communication links. [9]

b) The power generated internally within a double-hetero junction LED is 28.4 mW at a drive current of 60 mA. **Determine** the peak emission wavelength from the device when the radiative and nonradiative recombination lifetimes of the minority carriers in the active region are equal. [8]

Q5) a) Draw a neat labeled diagram of a WDM system. **Explain** the need of wavelength division multiplexing in fiber optic communication systems. [9]

b) **Explain** the optical components: optical isolators, circulators and fiber Bragg grating for multiplexers & De-multiplexers. [9]

OR

Q6) a) **Explain** the various loss mechanisms that arise on account of joints, splices, connectors, mismatch of parameters and fiber misalignment in a fiber optic link. [9]

b) **Compare** the SOA, EDFA and the Raman amplifiers in relation to the provision of amplification within optical fiber communication systems. [9]

Q7) a) Draw a neat labelled diagram to show a point to point fiber optic communication link. **Explain** the system design considerations for each of the components on the path. [9]

- b) In an experimental setup for establishing an analog optical fiber link, a student chooses the components with the 10% to 90% rise time values as indicated below:

Source (LED) : 10 ns

Detector (APD) : 3 ns

Fiber cable (intermodal) : 9 ns/km

The desired link length without repeaters is 5 km and the required optical bandwidth is 6 MHz. **Predict** whether the above selection of components gives a viable system. [8]

OR

- Q8)* a) A 1550 nm single mode digital fiber optic link needs to operate at 622 Mb/s over 80 km without amplifiers. A single mode InGaAsP laser launches an average optical of 13 dBm into the fiber. The fiber has a loss of 0.35dB/km, and there is a splice with a loss of 0.1 dB every kilometer.

The coupling loss at the receiver is 0.5 dB and the receiver uses an InGaAs APD with a sensitivity of -39 dBm. Excess noise penalties are predicted to be 1.5 dB. Set up an optical power budget for this link and find the system margin. **Calculate** the system margin at 2.5 Gb/s with an APD sensitivity of -31 dBm? [9]

- b) **Explain** the various methods used for the analysis of the optical fiber links. What metrics are useful for evaluating the performance of optical fiber analog links and digital links. [8]



Total No. of Questions : 8]

SEAT No. :

P3835

[Total No. of Pages : 2

[5870]-1093

T.E. (Electronics Engineering)

E - MOBILITY

(2019 Pattern) (Elective - II) (Semester - II) (304215E)

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 and waveforms must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of nonprogrammable calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Explain in brief Metal Air Battery, Zinc Chloride battery. [6]
b) Compare flywheel energy storage system & hydraulic energy storage system. [5]
c) Explain construction & working of Sodium based batteries. [6]

OR

- Q2)** a) Explain role of Ultra capacitors in energy storage system of EVs. [6]
b) Explain construction & working of Lithium based batteries. [7]
c) Compare Lead Acid battery & Nickel based battery. [4]

- Q3)** a) Explain with block diagram OFF board conductive charging. [8]
b) Explain various requirements for a battery charger in EVs. [5]
c) Explain concept of charge equalization process in battery. [5]

OR

- Q4)** a) Explain various battery indication methods. [8]
b) Standard power levels of conductive chargers - Explain. [5]
c) Explain with diagram working of basic charger circuit. [5]

P.T.O.

- Q5)** a) Explain various types of EV charging connectors. [6]
b) Explain North American EV Plug Standards. [6]
c) Explain Occasional Charging Station. [5]

OR

- Q6)** a) Explain Fast Charging station. [5]
b) Explain public charging infrastructure. [6]
c) Explain European EV Plug Standards. [6]

- Q7)** a) Explain with diagram 6LoWPAN protocol? Give its applications. [8]
b) Explain with diagram power line carrier communication. [6]
c) Explain I2C protocol. [4]

OR

- Q8)** a) What is Ethernet? Why it is used? Give its advantages & disadvantages. [8]
b) Explain with diagram LIN bus protocol. [6]
c) What is Modbus protocol? Explain where it is used. [4]



Total No. of Questions : 8]

SEAT No. :

P2324

[Total No. of Pages : 2

[5870]-1094

T.E. (Instrumentation & Control)

EMBEDDED SYSTEMS

(2019 Pattern) (Semester - I) (306261)

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

Q1) a) List and explain the types of instructions in 8051. [8]

b) Differentiate between conditional and unconditional branching instructions. [8]

c) What do you mean by indexing. [2]

OR

Q2) a) Differentiate between Assembly language and C language. [8]

b) Elaborate on Assembler Directives. [10]

Q3) a) Draw and explain how to interface a push button to 8051. [8]

b) Draw and explain how to interface a stepper motor to 8051. [9]

OR

Q4) a) Draw and explain how to interface LM35 to 8051. [9]

b) Draw and explain how to interface a relay to 8051. [8]

Q5) a) Draw block diagram of temperature controller using thermocouple for 8051. [8]

b) What are the safety interlocks in a washing machine? [5]

c) How are AC motors interfaced to 8051 in washing machine? [5]

OR

P.T.O.

Q6) a) Draw block diagram of AC heater using thermocouple for 8051. [8]

b) Draw and explain block diagram of line tracing robot with flowchart.[10]

Q7) a) Differentiate between RISC and CISC controllers. [8]

b) What is embedded firmware? [4]

c) Explain characteristics of embedded systems. [5]

OR

Q8) a) Differentiate between microprocessors and microcontrollers. [8]

b) Explain ASIC with example. [9]



[5870] - 1095

T.E. (Instrumentation & Control)
INDUSTRIAL AUTOMATION - I
(2019 Pattern) (Semester - I) (306262)

*Time : 2½ Hours]**[Max. Marks : 70]**Instructions to the candidates :*

- 1) All questions are compulsory.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) What is IEC 61131-3.Explain with example. [5]
 b) Implement the basic PID equation by making use of PLC instructions.[4]

OR

- Q2)** a) Convert the temperature in degree Celsius to degree Fahrenheit by making use of PLC instructions. [5]
 b) Consider a process which compares the set and actual temperature and generates a digital output if the actual value is greater than set temperature. Develop a ladder logic by assuming required data. [4]

- Q3)** a) List 2 PLC instructions and explain them in detail with example. [5]
 b) Explain difference between move and bulk move instructions by making use of example. [4]

OR

- Q4)** Consider a process which compares the set and actual temperature and generates a digital output for following conditions
 a) Red lamp if actual value is greater than set temperature.
 b) Green lamp if actual value is equal to set temperature.
 c) Orange lamp if actual value is greater than or equal to set temperature.
 d) Amber lamp if actual value is less than or equal to set temperature.
 Develop a ladder logic by assuming required data. [9]

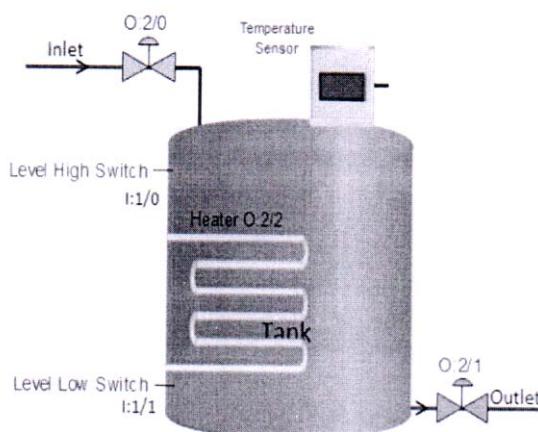
Q5) Explain the signal processing of analog output module. By making using of PLC instructions draw a ladder and scale an analog output of 0-1000 rpm to 0 - 10V. [9]

OR

Q6) Draw a ladder diagram for the figure shown below. List the IO's, assign them the ad-dress and also write the sequence of operation.

Process description :

When the high level switch is true the inlet valve should be off and when low level switch is sensed the inlet valve should be off. Once level is healthy and both inlet and outlet valves are off switch on the heater. if actual temperature sensed by the temperature sensor is equal to or greater than 40 degree then switch off the heater and after 5 sec open the outlet valve. Outlet valve should be on till low level switch is sensed. [9]



Q7) a) List 5 functions of a PID block used in PLC. [5]

b) Enlist and elaborate in short 2 applications where PLC is used. [4]

OR

Q8) a) List 5 functions of a HSC block used in PLC. [5]

b) List 2 manufacturers of PLC and compare at least 5 instructions used in both of them. [4]

Q9) a) Explain three different architectures of SCADA. [10]

b) Write a short note on trend management in SCADA. [7]

OR

- Q10)a**) Develop a SCADA system for a bottle filling plant.
Prepare below mentioned screens -
i) Welcome Screen,
ii) Parameter Screen,
iii) MIMIC Screen,
iv) Alarm screen.
Assume suitable data where ever required. [10]
b) Write a short note on functions of SCADA? [7]

Q11)a) Develop a MIMIC for conveyor control system using HMI instructions. [12]

b) Write short note on speed control methods of drive. [5]

OR

Q12)a) Develop a MIMIC for tank level control system using HMI instructions. [12]

b) Explain with block diagram concept of servo drive. [5]



[5870] - 1096

T.E. (Instrumentation and Control)
MODERN CONTROL THEORY
(2019 Pattern) (Semester - I) (306263)

Time : 2½ Hours]**[Max. Marks : 70****Instructions to the candidates:**

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

Q1) a) Check Controllability and observability of system whose state space representation as below. [10]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & -1 \\ 1 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 3 \\ -2 \\ 1 \end{bmatrix} u \text{ and } y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

b) The state model of system given by $\dot{x} = \begin{bmatrix} 0 & 1 \\ -1 & -2 \end{bmatrix}x + \begin{bmatrix} 0 \\ 1 \end{bmatrix}u$ Determine stability of system using direct method of Lyapunov Analysis. [8]

OR

Q2) a) Check Controllability and observability of system whose state space representation as below [12]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & -2 \\ 3 & -3 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 1 & -1 \\ 2 & 0 \\ 0 & 0 \end{bmatrix} u \text{ and } \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 0 & 4 & 1 \\ 0 & -2 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

b) Describe Lyapunov stability analysis (direct method) for continuous time LTI systems. [6]

Q3) A state space equation and output equation of control system is as follows it is desired to place the poles at location $-3, -4, -5$ using state feedback. Find state feedback gain matrix for the system. [17]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -3 & -6 & -7 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u \text{ and } y = \begin{bmatrix} 2 & 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

OR

Q4) Design a full order observer for the system defined by following state equation.

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u \text{ and } y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Given the set of desired poles for the Observer to be $s = -6, -6, -6$. [17]

Q5) a) Draw a neat block diagram of discrete time control system and explain each block in brief. [10]

b) Explain ADC and DAC operation in sampled data control system. [8]

OR

Q6) a) Derive an expression for Zero Order Hold (ZOH). Explain importance of ZOH. [10]

b) State and explain different advantages of discrete time control system. [8]

Q7) a) Solve difference equation

$$y(k+2) + 3y(k+1) + 2y(k) = 0; y(-1) = -\frac{1}{2}, y(-2) = \frac{3}{4} \quad [10]$$

b) Find the equivalent sampled impulse response sequence and the equivalent z-transfer.

Function for the cascade of the two analog systems with sampled input.

$$H_1(s) = \frac{1}{s+2} \text{ and } H_2(s) = \frac{2}{s+4} \quad [7]$$

OR

Q8) Consider system described by $y(k) - 0.6y(k-1) - 0.81y(k-2) + 0.67y(k-3) - 0.12y(k-4) = x(k)$ Where $x(k)$ is input and $y(k)$ is output of system. Determine stability of system. Use Jury's stability test. [17]



Total No. of Questions : 8]

SEAT No. :

P783

[Total No. of Pages : 2

[5870] - 1097

T.E. (Instrumentation and Control Engineering)
OPERATING SYSTEM(Theory)
(2019 Pattern) (Semester - I) (306264)

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 circuit diagrams should be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) What do you mean by contiguous memory allocation? Explain multiple and variable partition schemes. Also describe first fit, best fit and worst fit strategies. [8]
- b) What is page fault and page replacement? Describe Least Recently Used (LRU) page replacement algorithm. [9]

OR

- Q2)** a) What is paging? Explain logical and physical memory model. [8]
- b) Determine the number of page faults for a reference string:
7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1
Algorithm to be used is Least Recently Used and there are 3 frames per page. [9]

- Q3)** a) What is deadlock? Explain 4 conditions for deadlock to occur. [9]
- b) What do you mean by deadlock detection? Explain process termination and resource preemption as means of recovery from deadlock. [9]

OR

- Q4)** a) Write a note on resource allocation graph. [9]
- b) Describe in detail Banker's algorithm. [9]

P.T.O.

Q5) a) Which are the operations to be performed on directory? Explain single level directory. [9]

b) Briefly explain file operations and types of files. [8]

OR

Q6) a) Enlist approaches for free space management. Explain linked list approach. [8]

b) Which are the various controlled operations on files? Describe the access control method. [9]

Q7) a) What do you mean by system protection? What are the goals? Explain the access matrix. [9]

b) Define virus. Describe briefly any 4 categories of virus. [9]

OR

Q8) a) Enlist different methods to implement access matrix. Explain any two of them. [9]

b) Explain one time password and Biometrics as tools for user authentication. [9]



Total No. of Questions : 8]

SEAT No. :

P784

[5870] - 1098

[Total No. of Pages : 2

**T. E. (Instrumentation & Control)
MECHATRONICS & ROBOTICS
(2019 Pattern) (Semester - I) (Elective-I) (306265 A)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt all the Questions out of 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 side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Illustrate in brief different stages in designing a mechatronic system. [9]

b) Write the Design steps involved in Mechatronics system design. [9]

OR

Q2) a) Illustrate briefly the role of modeling and simulation in analysis of mechatronics systems. [9]

b) Elaborate briefly about Hardware-in-the-loop simulation and embedded software. [9]

Q3) a) Illustrate the different sensors used in robotics. [9]

b) Classify the different types of motors used in robots also explain each type in brief. [8]

OR

Q4) a) Sketch any one application of robotics in the industry also explain the same in brief. [9]

b) Explain the speed of motion in industrial robots. [8]

Q5) a) Explain the various parts of a robot with neat sketch. [9]

b) Describe the types of end effector & gripper mechanisms with simple sketches. [9]

OR

;

P.T.O.

- Q6)** a) Discuss the performance characteristics of actuators. Compare electrical, pneumatic & hydraulic actuators for their characteristics. [9]
b) Discuss in detail the selection and design considerations of grippers in robot. [9]

- Q7)** a) Explain the various programming methods used in robotics with examples and features of each. [9]
b) Consider two frames {A}&{B}. The frame {B} is rotated with respect to frame {A} by 30 degree. around z-axis and the origin of {B} is shifted with respect to the origin of {A} by [5,10,5]. the Z a and Z b axes are parallel point 'p' is described in {B} by 1,2,3). describe the same point with respect to {A} using the transform matrix (${}^A_B T$). [8]

OR

- Q8)** a) Explain the line following robot algorithm and its programming. [9]
b) Explain the remote controlled car programming. [8]



Total No. of Questions : 8]

SEAT No. :

P785

[5870] - 1099

[Total No. of Pages : 2

T. E. (Instrumentation & Control)

DATA SCIENCE

(2019 Pattern) (306265B) (Semester - I) (Elective - 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.
- 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) Explicate the various logical operations that can be performed on arrays using Numpy. [9]

b) Discuss on data representation plots in Matplotlib. [9]

OR

Q2) a) Explain basic pandas operation on data frame with suitable examples. [9]

b) Illustrate line, pie, bar chart with suitable examples. [9]

Q3) a) Explain the concept of continuous and discrete data with examples. [8]

b) Discuss on missing value treatments-mean, median and mode methods. [9]

OR

Q4) a) Comment on the advantages and disadvantages of outlier treatment algorithms using percentile and IQR. [9]

b) Discuss the analysis of multivariate data with suitable example. [8]

Q5) a) Explain the concept of Box plot and Z score with example. [9]

b) Discuss on advantages and applications of Label Encoding. [9]

OR

- Q6)** a) Demonstrate correlation analysis in categorical to numerical with suitable example. [9]
b) Discuss about the concept of feature rescaling. [9]

- Q7)** a) Explain concept of Tableau online. [8]
b) Explain concept of Tableau public. [9]

OR

- Q8)** a) Explain the different components of Tableau desktop dashboard. [9]
b) Differentiate between tree map and heat map with its advantages, limitations and applications. [8]



Total No. of Questions : 8]

SEAT No. :

P786

[5870] - 1100

[Total No. of Pages : 2

T. E. (Instrumentation & Control)

POWER ELECTRONICS

(2019 Pattern) (Semester - I) (306265 C) (Elective-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.
- 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) Obtain an expression for average dc output voltage of a 1-phase fully controlled rectifier for R load with firing angle, α . [9]
- b) Derive an expression for average output voltage in terms of input dc voltage and duty cycle for a step up chopper. [8]

OR

- Q2)** a) With neat circuit diagram explain the operation of a Single Phase Half Wave Rectifier with R, load. Sketch the shape of output voltage waveform. [9]
- b) Draw the circuit and explain the 180° operation of a 3 phase bridge inverter with R load. Draw the phase voltage and line voltage waveforms. [8]

- Q3)** a) Draw neat sketch of analog PI controller using Operational Amplifier and explain in brief. [9]
- b) Compare electronics P, PI and PID controllers. [9]

OR

- Q4)** a) Draw op-amp. based analog comparator and discuss voltage current characteristics of an analog comparator. [9]
- b) Write mathematical expression of PI and PID controller in a discrete mode. [9]

P.T.O.

- Q5)** a) Draw a neat sketch and explain block diagram of universal UPS system. [9]
b) Draw neat diagram of seriesw connected controllers in FACT and explain in brief. [8]

OR

- Q6)** a) Draw neat diagram of shunt connected controllers in FACT and explain in brief. [8]
b) Write short notes on Criteria for battery selection. [9]

- Q7)** a) Discuss in brief Boost Converter and Buck Converter in MPPT. [9]
b) Explain basic types of solar power system. [9]

OR

- Q8)** a) Compare On-Grid and Off-Grid solar system. [9]
b) How hybrid solar power system works? Explain in detail. [9]



Total No. of Questions : 8]

SEAT No. :

P787

[Total No. of Pages : 2

[5870] - 1101

T. E. (Instrumentation & Control)

BIO-MEDICAL INSTRUMENTATION

(Elective-I) (2019 Pattern) (Semester - I) (306265 D)

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) Figures to the right side indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

- Q1)** a) Design and explain with neat diagram of Photo-plethysmography. [9]
b) Explain dye dilution technique for cardiac output measurement with neat diagram. [9]

OR

- Q2)** a) Describe in brief various technique used for BP measurement. [9]
b) Explain Magnetic blood flow meter with neat diagram. [9]

- Q3)** a) What is an EEG? Explain the various types of EEG electrode. [8]
b) Draw and explain the structure of Neuron. Write short note on Neuro-muscular transmission. [9]

OR

- Q4)** a) Define Evoked response. List different waves from different parts of the brain. [8]
b) What is the principle of EMG? Draw and explain the block diagram of EMG. [9]

- Q5)** a) What is Audiometer? Briefly explain basic Audiometer. [9]
b) Draw and explain Anatomy of Eye. Explain various errors in vision with its ways of correction. [9]

OR

P.T.O.

- Q6)** a) What is the mechanism of hearing? Explain Sound conduction system. [9]
b) What are Rods and Cones in the human vision system? Explain the function performed by each of them. [9]

- Q7)** a) Explain natural process of breathing. Draw and explain any one type of Spirometer. [9]
b) Draw and explain Oxygen gas Analyzer. [8]

OR

- Q8)** a) Explain the breathing physiology with active and passive respiration. [8]
b) Explain Oxygenator. Draw and explain basic block diagram of Ventilator. [9]



Total No. of Questions : 8]

SEAT No. :

P788

[Total No. of Pages : 2

[5870] - 1102

**T.E. (Instrumentation & Control)
INTERNET OF THINGS
(2019 Pattern) (Semester -II) (306268)**

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.
- 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 is Third party integration of IoT platforms? [4]
b) Explain the different types of IoT platforms. [8]
c) Write in brief the functions of IoT platform. [6]

OR

- Q2)** a) Differentiate between Arduino and Raspberry Pi boards. [8]
b) What are the various sensors and actuators used in IoT. [8]
c) What are GPIOs? [2]

- Q3)** a) Explain in brief architecture and characteristics of IoT platform. [5]
b) Explain in brief the Service Models of IoT. [6]
c) What is the difference between public, private and hybrid deployment cloud models in IoT. [6]

OR

- Q4)** a) What you mean by identity and trust in IoT? [6]
b) Differentiate between user-centric identity management, device centric identity management and hybrid-identity management. [6]
c) What is Data synchronization in IoT? [5]

PTO.

- Q5)** a) Explain in brief what is IoT reference model? [6]
b) What are the different IoT security requirements? [6]
c) Elaborate on various IoT routing attacks. [6]

OR

- Q6)** a) What is an IoT gateway? Explain key features of an IoT Gateway. [6]
b) Explain in detail the IoT Protocols. [6]
c) Differentiate between network and transport layer challenges. [6]

- Q7)** a) What is Home Area Network? Explain its implementation in Smart home. [8]
b) Write short note on Energy management in Smart cities. [6]
c) What are challenges of V2X Communication? [3]

OR

- Q8)** a) Write a short note on future trends for IoT in Health Care. [6]
b) Explain role of mobile apps in Health Care sector. [6]
c) What are the challenges in the IoT Health Care sector? [5]



Total No. of Questions : 8]

SEAT No. :

P789

[Total No. of Pages : 2

[5870]-1103

T.E. (Instru. & Control)

INDUSTRIAL AUTOMATION - II

(2019 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) Neat diagrams must be drawn wherever necessary.
- 3) Figure to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) How does HART works? Explain the point to point and multidrop network. [8]
b) Discuss and differentiate between RS 485 and modbus. [9]

OR

- Q2)** a) Discuss the differences between traditional and field bus installation. Draw and discuss, how the multiple instrument are connected through field segments. [8]
b) Discuss third party interface with example with respect to DCS system.[9]

- Q3)** a) What is an HMI? Discuss the benefits of properly designed HMI. [9]
b) With example discuss the concept of integration and optimization in DCS system? [9]

OR

- Q4)** a) Discuss five types of displays used in DCS system with its significance.[9]
b) Explain the alarm management system with the stages rationalization, design details, implementation, operation, maintenance. [9]

- Q5)** a) Discuss Sequential Function Chart (SFC) used in DCS system in detail.[8]
b) Discuss the ANN and MPC for process control in detail. [9]

OR

P.T.O.

- Q6)** a) Develop a logic to start the three electric motors. (M1, M2, M3) sequentially. M1 should start immediately when start button pressed. After a delay of 10s, M2 and after a delay of 20s M3 should start. When start button pressed again to off the motors, motor M1 and M2 should off immediately and M3 should be off after 10s delay. [8]
- b) Discuss the architecture of DCS? List two manufactures of DCS. [9]

- Q7)** a) Internet-Based Monitoring of Distribution Control using DCS system with application. [9]
- b) Write a short note on faceplate concept in DCS system. [9]

OR

- Q8)** a) Discuss the pulp and paper plant implementation using DCS in detail.[10]
- b) Discuss the use of DCS for oil and gas processing environment. [8]



Total No. of Questions : 8]

SEAT No. :

P790

[Total No. of Pages : 2

[5870]-1104

**T.E. (Instrumentation & Control)
DIGITAL SIGNAL PROCESSING
(2019 Pattern) (Semester - II) (306270)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *Neat diagram must be draw wherever necessary.*
- 3) *Use of Non-programmable calculator is allowed.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Find DTFS for the following :

[8]

$$x(n) = \sin\left(\frac{\pi}{3}n\right)$$

b) Sketch magnitude and phase plot of LTI system described by [9]

$$h(n) = \frac{1}{2}[\delta(n) - \delta(n-1)]$$

OR

Q2) a) Plot the magnitude response of the system with $h(n) = (0.5)^n u(n)$. [10]

b) Sketch the ideal frequency selective filter response and state mathematical expression for each filter. [7]

Q3) a) Perform the circular convolution of given sequences [12]

$$x(n) = \{1, 3, 5, 7\}$$

$$h(n) = \{2, 4, 6, 8\}$$

using DFT and IDFT method

b) Discuss in brief Butterfly operations and Bit reversal form in FFT. [6]

OR

P.T.O.

- Q4)** a) State various properties of DFT. [6]
 b) Compute the 8-point DFT of the sequence [12]

$$x(n) = \{2, 2, 2, 2, 2, 2, 2, 2\}$$

using radix-2 decimation-in-time (DIT) FFT algorithm.

- Q5)** a) Draw analog filter frequency response show all details. Also sketch and brief the response of Butterworth, Chebyshev-I and II type filter responses. [9]
 b) Apply bilinear transformation to the following to find $H(z)$, [9]

$$H(s) = \frac{1}{(s+2)(s+3)}$$

with $T = 1$ sec

OR

- Q6)** Design a Butterworth digital low pass filter with following specification, [18]

$$0.8 \leq |H(e^{j\omega})| \leq 1; \text{ for } 0 \leq \omega \leq 0.2\pi$$

$$|H(e^{j\omega})| \leq 0.2; \text{ for } 0.6\pi \leq \omega \leq \pi$$

using bilinear transformation method. Assume $T = 1$ sec.

- Q7)** a) List various types of window function used in FIR filter Design, state the mathematical function. Explain Gibbs phenomenon in brief. [11]
 b) Compare FIR and IIR filters. [6]

OR

- Q8)** Design a linear-phase FIR Low Pass Filter with the following desired frequency response. Sketch magnitude response. [17]

$$H_d(e^{j\omega}) = 1; -\frac{\pi}{2} \leq \omega \leq \frac{\pi}{2}$$

$$H_d(e^{j\omega}) = 0; \frac{\pi}{2} \leq \omega \leq \pi$$

Using hanning window with $N = 9$.



Total No. of Questions : 8]

SEAT No. :

P791

[Total No. of Pages : 2

[5870]-1105

**T.E. (Instrumentation & Control)
BUILDING AUTOMATION**

(2019 Pattern) (Semester - II) (306271A) (Elective - 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 function of AHU? What are the different types of air handling units? [9]

b) How does an Air Handling Unit work? [9]

OR

Q2) a) Differentiate between Constant and Variable Air Volume Systems. [9]

b) What are the components of an AHU? [9]

Q3) a) Enlist the parts of fire tube boiler and explain its working? What is the advantage of fire tube boiler? [8]

b) What is geothermal energy? [9]

OR

Q4) a) What is the importance of heat exchanger? What is the working principle of heat exchanger? [8]

b) Differentiate between Water Cooled Chiller vs Air Cooled Chiller in HVAC System. [9]

P.T.O.

- Q5)** a) What is fire alarm? Why do we need NFPA 72 compliance? [9]
b) Explain the conventional (Non- addressable) and addressable Types of Fire Alarm Systems. [9]

OR

- Q6)** a) Explain FAS loops and classifications. [9]
b) Explain Different Types of Fire Alarm Cables. [9]

- Q7)** a) What is Video Analytics? Why Use Video Analytics? [8]
b) What is the difference between a Video Server, an NVR and a DVR? [9]

OR

- Q8)** a) Briefly explain the 5 parts of CCTV camera system? [8]
b) What are the types of CCTV camera? [9]



Total No. of Questions : 08]

SEAT No. :

P792

[Total No. of Pages : 2

[5870]-1106

**T.E. (Instrumentation Engineering)
MACHINE LEARNING**

(2019 Pattern) (Semester - II) (Elective - II) (306271B)

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 whenever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data, if necessary.

- Q1)** a) State pros, cons and applications of Naive Bayes algorithm. [10]
b) Derive Bayes Theorem and Naive Bayes Theorem. [8]

OR

- Q2)** a) Differentiate the concepts of logistic regression, KNN and Naive Bayes. [10]
b) Explain applications of KNN algorithm. [8]

- Q3)** a) Explain SVM machine learning algorithm. [9]
b) Explain separable and non-separable data with an application to SVM. [8]

OR

- Q4)** a) Define Hyperplane, hard margin and soft margin. [9]
b) Explain kernels with application. [8]

- Q5)** a) Explain Decision tree algorithm with example. [10]
b) Describe the methods to avoid the Over fitting in Model. [8]

OR

P.T.O.

Q6) a) What is mean by hyper parameter? Explain hyper parameter tuning. [10]
b) Describe Ensemble learning. [8]

Q7) a) Explain applications of K means clustering algorithm. [9]
b) Explain Silhouette method. [8]

OR

Q8) a) How to choose the value of “K number of clusters” in K-means Clustering? [9]
b) Explain Elbow method. [8]

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Total No. of Questions : 08]

SEAT No. :

P793

[Total No. of Pages : 2

[5870]-1107

T.E. (Instrumentation & Control)

ELECTRICAL DRIVES

(2019 Pattern) (Semester - II) (Elective - II) (306271C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) List the basic types of DC motors. Give the types of DC motor. Describe a DC series motor. [9]
- b) Describe a DC permanent-magnet motor. [9]

OR

- Q2)** a) Explain the Time ratio control strategies in dc chopper? [9]
- b) What is Universal Motor? How does a Universal Motor run on both AC and DC supply? List out the Properties and explain the Characteristics of Universal Motors. [9]

- Q3)** a) Elaborate on the different methods of braking applied to the induction motor? [8]
- b) Explain the Speed Control of Induction Motor by Variable Frequency Control. [9]

OR

- Q4)** a) What are the different methods of speed control of IM? What is meant by stator voltage control. Mention the application of stator voltage control. [8]
- b) What are the features of the Variable Frequency Control of Induction Motor Drive? Give the advantages of the same. [9]

P.T.O.

- Q5)** a) Elaborate on Machine Tool Drives as a Applications of Electric Drives. [9]
b) Explain electrical drives for Lathes, Milling and Grinding Machines. [9]

OR

- Q6)** a) Explain the electrical drives for Electric Traction and Refrigeration and Air Conditioning. [9]
b) Discuss electrical drives for Pumps and Air Compressor. [9]

- Q7)** a) What is Electric Drive? Discuss the types of Electric Drives and parameters on which it depends. [8]
b) Discuss the Non-isolated converters and isolated converters types of DC/DC converters. [9]

OR

- Q8)** a) Explain the Speed control of three phase induction motor using pole changing method and changing Supply Voltage Method. [8]
b) Describe a DC/DC converter in electric vehicle? [9]

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Total No. of Questions : 8]

SEAT No. :

P794

[5870]-1108

[Total No. of Pages : 2

**T.E. (Instrumentation and Control)
ANALYTICAL INSTRUMENTATION
(2019 Pattern) (Semester - II) (Elective - II) (306271D)**

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) *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)** a) Draw a block diagram of Gas Chromatography system? Explain function of each element? [8]
- b) Write a note on HPLC? Give its applications? [9]

OR

- Q2)** a) Enlist various types of detectors, columns and carrier gases used in Gas Chromatography? Explain one from each category with appropriate diagrams? [8]
- b) Write a note on Liquid Chromatography? Give its applications? [9]

- Q3)** a) Explain with suitable diagram how thermal conductivity circuit works? How this is used to carry out flue gas analysis? [9]
- b) Draw and explain the principle of Oxygen gas analyzer using Paramagnetic Principle? [9]

OR

- Q4)** a) Draw and explain [9]
i) Single beam and
ii) Double beam Turbidity measuring instrument? Compare them?
- b) Draw and explain the principle of Zirconium oxide based Oxygen gas analyzer? [9]

P.T.O.

- Q5)** a) Draw and Explain working of the Membrane? List and explain any three factors which affect the separation process? [9]
b) Explain the Principle operation of Mass Spectrometer using suitable block diagram? Give its applications? [9]

OR

- Q6)** a) Draw and explain the Dialysis process? State and explain any one application of it? [9]
b) State the principle of Mass Spectrometer? Show analogy between Optical Spectroscopy and Mass Spectrometry with suitable block diagram? [9]
- Q7)** a) Enlist nuclear radiation detectors? Explain any one in detail? Draw suitable diagram? [8]
b) What is Gamma Spectrometry? Draw a suitable diagram to support your answer? [9]

OR

- Q8)** a) Explain principle of working of GM Counter? Draw suitable diagram of it. [8]
b) Write a note on Solid State detectors? [9]

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Total No. of Questions : 8]

SEAT No. :

P795

[5870]-1109

[Total No. of Pages : 2

T.E. (Chemical)

MASS TRANSFER-I

(2019 Course) (Semester-I) (309341) (Theory)

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 side indicate full marks.
- 4) Assume Suitable data if necessary.

Q1) a) 5000 kg/hr of SO_2 air mixture contain 5% by volume SO_2 is to be scrubbed with 2,00,000 kg/hr of water in a packed tower. The exit concentration of SO_2 is reduced to 0.15%. The tower operates at 1 atm. The equilibrium relation is given by $Y = 30 X$

Where $Y = \text{Moles } \text{SO}_2 / \text{Moles water}$

$X = \text{Moles } \text{SO}_2 / \text{Moles water}$

If the packed height of tower is 420 cm. Estimate the height of transfer unit (H.T.U.) [6]

- b) Explain Criteria for Selection of Solvent for absorption [4]
- c) An air- NH_3 mixture with 20 mol % NH_3 is to be scrubbed with water at 30°C and 1 atm. The equipment to be used has an efficiency of 99%. Determine the final concentration of NH_3 in the outgoing gaseous stream. What is the maximum possible solubility of NH_3 in water at this condition? [8]

OR

- Q2)** a) Derive and explain the calculation of number of trays for absorption [8]
- b) The equilibrium data for a certain absorption may be represented by the equation $Y=5.1 X^2$ where Y is kmol of gaseous absorbable material per kilomole of inert gas and X is kilomole of dissolved absorbable material per kilomole of inert liquid. The unit is operated as continuous countercurrent absorption. The entering gas contain 5 moles of absorbable material per 20 moles of inert gas. The liquid mixture enters the column as a pure material . Determine the minimum molal ratio of the liquid to gas if the gases leaving the tower contain 1 mole absorbable material per 50 mole of inert gas. [10]

P.T.O.

- Q3)** a) What is vapour-liquid equilibria, Explain in Detail with Example. [8]
b) Write a short Note on (Any Three) [9]

- i) Cooling towers,
- ii) Tray towers,
- iii) Spray chambers,
- iv) Spray ponds,

OR

- Q4)** a) Discuss about calculation of height of cooling tower. [8]
b) What is Humidification and Dehumidification, Explain in Detail with Example? [6]
c) What is Lewis Relation. [3]

- Q5)** a) Explain in detail about Gas dispersal equipment with neat diagram. [8]
b) What is Trey Efficiency? Explain types of trays and efficiency in Detail. [9]

OR

- Q6)** a) Explain Constriction, Working and Application of mechanically agitated vessels. [8]
b) Discuss about Various Types of Trays and Packing used in Chemical Industry. [9]

- Q7)** a) A dryer reduces the moisture content of 100kg of a potato product from 80% to 10% moisture. 250kg of steam at 70kPa gauge is used to heat 49,800m³ of air to 80°C, and the air is cooled to 71°C in passing through the dryer. Calculate the efficiency of the dryer. The Specific heat of potato is 3.43kJkg⁻¹°C⁻¹. Assume potato enters at 24°C, which is also the ambient air temperature, and leaves at the same temperature as the exit air. [10]
b) Explain in Detail about Role of Mass Transfer in Tray Dryer. Also state the Application of Tray Dryer. [8]

OR

- Q8)** a) Draw and Explain Rate of Drying Curve. [6]
b) A Certain Material was dried under constant drying condition and it was found that 2 hours are required to reduce the free moisture content from 20% to 10%. How much longer would be required to reduce free moisture content to 4%. Assume that no constant rate period is encountered. [6]
c) Write a short note on [6]
 - i) Pneumatic Dryer and vacuum dryer
 - ii) Fluidized bed Dryer



Total No. of Questions : 8]

SEAT No. :

P796

[Total No. of Pages : 2

[5870] - 1110
T.E. (Chemical)
CHEMICAL TECHNOLOGY - II
(2019 Pattern) (Semester - I) (309342)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q.No.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) *Assume suitable data if necessary.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.*
- 5) *Figures to the right indicate full marks.*

Q1) a) Explain the process of manufacturing of Portland cement with major engineering problems. [9]

b) Describe various steps involved in pyrolysis of coal. [8]

OR

Q2) a) Explain carbonization of coal and the effect of temperature on the products obtained. [9]

b) Explain construction and working of Blast furnace. [8]

Q3) a) Describe different types of solvents used in paint manufacture? [9]

b) Explain production of water gas and its applications. [9]

OR

Q4) a) Write a short note on the following with suitable diagram (any 2) [12]

- i) Producer Gas
- ii) Natural Gas
- iii) Water Gas

b) Write the classification of dyes with their properties. [6]

P.T.O.

Q5) a) Discuss different types of agrochemicals and explain manufacturing process of pesticides. [9]

b) Discuss properties and applications of Varnishes. [8]

OR

Q6) a) Explain manufacturing of penicillin with major engineering problems.[9]

b) Describe in detail about plant growth regulators and yield stimulators.[8]

Q7) a) Explain production of methanol in brief with a neat process flow diagram. [9]

b) Describe production of styrene with its engineering problems. [9]

OR

Q8) Draw a neat flow diagram and explain in brief (any 3) [18]

- a) Production of vinyl chloride
- b) Production of Phenol
- c) Production of acetone
- d) Production of Ethylene



Total No. of Questions : 8]

SEAT No. :

P6516

[Total No. of Pages : 2

[5870]-1112

T.E. (Chemical)

**CHEMICAL ENGINEERING MATHEMATICS
(2019 Pattern) (Semester - I) (309343)**

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) Use least-squares regression to fit a straight line to [8]

x	0	2	4	6	9	11	12	15	17	19
y	5	6	7	6	9	8	7	10	12	12

b) Use a Lagrange interpolating polynomial of the second order to evaluate f(2) on the basis of the data given [9]

x	1	4	6
F(x)	0	1.386	1.792

OR

Q2) a) Fit an exponential model of the form $y = ae^{bx}$ to [10]

x	0.4	0.8	1.2	1.6	2	2.3
y	800	975	1500	1950	2900	3600

b) Find the integration of $(3x + 4)$ in the limits 2 to 5 by Trapezoidal rule using six steps. [7]

Q3) a) Solve the following initial value problem over the interval from t=0 to t=2

where $y(0) = 1$ using Euler's method with $h = 0.25$ $\frac{dy}{dx} = yt^3 - 1.5y$. [10]

b) Given that $\frac{dy}{dx} = x + y^z$ and $y = 0$ when $x = 0$, determine the value of y when $x = 0.3$, correct to four places of decimals using Picard's method. [8]

P.T.O.

OR

Q4) a) Solve the following problem using second order RK method from $t = 0$

$$\text{to } 1 \text{ taking } h = 0.5 \quad \frac{dy}{dx} = -y + t^2 \quad y(0) = 1. \quad [10]$$

b) Obtain the approximate solution $y(t)$ of IVP using Taylor series method. Obtain approximate solution at $t = 0.1$ correct to 4 places of decimal.

$$\frac{dy}{dx} = 1 + ty \quad y(0) = 1 \quad [8]$$

Q5) Use the explicit method to solve the temperature distribution of a long thin rod with a length of 10 cm and the following values: $k' = 0.49 \text{ cal/(s.cm. } ^\circ\text{C)}$, $\Delta x = 2 \text{ cm}$ and $\Delta t = 0.1 \text{ s}$. At $t = 0$, the temperature of the rod is zero and the boundary condition is fixed for all times at $T(0)=100 \text{ } ^\circ\text{C}$ and $T(10)=50 \text{ } ^\circ\text{C}$. The rod is of aluminium with $C = 0.2174 \text{ cal/g. } ^\circ\text{C}$ and $\rho = 2.7 \text{ g/cm}^3$.

Therefore, $k = 0.49(2.7 * 0.2174) = 0.835 \text{ cm}^2/\text{s}$ and $\lambda = 0.835(0.1)/(2)^2 = 0.020875$. Do two iterations.

$$T_i^{l+1} = T_i^l + \lambda(T_{i+1}^l - 2T_i^l + T_{i-1}^l) \text{ where } \lambda = k \frac{\Delta t}{\Delta x^2}. \quad [18]$$

OR

Q6) a) Explain implicit method and its advantages and disadvantages in details. [12]

b) Explain classification of partial differential equations with examples. [6]

Q7) a) Use Newton's method to approximate the maximum of $f(x) = 2 \sin x - (x^2/10)$ with initial guess $x_0 = 1$. Do three iterations. [10]

b) What are the six steps of optimization? Enlist and explain. [7]

OR

Q8) Using Simplex method, [17]

$$\text{Maximize } Z = 5x_1 + 3x_2$$

$$\text{Subject to : } x_1 + x_2 < 2$$

$$5x_1 + 2x_2 <= 10$$

$$3x_1 + 8x_2 <= 12$$

$$x_1, x_2 >= 0$$



Total No. of Questions : 8]

SEAT No. :

P797

[Total No. of Pages : 3

[5870] - 1113

T.E. (Chemical)

CHEMICAL ENGINEERING THERMODYNAMICS

(2019 Pattern) (Semester - I) (309344)

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 right side indicates full marks.
- 4) Use of Calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) Assuming the validity of Raoult's law do the following calculations for benzene(1) toluene (2) system. [18]

- a) Given $x_1 = 0.33$ and $T = 100^\circ\text{C}$, find y_1 and P
- b) Given $y_1 = 0.33$ and $T = 100^\circ\text{C}$, find x_1 and P
- c) Given $x_1 = 0.33$ and $P = 120 \text{ kPa}$, find y_1 and T .

The Antoine equation and parameters are given below:

$$\ln P^{\text{sat}}/\text{kPa} = A - \frac{B}{T+C} \quad (\text{T in } ^\circ\text{C})$$

Compound	A	B	C
Benzene	13.8594	2773.78	220.07
Toluene	14.0098	3103.01	219.79

OR

Q2) a) Construct the $p-x-y$ diagram for cyclohexane (1) – benzene (2) system at 313K given that at 313 K the vapour pressures of cyclohexane and benzene are 24.62 kPa and 24.41 kPa respectively. The liquid phase activity coefficients are given by $\ln \gamma_1 = 0.458 x_2^2$, $\ln \gamma_2 = 0.458 x_1^2$. [10]
b) Explain phase rule for non-reacting systems with suitable examples. [8]

P.T.O.

- Q3)** a) Explain liquid - liquid equilibrium diagram on triangular co-ordinates for a system in which two pairs are partially soluble. [8]
- b) Explain the following two methods of consistency tests for VLE data:[9]
- Using the coexistence equation.
 - Using the partial pressure data.

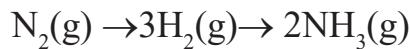
OR

- Q4)** a) Derive the following expression for solid - liquid equilibrium. [10]

$\Psi_i = \exp \int_{T_m}^T \frac{H_i^\ell - H_i^s}{RT^2} dt$ Where $\Psi_i = \frac{fis}{fil} \cdot H_i^\ell$ and H_i^s are the molar enthalpies for the species i in the liquid and solid phases. T_m is the melting temperature of pure species i.

- b) Discuss various criteria for phase equilibrium. [7]

- Q5)** a) Estimate the standard free energy change and equilibrium constant at 700K for the reaction [14]



Given that the standard heat of formation and standard free energy of formation of ammonia at 298K to be- 46100 J/mol and - 16500 J/mol respectively. The specific heat data is given as,

$$C_p = 27.27 + 4.93 \times 10^{-3}T \text{ for } N_2$$

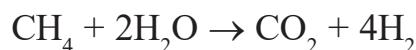
$$C_p = 27.01 + 3.51 \times 10^{-3}T \text{ for } H_2$$

$$C_p = 29.75 + 25.11 \times 10^{-3}T \text{ for } NH_3$$

- b) Write a note on feasibility of a chemical reaction. [4]

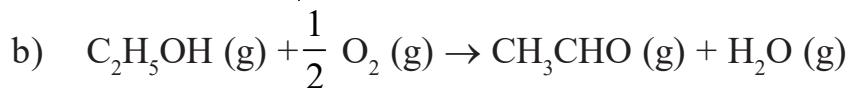
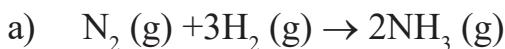
OR

- Q6)** a) A system consisting 2 mol methane and 3 mol water is undergoing the following reactions: $CH_4 + H_2O \rightarrow CO + 3H_2$ [9]



Derive expressions for mole fractions in terms of extent of reaction.

- b) Calculate the standard Gibbs free energy change and the equilibrium constant at 298.15K for the following reactions: [9]



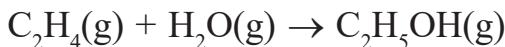
Free energies of formation at 298.15 K are given as follows:

$$\Delta G_f^\circ(NH_3) = -16.747 \text{ kJ/mol}, \Delta G_f^\circ(CH_3CHO) = -133.978 \text{ kJ/mol}$$

$$\Delta G_f^\circ(H_2O) = -228.600 \text{ kJ/mol}, \Delta G_f^\circ(C_2H_5OH) = -174.883 \text{ kJ/mol.}$$

- Q7) a)** 100 moles of gas mixture containing 60% H_2 , 20% N_2 and 20% inert is catalytically reacted to get NH_3 at 50 bar and 400°C. Calculate percent conversion of H_2 and percent NH_3 in exit gases. Given K_p at 400°C = 0.0125. [8]

- b) Calculate the equilibrium constant at 298 K for the reaction [9]

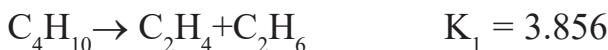


with the help of following data. Also comment about the feasibility of reaction.

	$S_{298}^\circ, J/mol.K$	$H_{298}^\circ, J/mol.K$
$C_2H_4(g)$	220.85	48,986
$H_2O(g)$	189.12	-241997
$C_2H_5OH(g)$	278.00	-238941

OR

- Q8) a)** A feed stock of pure n- butane is cracked at 750K and 1.2 bar to produce olefins. Only two reactions have favourable equilibrium conversion at these condition: [10]



if these reactions reach equilibrium, what is the product composition?

- b) Explain in detail about the relation of equilibrium constant to composition. [7]



Total No. of Questions : 8]

SEAT No. :

P6517

[Total No. of Pages : 2

[5870]-1114

T.E. (Chemical)

CHEMICAL INDUSTRY MANAGEMENT

(2019 Pattern) (Semester - I) (409345 - A) (Elective - IA)

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) *Figures to the right side indicates full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Explain various functions of Storekeeper. [9]

b) Explain various functions of Purchase Manager. [9]

OR

Q2) Explain in detail quotation, tenders and comparative statement. [18]

Q3) a) Explain penetration pricing and skimming pricing detail. [9]

b) What is market research? What are different market research techniques? [8]

OR

Q4) a) What is sales promotion? Explain sales promotion techniques. [9]

b) What do you mean by pricing? Explain any two in detail. [8]

Q5) a) Write Notes on : [9]

- i) Antidumping Duty
- ii) International Trade

b) Explain in detail the procedure to import equipment from foreign source. [9]

OR

P.T.O.

Q6) a) Explain in detail various factors affecting international trade. [9]

b) Explain the role of Quality Circles for Quality Management of a process industry. [9]

Q7) Write short notes on : [17]

a) FERA and FEMA

b) Patent and Patent Rights

c) Monopolies Restrictive Trade Practices (MRTP)

OR

Q8) 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. [5]



Total No. of Questions : 8]

SEAT No. :

P1007

[5870]-1115

[Total No. of Pages : 2

T.E. (Chemical)

FOOD TECHNOLOGY

(2019 Pattern) (Semester-I) (Elective-I)(309345 B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *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) *Use of logarithmic tables slide rule, electronic pocket calculator and steam tables is allowed*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Explain principles and methods used for fruit and vegetable preservation [9]
b) Explain composition and related quality factor for fruit and vegetable processing [9]

OR

- Q2)** a) Explain principles of storage of fruits and vegetables and also discuss the types of storage [9]
b) Discuss preparation of syrups, cordials and nectars [9]

- Q3)** a) Explain various methods of raw material preparation of food such as cleaning, sorting and grading/peeling used before its processing [9]
b) Explain how in food industry waste management is done and controlled [8]

OR

- Q4)** a) Explain the construction and working of Ball mill with neat diagram [8]
b) Write short note on shredding, dicing and pulping equipment used in size reduction of food [9]

- Q5)** a) Enlist various packaging materials used in the food industry and explain them in short [8]
b) What is combined packaging system and explain [5]
c) Write short note on bar code and other marking printed to food packets [5]

OR

P.T.O.

- Q6)** a) Write short note on various chemical food preservatives used [6]
b) Write short note on Modified and controlled atmosphere packaging of food products. [6]
c) Explain the process of Jelly and Pickle making in detail [6]

- Q7)** a) What are various factors considered while deciding packaging materials? Explain with suitable examples [7]
b) Differentiate between stretched packaging and shrink packaging [5]
c) Write short note on labeling of containers [5]

OR

- Q8)** a) Write short note on [12]
i) Hurdle technology
ii) HACCP
iii) USFDA
b) Explain the term safety used in good manufacturing practices and quality assurance in the food industry [5]



Total No. of Questions : 8]

SEAT No. :

P798

[Total No. of Pages : 2

[5870] - 1116

T. E. (Chemical)

POLYMER ENGINEERING

(2019 Pattern) (Semester - I) (Elective-I) (309345 C)

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 side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Define the following terms and their significance in molecular weight of polymers; [6]

- i) Mn
- ii) Mw
- iii) Mv

b) What is molecular weight? Describe the effect of molecular weight on engineering properties of polymers? [6]

c) Determine the molecular weight of a polystyrene sample which has an a value of 0.60, a K value of 1.6×10^{-4} dL/g, and al limiting viscosity number or intrinsic viscosity of 0.04 dL/g. [6]

OR

Q2) a) Calculate the relative viscosity, specific viscosity and reduced viscosity of a 0.5% (made by dissolving 0.25 g of polymer in 50 mL of solvent) solution where the time for solvent flow between the two appropriate marks was 60 s and the time of flow for the solution was 80 s. [6]

b) What are the instruments used to measure the engineering properties of polymers? [6]

c) Write a short on the following terms; [6]

- i) Molecular weight distribution and its significance.
- ii) Polydispersity Index.

P.T.O.

- Q3)** a) Describe the copolymers & its kinetics coordination polymerization. [6]
b) Write the differences between thermoplastics and thermosetting polymers. [6]
c) Write a short on the following terms; [5]
i) Ionic reaction.
ii) Copolymerization.

OR

- Q4)** a) Describe the kinetics of free radical polymerization with reactions and chain transfer agents. [10]
b) What is polymerization? Explain the types polymerization and its applications. [7]

- Q5)** a) Describe the different moulding methods of polymers with neat sketch. [10]
b) Write a short on the following terms; [8]
i) Fillers
ii) Plasticizers
iii) Lubricants and Colourants
iv) UV stabilizers

OR

- Q6)** a) In molding process, the polymer material will try to stick to the wall of the mold (container). How can you prevent it? [5]
b) Write a short on the following terms; [9]
i) Polymer additives
ii) Fire retardants
iii) Antioxidants
c) What are stereospecific Polymers? How are they achieved? [4]

- Q7)** a) Explain the pressure-less processing techniques for polymer synthesis. [7]
b) Describe the properties and applications of PE, PP, PS, PPO and Teflon Polyesters. [10]

OR

- Q8)** a) Describe the compassions between Kevlar and Nomex. [4]
b) Write the applications of SBR? [3]
c) Describe the properties and applications of natural rubber, SBR, Vinyl esters, Bunas Silicones, Thiokol. [10]



Total No. of Questions : 8]

SEAT No. :

P799

[Total No. of Pages : 2

[5870] - 1117

T. E. (Chemical Engg.)

DOWNSTREAM PROCESSING

(2019 Pattern) (Semester - I) (Elective-I) (309345 D)

Time : 2 1/2 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt 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) What is Cryogenic distillation for refinery? Explain in details with suitable examples. [10]

b) What is desulfurization? Explain methods of desulfurisation [8]

OR

Q2) a) Explain in details with suitable examples azeotropic distillation. [10]

b) Give advantages and disadvantages of Cryogenic distillation. [8]

Q3) a) Explain in details about pressure swing distillation. [10]

b) Explain in details homogeneous and heterogeneous azeotropic distillation. [7]

OR

Q4) a) Explain in details hydrogel process with suitable application. [10]

b) Give the properties of catalyst and advantages of catalyst. [7]

Q5) a) What is adsorption? Explain in details about thermal swing adsorption. [10]

b) Explain in details about pressure swing adsorption [8]

OR

P.T.O.

- Q6)** a) Explain in details about any one process of energy conservation separation. [10]
b) What is role of catalyst in chemical reaction, Gives the uses of catalyst.[8]

- Q7)** a) Explain in detail methods of resin manufacturing with physical & chemical properties. [10]
b) Define Capacity, selectivity and regeneration. [7]

OR

- Q8)** a) Explain in details with neat sketches separation synthesis algorithm.[10]
b) Explain in short advancement in distillation. [7]



Total No. of Questions : 8]

SEAT No. :

P800

[Total No. of Pages : 2

[5870] - 1118

T.E. (Chemical)

**CHEMICAL REACTION ENGINEERING -I
(2019 Pattern) (Semester -II) (309348)**

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 side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Derive performance equation for Steady state batch and show graphical representation. [12]

b) A homogeneous liquid phase second order reaction takes place in MFR with 50% conversion. Find conversion if original reactor is replaced by another MFR having volume 6 times that of the original reactor-all else remain unchanged. [6]

OR

Q2) a) Derive performance equation for steady state Plug Flow Reactor and show graphical representation. [12]

b) Explain the terms holding time and space time in detail. [6]

Q3) a) Explain series, parallel, and independent reactions. With suitable examples [12]

b) Derive the relationship for C_{rf} in terms of ψ for CSTR in case of parallel reaction. [5]

OR

PTO.

Q4) In CSTR, reactant A produces Products R and S by parallel reaction, $r_R = 0.4C_A^2$ and $r_S = 2C_A$. A feed with $C_{A0} = 40$ enters a MFR and mixture of A, R and S leaves the reactor. Find C_R , C_S and τ for 90% conversion in CSTR. [17]

Q5) a) Explain effect of temperature on heat of reaction with equations. [12]

b) Discuss the Van't Hoff isotherm equation. [6]

OR

Q6) a) Explain non-adiabatic operation in detail. [12]

b) Explain the characteristics of chemical equilibrium. [6]

Q7) a) Explain tank in series model in detail. [9]

b) Explain the concept of residence time distribution in detail. [8]

OR

Q8) What do you mean by E, F and C curves? Explain relationship between E, f and C curves. [17]



Total No. of Questions : 8]

SEAT No. :

P801

[Total No. of Pages : 3

[5870]-1119

T.E. (Chemical)

MASS TRANSFER - II

(2019 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) Neat diagrams must be drawn wherever necessary.
- 3) Figure to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Define the following terms in solvent Extraction with their significance [6]

- i) Selectivity
- ii) Distribution coefficient
- iii) Plait point

b) Explain the selection criteria of solvent used for Liquid-Liquid Extraction. [6]

c) A solution of Nicotine in water containing 1% nicotine is to be extracted with kerosene as a solvent at 293K. Water and kerosene are practically immiscible (Essentially insoluble).

Assume the equilibrium relationship to be $Y = 0.9 X$

Where $Y = \text{kg of nicotine} / \text{kg of kerosene}$

$X = \text{kg of nicotine} / \text{kg of water}$

Determine % extraction of nicotine if 100 kg of the feed solution is extracted with 150 kg of solvent. [6]

OR

Q2) a) Carbon Disulphide is used to extract iodine from its saturated solution in water in a single stage extraction. The distribution coefficient is given by $K = Y/X = 588.2$, where Y is gm of Iodine/ 1lit of CS_2 and X is gm of Iodine/ 1 litre of water. Calculate the concentration of Iodine in the aqueous phase if 1 litre of saturated aqueous solution containing 0.3 gm of Iodine / litre of water at 293K and contacted with 50ml of CS_2 by stirring. [6]

P.T.O.

- b) Write a material balance for single stage solvent Extraction with immiscible solvents. [6]
- c) Describe the principle, construction and mechanism of pulsed column for solvent Extraction with neat sketch. [6]

- Q3)** a) Write the material balance for the continuous crosscurrent leaching assuming variable underflow and no insolubles in the overflow. [6]
- b) Explain the constant and variable underflow in leaching operation. [5]
- c) Discuss on the graphical representation of equilibrium characteristics of Leaching operation for constant underflow and no solid in overflow with diagram and proper notations. [6]

OR

- Q4)** a) Oil is be extracted from meal by means of benzene using continuous countercurrent leaching unit. The unit treats 1000 kg of meal (on completely exhausted solids basis) per hour. The untreated meal contains 365 kg of oil and 30 kg of benzene. The solvent used contains 14 kg of oil and 590 kg of benzene. The exhausted solids contain 55 kg of oil and 451 kg of benzene. Find the number of stages required. The entrainment data is : [10]

Kg of oil/kg of solution	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7
Kg of solution/kg of solid	0.5	0.505	0.515	0.53	0.55	0.517	0.595	0.62

- b) Enlist the equipment for leaching operation and explain any of them in detail. [7]

- Q5)** 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 colour of 0.96. Calculate the necessary dosage of the fresh carbon per 2000 kg solution for a single stage process. 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 colour	9.6	8.6	6.3	4.3	1.7	0.7

- b) Which parameters should affect the shape of Breakthrough curve in adsorption. [8]

OR

- Q6)** a) Describe the Freundlich and Langmuir adsorption Isotherms in adsorption operation. [6]

- b) Discuss on the principle, equilibria and rate of ion Exchange process in details. [8]

- c) Discuss the applications of absorption operation. [4]

- Q7)** a) Give the classification of crystallizers. Explain the construction and working of Swenson Walker Crystallizer with diagram. [7]

- b) A Solution contains 500 Kg Na_2CO_3 and water has a concentration of 25% by wt. of salt. It is cooled from 335K to 285K in an agitated mild steel vessel. Weight of the vessel is 750 Kg. 2.0 % water is lost by evaporation. Crystals of $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ are formed. Calculate the yield of crystals and the heat to be removed? [10]

Data: Solubility At 285K: 8.9 Kg/ 100 Kg water.

Heat capacity of solution: 3.6 KJ / Kg K.

Heat Capacity of M.S: 0.5 KJ/ KgK.

Heat of Solution: 78.5 MJ / KMo1.

Latent heat of Vaporization: 2395 KJ/ Kg.

OR

- Q8)** a) Define the terms in membrane processes; [4]

- | | |
|-----------------------|---------------------|
| i) Rejection | ii) Permeability |
| iii) Membrane fouling | iv) Cake Resistance |

- b) What are different membrane modules? [3]

- c) Write the material and energy balance of crystallizer. [10]



Total No. of Questions : 8]

SEAT No. :

P802

[Total No. of Pages : 2

[5870]-1120

T.E. (Chemical)

TRANSPORT PHENOMENA

(2019 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) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Derive the expression of molar flux, concentration profile and average concentration for diffusion through stagnant gas. [12]

b) Calculate the mass flux of benzene through a layer of air 10 mm thickness at 25 °C and 200 KN/m² (total pressure), partial pressure of benzene is 6×10^3 N/m² at the left side of the layer and 1 KN/m² at the right side. The mass diffusivity at this temperature and pressure is 4.4×10^{-6} m²/s? [6]

OR

Q2) a) Derive the expression of molar flux and concentration profile for diffusion with heterogeneous (instantaneous and dimerization) chemical reaction. [12]

b) What is rate of evaporation of chloropicrin into air at 298 K? Total pressure = 770 mm Hg, diffusivity = 0.088 cm²/sec, vapor pressure = 23.81 mm Hg, $Z_2-Z_1 = 11.14$ cm, density of chloropicrin = 1.65 g/cm³, $S = 2.29$ cm². [6]

Q3) a) Derive Navier Stoke's equation of motion. [12]

b) Give significance of different types of derivatives. [5]

OR

Q4) a) Derive equation of continuity in three dimensional form. [12]

b) Derive dimensionless form of equation of change. [5]

P.T.O.

- Q5)** a) Derive Ergun equation for flow through packed bed. [12]
b) Show that for laminar flow of fluid through the tube $f = 16/Re$. [6]

OR

- Q6)** a) Derive expression of fanning friction factor. [12]
b) What pressure gradient is required to cause N, N-diethylamine to flow in a horizontal smooth tube of inside diameter 3 cm at a rate of 1.1 lit/s. Density of diethylamine is 935 kg/m^3 and viscosity is 1.95 cp. (Assume friction factor $f = 0.0063$). [6]

- Q7)** a) Explain Chilton and Colburn analogy. [9]
b) A spherical water droplet, 0.05 cm in diameter is falling at velocity of 215 cm/sec through dry, still air at 1 atm pressure. Estimate instantaneous rate of evaporation from the drop if drop surface is at 21°C and air at 60° C . Vapor pressure of water at 21°C is 0.0247 atm. Assume pseudo steady state condition and $k_{xm} = 1.35 \times 10^{-3} \text{ mol s}^{-1}\text{cm}^{-2}$. [8]

OR

- Q8)** a) Explain Martinnelli's analogy. [9]
b) Explain co-relation of binary mass transfer coefficient in one phase at low mass transfer rates. [8]



Total No. of Questions : 8]

SEAT No. :

P803

[5870]-1121

[Total No. of Pages : 2

T.E. (Chemical)

**ENERGY CONSERVATION IN CHEMICAL PROCESS
INDUSTRIES**

**(2019 Pattern) (Semester - II)
(Elective - II) (End Sem) (309351 A)**

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 wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume Suitable data, if necessary.*

Q1) Explain in detail new energy technologies. [18]

OR

Q2) Explain in detail methodology for forecasting industrial energy supply and demand. [18]

Q3) Explain in detail human aspect of energy conservation and involvement tree. [17]

OR

Q4) a) Write in details elements of energy management program. [9]

b) Enlist activities for promoting energy conservation in present status. [8]

Q5) a) Draw the sketch of heat pump and explain its principle and working. [9]

b) Explain Waste-Minimization and Resource Conservation. [9]

OR

Q6) a) How and where the energy losses can be minimized in coolers. [9]

b) Enlist the checklist for energy conservation in boilers. [9]

Q7) What are the energy consuming units in petrochemical Industries and give the important conservation steps? [17]

OR

Q8) Explain waste minimization and its classification, housekeeping, process change, recycling, product modification, waste minimization methodology steps, benefits of waste minimization in sugar industry. [17]

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Total No. of Questions : 8]

SEAT No. :

P2325

[Total No. of Pages : 2

[5870]-1122

T.E. (Chemical)

PROCESS INSTRUMENTATION AND CONTROL

(2019 Pattern) (Semester - II) (Elective - II) (Theory) (309351B)

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) Figures to the right indicate full marks.
- 3) Neat diagram must be drawn wherever necessary.
- 4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Explain with diagram, construction and working of bellows. [8]

b) What are transducers? Explain types of transducers. [8]

OR

Q2) a) Enlist various pressure measuring instruments and explain U tube manometer in detail. [8]

b) Explain with diagram, construction, working and calibration of pressure sensor using dead weight tester. [8]

Q3) a) Explain with diagram, construction and working of Orifice meter with its industrial application. [10]

b) How level can be measured using radioactive transducers? Draw neat sketch and explain in detail. [8]

OR

Q4) Write short note on : [18]

- a) Radiation level method
- b) Sight glass method

P.T.O.

Q5) a) Explain principle with diagram, construction and working of pH meter. [8]

b) Write short note on : [10]

- i) Refractometry
- ii) Liquid chromatography

OR

Q6) Describe with neat diagram the following techniques of composition analysis. [18]

- a) Gas chromatography
- b) Mass spectroscopy

Q7) a) Derive the transfer function of mercury in glass thermometer and find the dynamic behavior of step change in input. [9]

b) Give classification of process variable with respect to process control. [9]

OR

Q8) a) Explain with equation, different control actions. [9]
b) What are servo and regulatory operation? [9]



Total No. of Questions : 08]

SEAT No. :

P804

[5870]-1123

[Total No. of Pages : 2

T.E. (Chemical)

CORROSION ENGINEERING

(2019 Pattern) (Semester-II) (Elective II) (309351C)

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 side indicate full marks.
- 4) Assume Suitable data, if necessary.

Q1) a) Explain in Detail about dezincification [2]

b) Explain in Detail about pitting corrosion and method to prevent pitting corrosion [8]

c) Discuss Remedial Measure for dezincification and intergranular Corrosion. [8]

OR

Q2) a) What is erosion and cavitation, Explain in Detail? [8]

b) What is stress corrosion cracking? Explain Prevention of Stress Corrosion Cracking. [10]

Q3) a) Explain the Concept in Detail about Explains Pilling-Bedworth Ratio. [5]

b) Explain in Detail about Mechanisms of Oxidation. [6]

c) Explain in Detail about Corrosion of iron and steel [6]

OR

Q4) a) Explain the Testing method for Different Metal [7]

b) Explain in Detail about the Effect of temperature and composition on Media [8]

c) Define Corrosion. [2]

- Q5)** a) Explain Different types of Corrosion and Preventive Method for it. [10]
b) What is Coating? Explain with Example. [8]

OR

- Q6)** Write a short note on. [18]

- a) Heat treatment
- b) Anodic protection
- c) Passivity

- Q7)** a) Explain in detail the role of Zink in Galvanizing. [5]
b) What is High temperature oxidation? Explain with Example. [6]
c) Write a short note on Alloying. [6]

OR

- Q8)** a) Explain the Modification required in Material to Prevent Corrosion. [10]
b) Explain in Detail about reaction occurred in Corrosion, with Example. [7]



Total No. of Questions : 8]

SEAT No. :

P1008

[Total No. of Pages : 2

[5870]-1124

T.E. (Chemical)

**ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
(2019 Pattern) (309351D) (Semester - II) (Elective - II)**

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) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) Explain what is neural network and its applications in detail. [18]

OR

Q2) Explain knowledge based process control in detail with suitable example.[18]

Q3) Define expert system and explain in detail characteristics, limitations, advantages and disadvantages of expert system. [17]

OR

Q4) Discuss expert system's applications in various chemical and bio – Chemical processes in detail [17]

Q5) Explain resolution in propositional and first order logic with resolution graph. [18]

OR

Q6) Explain the following points in detail [18]

- a) Deductive Retrieval
- b) Backward Chaining
- c) Second order Logic.

P.T.O.

Q7) a) Explain the concept of problem decomposition with help of goal trees. [9]

b) Discuss unified framework for planning in detail. [8]

OR

Q8) Explain in detail the difference between state space planning and goal stack planning. [17]



Total No. of Questions : 8]

SEAT No. :

P805

[Total No. of Pages : 2

[5870]-1125

T.E. (Computer Engineering)
DATABASE MANAGEMENT SYSTEMS
(2019 Pattern) (Semester-I) (310241)

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) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data if necessary.

Q1) a) Explain 3NF and BCNF and give its example. Also enlist their differences. [8]

b) What are the desirable properties of decomposition? Explain it with example. [9]

OR

Q2) a) Explain partial and transitive dependencies with example. [8]

b) Explain why database normalization is required for good relational database design? Explain with example requirements of different normal forms like 1NF, 2 NFand 3NF. [9]

Q3) a) What is conflict serializability? How to check schedule is conflict serializable schedule. Give one example. [9]

b) During execution, a transaction passes through several states, until it commits or aborts. List all possible sequence of states through which transaction may pass. Explain the situation when each state transition occurs. [9]

OR

Q4) a) Consider the following two transactions: [9]

T31: read(A);
read(B);
if A = 0 then B:=B+1;

Write (B)

T32: read(B);
read(A);
if B= 0 then A: = A+1;
write (A).

Add lock and unlock instructions to transactions T31 and T32, so that they observe the two phase locking protocol. Can the execution of these transactions result in a deadlock?

P.T.O.

- b) To ensure atomicity despite failures we use Recovery Methods. Explain in detail log based recovery method. [9]

- Q5)* a) Explain following NOSQL database types with examples and also state the scenario where it is useful [9]
i) Column-oriented
ii) Graph
iii) Document -oriented
b) Explain CAP theorem and BASE properties. [8]

OR

- Q6)* a) Describe distributed database. Explain System architecture of distributed transaction. [8]
b) Explain following types of data with example [9]
i) Structured
ii) Semi-structured
iii) Unstructured
- Q7)* a) Write short note on [9]
i) Active database
ii) Deductive database
b) Explain how encoding and decoding of JSON object is done JAVA with example. [9]

OR

- Q8)* a) Write short note on [9]
i) Geometric data
ii) Geographic data
b) What is object relational database? What are its advantages and disadvantages? [9]



Total No. of Questions : 8]

SEAT No. :

P806

[Total No. of Pages : 2

[5870]-1126

T.E. (Computer Engineering)
THEORY OF COMPUTATIONS
(2019 Pattern) (Semester-I) (310242)

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) Figures to the right side indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

Q1) a) Write a grammar G for generating the language [9]

- i) $L = \{w \text{ belongs to } \{a,b\}^* \mid w \text{ is an even length palindrome with } |w| > 0\}$
- ii) Set of odd length strings in $\{0,1\}^*$ with middle symbol '1'

b) Simplify the following grammar [9]

$$S \rightarrow 0A0|1B1|BB$$

$$A \rightarrow C$$

$$B \rightarrow S|A$$

$$C \rightarrow S|\epsilon$$

OR

Q2) a) Reduce the following grammar to Greibach Normal form. [9]

$$S \rightarrow AA \mid 0$$

$$A \rightarrow SS \mid 1$$

b) Construct a DFA for the following left linear grammar. [9]

$$S \rightarrow B1/A0/C0$$

$$B \rightarrow B1/1$$

$$A \rightarrow A1/B1/C0$$

$$C \rightarrow A0$$

Q3) a) Construct a context free grammar which accepts $N(A)$, where [9]

$A = (\{q_0, q_1\}, \{0, 1\}, \{Z_0, Z\}, \delta, q_0, Z_0, \varphi)$ where δ is given by

$\delta(q_0, 1, Z_0) = \{(q_0, ZZ_0)\}$

$\delta(q_0, \epsilon, Z_0) = \{(q_0, \epsilon)\}$

$\delta(q_0, 1, Z) = \{(q_0, ZZ)\}$

$\delta(q_0, 0, Z) = \{(q_1, Z)\}$

$\delta(q_1, 1, Z) = \{(q_1, \epsilon)\}$

$\delta(q_1, 0, Z_0) = \{(q_0, Z_0)\}$

P.T.O.

- b) Construct a PDA that accept the language generated by grammar [8]
- $S \rightarrow 0S1 | A, A \rightarrow 1A0 | S | \epsilon$
 - $S \rightarrow aABB | aAA, A \rightarrow aBB | a, B \rightarrow bAA | A$

OR

- Q4)** a) What is NPDA? Construct a NPDA for the set of all strings over {a,b} with odd length palindrome. [9]
- b) Design a push down automaton to recognize the language generated by the following grammar: [8]
- $$S \rightarrow S + S \mid S \square S \mid 4 \mid 2$$
- Show the acceptance of the input string $2 + 2^*4$ by this PDA.

- Q5)** a) What is a Turing Machine? Give the formal definition of TM. [9]
Design a TM that replaces every occurrence of abb by baa.
- b) What are the different ways for extension of TM? Explain. [9]
Design TM for language $L = \{a^i b^j \mid i < j\}$

OR

- Q6)** a) What is TM? Design TM to check well formedness of Parenthesis. Expand the transition for $((())()$ [9]
- b) Elaborate the following terms [9]
- Universal Turing Machine (UTM)
 - Recursively Enumerable Languages
 - Halting Problem of Turing Machine

- Q7)** a) Justify “Halting Problem of Turing machine is undecidable”. [9]
b) Define the Class P and Class NP and Problem with their example in detail. [8]

OR

- Q8)** a) Explain Satisfiability Problem and SAT Problem and comment on NP Completeness of the SAT Problem. [9]
b) What do you mean by polynomial time reduction? Explain with suitable example. [8]



Total No. of Questions : 8]

SEAT No. :

P807

[Total No. of Pages : 2

[5870]-1127

T.E. (Computer Engineering)

**SYSTEMS PROGRAMMING AND OPERATING SYSTEM
(2019 Pattern) (Semester - I) (310243)**

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 indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain Differences between static link library and dynamic link library. [8]
b) What are the different types of Loaders? Explain compile and Go loader in detail. [9]

OR

- Q2)** a) List and explain different loader schemes in detail. [9]
b) Explain Design of Direct linking loaders and explain required data structures. [8]

- Q3)** a) Compare Compilers and Interpreters. [8]
b) What is LEX? Explain working of LEX with suitable diagram. [9]

OR

- Q4)** a) Define token, pattern, lexemes & lexical error. [8]
b) What is a compiler? Explain any two phases of compiler with suitable diagram. [9]

- Q5)** a) What is the need of Process synchronization? Explain Semaphore in detail. [9]
b) What is Operating System? Explain various operating system services in detail. [9]

P.T.O.

OR

- Q6)** a) Explain preemptive and Non preemptive scheduling in detail. [9]
b) Explain any two scheduling algorithm with suitable example. [9]

- Q7)** a) What is virtual memory management? Explain address translation in paging system. [9]

- b) Write proper examples and explain memory allocation strategies first fit, best fit and worst fit. Also explain their advantages and disadvantages. [9]

OR

- Q8)** a) Explain any two page replacement strategies in detail. [9]
b) What is TLB? Explain the paging system with the use of TLB? What are the advantages of TLB? [9]



Total No. of Questions : 8]

SEAT No. :

P808

[Total No. of Pages : 3

[5870] - 1128

T.E. (Computer)

**COMPUTER NETWORK AND SECURITY
(2019 Pattern) (Semester - I) (310244)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1, 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 Calculator is allowed.
- 5) Assume suitable data is necessary.

Q1) a) Explain distance vector routing algorithm. [6]

- b) A host was given the 192. 168.2.64 /25 IP address, indicate:
i) Net mask of the network in dotted decimal notation.
ii) The network address to which the host belongs.
iii) The network broadcast address to which the host belongs.
iv) The total number of hosts available in the network.

c) Explain IPv4 header format in detail [6]

OR

Q2) a) What is ARP? How it works? [6]

- b) Suppose a router has built up the routing table as shown in the following table. The router can deliver packets directly over interfaces eth0 and eth1, or it can forward packets to other routers in the table. [6]

Destination	Netmask	Gateway
156.26.10.0	255.255.255.192	Eth0
156.26.10.128	255.255.255.128	Eth1
156.26.0.0	255.255.0.0	156.26.10.1
0.0.0.0	0.0.0.0	156.10.1.30

Describe what the router does with a packet addressed to each of the following destinations

- i) 156.26.10.66
 - ii) 156.26.10.226
 - iii) 168.130.12.27
- c) Explain Network Address Translation (NAT) process. [6]

P.T.O.

- Q3)** a) For each of the following applications, determine whether TCP or UDP is used as the transport layer protocol and justify the reason(s) for your choice. [5]
- i) File Transfer
 - ii) Watching a real time streamed video
 - iii) Web browsing
 - iv) A Voice over IP (VoIP) telephone conversation.
 - v) YouTube video
- b) Explain TCP state transition diagram? [6]
- c) Define Socket? Explain Socket primitives at client and server side for TCP communication with diagram. [6]

OR

- Q4)** a) Explain TCP connection establishment process with suitable diagram. [5]
- b) What causes silly window syndrome? How is avoided? Explain. [6]
- c) Following is a dump of UDP header in Hexadecimal format [6]
- 06 32 00 0D 00 1C E2 17
- i) What is source port number?
 - ii) What is destination port number?
 - iii) What is total length of the user datagram?
 - iv) What is the length of the data?
 - v) Is packet directed from a client to server or vice versa?
 - vi) What is the client process?
- Q5)** a) What is the difference between persistent & non persistent HTTP? Explain HTTP Request & Response message format. [6]
- b) Explain working of DHCP. [6]
- c) Differentiate between POP & IMAP protocol. [6]

OR

- Q6)** a) Explain how DNS query resolved? [6]
- b) Explain FTP w.r.t. control and data connection? Explain any two FTP commands. [6]
- c) When web pages containing emails are sent out, they are prefixed by MIME Header, why? Explain MIME Header. [6]

- Q7)** a) Draw and explain Operational Model of Network Security. [5]
b) Discuss the working of IPSec? What are the different security services offered by IPSec? [6]
c) Differentiate between Active attacks and Passive Attacks. [6]

OR

- Q8)** a) List and explain various elements of Information Security. [5]
b) Compare Symmetric Key and Asymmetric key encryption techniques. [6]
c) Explain Secure Socket Layer handshake Protocol. [6]



Total No. of Questions : 8]

SEAT No. :

P809

[5870] - 1129

[Total No. of Pages : 2

T.E. (Computer Engineering)

INTERNET OF THINGS AND EMBEDDED SYSTEMS

(2019 Pattern) (Semester - I)(Elective - I) (310245A)

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) Assume suitable data, if necessary.

- Q1)** a) Demonstrate the working of Publish-Subscribe Communication model using Diagram with suitable application. [6]
- b) Illustrate REST based Communication API with Suitable IoT System. [6]
- c) Classify the four pillars of IoT. [6]

OR

- Q2)** a) Illustrate steps of IoT design methodology for smart irrigation system. [6]
- b) Demonstrate the use of SCADA with the help of suitable IoT Application. [6]
- c) Categorize different connectivity technologies required for IoT system development and explain any one of them in brief. [6]

- Q3)** a) Illustrate different issues with standardization of IoT Protocols. [6]
- b) Classify the different Topology of IEEE 802.15.4 and explain with suitable diagram. [6]
- c) Show the use of LoRa protocol in any suitable IoT application development. [5]

OR

PTO.

- Q4)** a) Classify between RFID and SCADA Protocol. [6]
b) Illustrate the various IoT applications developed using IP based protocols. [6]
c) Show with suitable reasons why Zigbee is popular than Wi - Fi and Bluetooth in IoT. [5]

- Q5)** a) Demonstrate Python Web Application Framework - Django with the suitable example. [8]
b) Use the knowledge of Cloud Computing to demonstrate
i) Amazon Auto Scaling.
ii) Xively Cloud for IoT. [10]

OR

- Q6)** a) Show that WAMP and its key concepts are useful in Cloud based IoT application Development. [8]
b) Apply the concept of cloud computing to design the smart irrigation system with proper explanation. [10]

- Q7)** a) Predict the possible challenges in designing secure IoT applications. [8]
b) Illustrate the classic pillars of information assurance while securing the IoT application. [9]

OR

- Q8)** a) Illustrate the threat model in securing IoT applications. [8]
b) Use security concepts to identify different threats (at least 03 in each) in the following IoT applications:
i) Smart Home Automation
ii) Smart Parking System
iii) Smart Irrigation System [9]



Total No. of Questions : 8]

SEAT No. :

P810

[5870] - 1130

[Total No. of Pages : 2

**T.E. (Computer Engineering)
HUMAN COMPUTER INTERFACE
(2019 Pattern) (Semester - I)(Elective - I) (310245B)**

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) Figures to the right side indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Make suitable assumption wherever necessary.

Q1) a) Explain interaction styles:

- i) Command - line and
- ii) Menu Selection

[6]

b) Which are the characteristics of Graphical User Interface? Explain. **[6]**

c) Write down about software life cycle importance in HCI. **[6]**

OR

Q2) a) Explain interaction styles:

- i) Form fill - in and
- ii) Direct Manipulation

[6]

b) Which are the characteristics of Web User Interface? Explain. **[6]**

c) Write down about Iterative design and Prototyping in detail. **[6]**

Q3) a) Describe Usability Assessment and common usability problems with example. **[6]**

b) Write short note on :

- i) Formative evaluation
- ii) Summative Evaluation.

[6]

c) Elaborate Heuristic Evaluation with example. **[5]**

OR

PTO.

Q4) a) Describe Practical and objective measures of Usability in detail. [6]

b) Write short note on :

i) Universal Design

ii) Multi-modal Interaction [6]

c) Elaborate Cognitive Walkthrough. [5]

Q5) a) List down paradigms used for Interaction in HCI. Explain any five Paradigms. [6]

b) Explain ubiquitous computing in detail. [6]

c) Explain role of Machine learning in HCI with example. [6]

OR

Q6) a) What is mean by framework in HCI? Explain Five - Stage search framework. [6]

b) Explain dynamic queries and faceted search used in HCI. [6]

c) Explain pattern recognition process with suitable example. [6]

Q7) a) Describe Mobile form factors using suitable mobile app developed using HCI. [6]

b) Discuss Navigation and toolbars in detail. [6]

c) Write down about designing for automotive interfaces in HCI. [5]

OR

Q8) a) Describe Tablet format app using suitable mobile app developed using HCI. [6]

b) Discuss Tap - to reveal and direct manipulation in detail. [6]

c) Write down about designing for audible interfaces in HCI. [5]

Total No. of Questions : 8]

SEAT No. :

P1009

[Total No. of Pages : 2

[5870]-1131

**T.E. (Computer Engineering)
DISTRIBUTED SYSTEMS**

(2019 Pattern) (Semester - I) (Elective - I) (310245C)

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) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data wherever necessary.

Q1) a) Why clock synchronization is important in distributed system with suitable example? Describe two clock synchronization algorithms. [9]

b) What is mutual exclusion? Compare and contrast mutual exclusion algorithms. [9]

OR

Q2) a) Describe the purpose of election algorithm in distributed system. Describe the bully election algorithm. [9]

b) Describe gossip-based contribution in detail. [9]

Q3) a) Describe File service architecture in distributed system. [9]

b) Explain in detail suns network file system. [8]

OR

Q4) a) Why naming is important in distributed system? Explain flat naming and structured naming. [9]

b) Describe Andrew file system in detail. [8]

P.T.O.

Q5) a) Explain the reasons of replication? Describe replica management in distributed system. [9]

b) Describe data-centric consistency model in detail. [9]

OR

Q6) a) Describe replication as scaling technique in distributed system. Describe how replicated objects can be managed? [9]

b) Describe client-centric consistency model in detail. [9]

Q7) a) What is mean by process resilience? Explain process resilience techniques in distributed system. [9]

b) Describe RPC semantics in the presence of failures. [8]

OR

Q8) a) Describe various failure models in distributed system. [9]

b) Describe how reliable group communication achieved in distributed system. [8]



Total No. of Questions : 8]

SEAT No. :

P811

[5870] - 1132

[Total No. of Pages : 2

T.E. (Computer Engineering)

SOFTWARE PROJECT MANAGEMENT

(2019 Pattern) (Semester - I)(Elective - I) (310245)(D) (Theory)

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 side indicate full marks.
- 4) Assume Suitable data, if necessary.

- Q1)** a) Enlist and explain the 4 types of activity relationships? [8]
b) Explain various steps involved & the objectives of activity planning in detail. [10]

OR

- Q2)** a) Explain following in detail:
i) Scheduling
ii) Types of Scheduling
iii) Benefits of scheduling [10]
b) Discuss the network model represented by the CPM network. [8]

- Q3)** a) Discuss the Contract Management in detail. [8]
b) Outline the various steps involved in a Change Control Procedure. [9]

OR

- Q4)** a) Explain the level of Monitoring with examples. [8]
b) Define Contract. Explain the typical terms of a Contract. Give Examples. [9]

PTO.

Q5) a) What are software development approaches? Explain agile project management in detail. [8]

b) Explain Scrum framework in detail. [10]

OR

Q6) a) Explain in detail advantages and disadvantages of agile methodology. [10]

b) Write short note on :

i) Estimation

ii) Product backlog

[8]

Q7) a) Explain the importance of working together as a team and the various aspects of team development. [9]

b) Define motivation. Explain the different models of motivation. [8]

OR

Q8) a) What is stress? Mention the important causes of stress encountered in projects. [8]

b) Discuss leadership models. Explain function of a leader with an example. [9]

❖ ❖ ❖

Total No. of Questions : 8]

SEAT No. :

P812

[Total No. of Pages : 2

[5870] - 1133

T.E. (Computer Engineering)

**DATA SCIENCE AND BIG DATA ANALYTICS
(2019 Pattern) (Semester - II) (310251)**

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.
- 1) Neat diagrams must be drawn whenever necessary.
- 2) Figures to the right side 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) What is driving data deluge? Explain with one example. [9]
b) What is data science? Differentiate between Business Intelligence and Data Science. [9]

OR

- Q2)** a) What are the sources of Big Data. Explain model building phase with example. [9]
b) Explain big data analytics architecture with diagram. What is data discovery phase. Explain with example. [9]

- Q3)** a) Explain various data pre-processing steps. Discuss essential python libraries for preprocessing. [8]
b) What are association rules? Explain Apriori Algorithm in brief. [9]

OR

- Q4)** a) Explain the following
i) Linear Regression
ii) Logistic Regression [8]
b) Explain scikit-learn library for matplotlib with example. [9]

PTO.

- Q5)** a) Write short note on
- i) Time series Analysis
 - ii) TF - IDF.
- [9]
- b) What is clustering? With suitable example explain the steps involved in k - means algorithm. [9]

OR

- Q6)** a) Write short note on
- i) Confusion matrix
 - ii) AVC - ROC curve
- [9]
- b) Discuss Holdout method and Random Sub Sampling methods. [9]

- Q7)** a) With a suitable example explain Histogram and explain its usages. [8]
- b) Describe the Data visualization tool “Tableau”. Explain its applications in brief. [9]

OR

- Q8)** a) With a suitable example explain and draw a Box plot and explain its usages. [8]
- b) Describe the challenges of data visualization. Draw box plot and explain its usages. [9]

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Total No. of Questions : 8]

SEAT No. :

P2310

[Total No. of Pages : 2

[5870]-1134

**T.E. (Computer Engg.)
WEB TECHNOLOGY**

(2019 Pattern) (Semester - II) (310252)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve 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.*

Q1) a) What is difference between server side scripting language and client side scripting language. [5]

- b) Describe servlet architecture in detail. [4]
- c) Explain DTD in XML with schemes, elements & attributes. [9]

OR

Q2) a) What is session? How cookies & URL rewriting for session management in servlet. [9]

- b) Write short note on :
- i) AJAX
 - ii) XML transformation

Q3) a) Explain life cycle of JSP. Write advantages of JSP over servlet. [9]

- b) Write a short notes on :
- i) SOAP
 - ii) WSDL

OR

Q4) a) Explain streets framework with its components. Also explain interceptors. [9]

- b) Explain JSP support for MVC i.e. model, view controller for developing web application. [8]

P.T.O.

Q5) a) Identify and explain steps involved in connecting to mySQL with PHP. [9]

b) Write short notes on : [9]

i) Overview of ASP. NET

ii) Overview of C#

OR

Q6) a) Explain in detail WAP Architecture & WML. [9]

b) Explain functions in PHP with example & session management. [9]

Q7) a) Explain classes and objects in Ruby with appropriate examples. [9]

b) Introduce the concept of Rails application. Describe layouts & stylesheet in Rail. [8]

OR

Q8) a) Explain the scalar types & their operations in Ruby. [8]

b) Explain Architecture of EJB & explain types of EJB in detail. [9]



Total No. of Questions : 8]

SEAT No. :

P814

[Total No. of Pages : 2

[5870] - 1135

**T.E. (Computer Engineering)
ARTIFICIAL INTELLIGENCE
(2019 Pattern) (Semester - II) (310253)**

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 whenever necessary.
- 3) Assume suitable data if necessary.

- Q1)** a) Explain Alpha - Beta Tree search and cutoff procedure in detail with example. [9]
b) What are the issues that need to be addressed for solving esp efficiently? Explain the solutions to them. [9]

OR

- Q2)** a) Explain in detail the concepts of back tracking and constraint propagation and solve the N-queen problem using these algorithms. [9]
b) Write a short note on Monte Carlo Tree search and list its limitations. [5]
c) Apply constraint satisfaction method to solve following Problem

SEND + MORE = MONEY. (TWO + TWO = FOUR, CROSS+ROADS= DANGER) [4]

- Q3)** a) List the inference rules used in propositional logic? Explain them in detail with suitable example. [9]
b) Explain syntax and semantics of First Order Logic in detail. [8]

OR

- Q4)** a) Detail the algorithm for deciding entailment in propositional logic. [8]
b) Explain knowledge representation structure and compare them. [9]

PTO.

- Q5)** a) Explain Forward and Backward chaining. What factors justify whether reasoning is to be done in forward or backward chaining. [9]
b) What are the reasoning patterns in propositional logic? Explain them in detail. [9]

OR

- Q6)** a) Explain unification algorithm with an example. [8]
b) Explain knowledge representation structures and compare them. [7]
c) What do you mean by Ontology of situation calculus? [3]

- Q7)** a) Analyse various planning approaches in detail. [9]
b) Discuss AI and its ethical concerns. Explain limitations of AI. [8]

OR

- Q8)** a) Explain the terms for time and schedule from perspective of temporal planning. [9]
b) Write a detailed note on AI Architecture. [8]

❀ ❀ ❀

Total No. of Questions : 08]

SEAT No. :

P815

[Total No. of Pages : 2

[5870]-1136

**T.E. (Computer Engineering)
INFORMATION SECURITY**

(2019 Pattern) (Semester-II) (Elective II) (310254 A)

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) Neat diagram must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.

Q1) a) Explain El-Gammal Algorithm in detail. [6]

- b) Consider a Diffie -Hellman Scheme with a common prime $q = 71$ and a primitive root $\alpha = 7$ [6]
- i) If user A has private key $X_A = 5$, what is A's public key y_A ?
 - ii) If user B has private key $X_B = 12$, what is B's public key y_B ?
 - iii) What is the shared secret key K?
- c) Differentiate between Asymmetric key cryptography and symmetric key cryptography. [6]

OR

Q2) a) Discuss elliptic curve cryptography in detail. [6]

- b) Perform encryption and decryption using RSA algorithm for the following: [6]
- $P = 3 ; q = 11; d = 7; M = 5$
- c) Explain Fermat's theorem with example. [6]

Q3) a) What is Message Digest? Compare MD-5 with SHA-I. [6]

- b) What is S/MIME? Explain working of S/MIME in detail. [5]
- c) What is digital signature? Explain the use of digital signature. [6]

OR

Q4) a) What is the difference between a message authentication code and a one-way hash function? [6]

- b) Explain the steps to create the digital certificate. [5]
- c) What services are provided by IPSec? What is the difference between transport mode and tunnel mode in IPSec? [6]

P.T.O.

- Q5)** a) Explain access control and its types in detail. [6]
b) What are the functions of Intrusion detection system? [5]
c) Differentiate between Packet filtering firewall and proxy (Application-level Gateway) [6]

OR

- Q6)** a) Discuss various flooding attacks. [6]
b) Differentiate between Host based Intrusion detections system and Network based Intrusion detection system. [5]
c) What are the functions of an Intrusion prevention system? [6]

- Q7)** Write short note on any three [18]

- a) Cyber Terrorism
- b) Types of Cyber Crime
- c) Information Security Life Cycle
- d) Indian IT act

OR

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

- a) Botnet
- b) Examples of Cyber Crime
- c) Cyber Stalking
- d) Social Engineering



Total No. of Questions : 08]

SEAT No. :

P816

[5870]-1137

[Total No. of Pages : 2

T.E. (Computer Engineering)

AUGMENTED AND VIRTUAL REALITY

(2019 Pattern) (Semester-II) (Elective II) (310254B)

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) Neat diagram must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

- Q1)** a) What are different representation issues related to Virtual Reality? [9]
b) Explain features of Haptic representation in Virtual Reality [9]

OR

- Q2)** a) Explain different methods of Aural rendering systems. [9]
b) List out different methods for simplifying the amount of information needed to pass between simulation and haptic rendering. Explain any three in detail. [9]

- Q3)** a) Explain different methods of manipulation a virtual world. [8]
b) List out different properties of manipulation a virtual world. Explain any four in detail. [9]

OR

- Q4)** a) Explain physical and mental immersion in detail. [8]
b) Explain different types of virtual world physics. [9]

- Q5)** a) Explain different categories of sensors used in Augmented Reality. [9]
b) Write short note on
 - i) Visual Depth Cues in AR.
 - ii) Auditory Depth Cues in AR. [9]

OR

- Q6)** a) Write short note on
 - i) Spatial Multiplexing
 - ii) Temporal Multiplexing [9]
b) List the different ingredients of an Augmented Reality applications. Explain any three in detail. [9]

P.T.O.

- Q7)** a) Explain the software functional components involved directly in Augmented Reality applications. [8]
b) What is Mobile Augmented Reality? Write down different advantages and disadvantages of Mobile Augmented Reality. [9]

OR

- Q8)** a) Write short note on [8]
i) Realistic and Abstract representation.
ii) Physical & Conceptual representation
b) Explain the following terms related to interaction in virtual world. [9]
i) Manipulation
ii) Communication
iii) Navigation



Total No. of Questions : 8]

SEAT No. :

P817

[Total No. of Pages : 2

[5870]-1138

**T.E. (Computer Engg.)
CLOUD COMPUTING**

(2019 Pattern) (Semester-II) (Elective II) (310254 C)

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 side indicate full marks.
- 4) Assume Suitable data, if necessary.

- Q1)** a) Define Virtualization? Explain different types of Virtualizations? [8]
b) Discuss Virtualization in Grid and Virtualization in Cloud? [9]

OR

- Q2)** a) Differentiate between full and para virtualization? [8]
b) Explain the functionality of hypervisor? What is type 1 and type 2 hypervisor? [9]

- Q3)** a) Enlist the different services offered by Amazon web Service? Explain it? [8]
b) Discuss Amazon Dynamo Database Service in detail? [9]

OR

- Q4)** a) Explain Microsoft Windows Azure Platform? [8]
b) Elaborate the unique features Google App Engine with suitable example? [9]

- Q5)** a) Discuss the various Cloud Security Services with its necessity? [9]
b) What are different risks in cloud computing and how to manage them? [9]

OR

- Q6)** a) Explain security authorization challenges in cloud computing? [9]
b) Discuss how we need to perform secure cloud software testing? [9]

- Q7)** a) Discuss Energy Aware Cloud Computing with suitable example? [9]
b) Explain with example, working of Docker? [9]

OR

- Q8)** a) How the Cloud and IoT together works for Home Automation? [9]
b) Differentiate Distributed Cloud Computing Vs Edge Computing? [9]



Total No. of Questions : 8]

SEAT No. :

P818

[5870]-1139

[Total No. of Pages : 3

T.E. (Computer Engineering)

SOFTWARE MODELING AND ARCHITECTURES

(2019 Pattern) (Semester-II) (Elective II) (310254 D)

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 side indicate full marks.
- 4) Assume Suitable data, if necessary.

Q1) a) Explain Fork and Join concept in Activity diagram with a suitable example [6]

b) Explain Communication diagram with example [6]

c) Draw state machine diagram for coffee vending machine [6]

OR

Q2) a) Explain the importance of Interaction diagram [6]

b) Explain the significance of timing diagram with a suitable example [6]

c) Write short note on timing diagram [6]

Q3) a) What is architecture pattern? What is significance of architecting software product? [8]

b) Company XYZ Integrated Solutions Pvt Ltd is responsible to develop a reusable system architecture for high-tech medical test equipment. Some of the key functionality requirements and features are listed below: [9]

- i) Performs measurements at a stipulated time interval
- ii) Ability to fix and correct errors and bring back to the system extremely fast as it deals with real time users and instrumentation
- iii) Interface to a network of workstations, instruments
- iv) Ability to work with multiple types of mobile phones and digital devices
- v) Sophisticated user interface with colour displays
- vi) Touch panel screen

P.T.O.

- vii) Built - in help facilities
- viii) Support for novice and expert users
- ix) Support for multiple languages and interface for voice enabled inputs and outputs
- x) Should be used only by certified authorities and the sensitive data should be taken care with utmost care.
- .
- . List the key quality attributes that will be addressed by the application.
- .
- . Identify which attribute relates to each of the requirements listed.
- .
- . Which is the Most Architecturally Significant Attribute?
- .
- . What tactics would you recommend addressing this requirement?

OR

- Q4)** a) What is the software architecture? What are the three different views of an architecture? [8]
- b) SAR is a software company who is in to the business of helping customers move their stores or put ones business on the e-commerce platform. SAR had recently received a project from the Government of India - Horticulture department to design and implement a software system to integrate farmers and consumers on the web allowing the procurement and selling of vegetables and fruits at wholesale prices to the general public. you and your team has been chosen to come up the architectural design for the system to be developed. How would you use the Business goals to arrive at the ASR for this project?
Capture the ASR on the Utility Tree list a few quality attributes and prioritize them based on the business value and architectural impact [9]

- Q5)** a) Explain Client Server architecture for Software Design [6]
- b) Explain the importance of Object oriented software architecture and its applicability in software development [6]
- c) Explain the broker pattern for desing of service oriented architecture [6]

OR

- Q6)** a) Explain the real time software architecture with a suitable example [6]
- b) Explain synchronous communication pattern in Client server architecture with example? [6]
- c) Explain Location & Platform transparency in service oriented architecture [6]

- Q7)** a) What is the Design pattern? What is the purpose of design patterns? What are the different types of design patterns? What is purpose of each type of design pattern? [9]
- b) What are the different creational Pattern? Explain any three creational pattern in short [8]

OR

- Q8)** a) What are the benefits of Design Patterns? Explain Factory and abstract factory patterns in detail with comparison between them and application of factory and abstract factory pattern [9]
- b) What are the different structural pattern? Explain any three structural pattern in short [8]



Total No. of Questions : 8]

SEAT No. :

P819

[Total No. of Pages : 2

[5870]-1140

T.E. (Information Technology)
THEORY OF COMPUTATION
(2019 Pattern) (Semester - I) (314441)

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) Assume suitable data, if necessary.

Q1) a) i) What is an ambiguous grammar? Explain with a suitable example. [4]

ii) Convert the following RLG to FA. [5]

$$S \rightarrow 0A \mid 1B \mid 0 \mid 1$$

$$A \rightarrow 0S \mid 1B \mid 1$$

$$B \rightarrow 0A \mid 1S$$

b) Convert the following grammar to GNF. [9]

$$S \rightarrow AB$$

$$A \rightarrow BSB \mid BB \mid b$$

$$B \rightarrow aAb \mid a$$

OR

Q2) a) i) Write CFG for the language $L = \{a^i b^j c^k \mid k=i+j \text{ & } i, j \geq 1\} [6]$

ii) Check whether the given language is CFL or not $L = \{a^n b^n c^n \mid n \geq 0\} [6]$

iii) What is Regular Grammar? Explain types of regular grammar. [6]

Q3) a) Design a Pushdown Automata for the following language. [8]

$$L = \{a^p b^q c^m \mid p + m = q\}$$

b) i) Define Post machine. [3]

ii) Convert the grammar. [6]

$$S \rightarrow 0S1 \mid A$$

$$A \rightarrow 1A0 \mid S \mid \epsilon$$

to PDA that accepts the same language by empty stack.

OR

P.T.O.

- Q4)** a) i) Design a Pushdown Automata for the following language $L = \{a^n cb^n \mid n \geq 1\}$. [6]
ii) Compare Finite Automata and Pushdown Automata. [4]
- b) Design PM for $L = \{a^n b^n \mid n \geq 0\}$ [7]

- Q5)** a) i) Explain Church Turing hypothesis. [3]
ii) Write a note on Universal turing Machine. [6]
- b) Design a Turing machine to accept language $L = \{a^n b^n c^n \mid n > 0\}$. Draw transition graph and write down transition table. [9]

OR

- Q6)** a) Construct a Turing Machine to replace string ‘110’ by ‘101’ in a binary input string. [8]
- b) i) Explain post correspondance problem with a suitable example. [6]
ii) What are recursive and recursively enumerable language? [4]

- Q7)** a) What do you mean by NP problems? Justify why the Travelling Salesman problem is a NP problem. [8]
- b) Write short note on :
i) A Simple Un-decidable problem PCP
ii) Measuring Complexity

OR

- Q8)** a) Explain in detail Cook’s theorem. [8]
b) Define decidability of problem with suitable example. Describe un-decidable problems for context-free Grammar. [9]



Total No. of Questions : 8]

SEAT No. :

P820

[5870] - 1141

[Total No. of Pages : 2

T.E.(I.T.)

OPERATING SYSTEMS

(2019 Pattern) (Semester - I) (314442)

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 diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Explain requirements for mutual exclusion. [8]
b) Explain following terms: [9]

- i) Principles of concurrency
- ii) Semaphores
- iii) Mutex

OR

Q2) a) Explain following synchronization problems [8]
i) Readers/ Writers Problem.
ii) Producer and Consumer problem.

b) Explain Inter-process communication using [9]
i) Pipes
ii) Shared Memory
iii) Semaphore

Q3) a) For the given reference string with 4 page frame available, determine the number of page faults for FIFO, OPTIMAL, LRU algorithms:
3, 5, 3, 7, 2, 1, 5, 4, 6, 7, 4, 1, 2. [12]
b) Explain with the help of neat diagram Hierarchical page table. [6]

OR

Q4) a) A 1 MByte block of memory is allocated using the buddy system. [10]
i) Show the result of the following sequence in the graphical form for
A : Request 35KB, B: Request 140 KB, C : Request 120KB,
D : Request 250KB, Return C, E: Request 70 KB, Return B, Return
D, F : Request, 100KB, Return A, Return E.
ii) Draw the tree representation after Return B.
b) What is Principle of Locality? Explain working set model. [8]

P.T.O.

- Q5)** 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 [12]
- i) FCFS
 - ii) SSTF
 - iii) SCAN
 - iv) C-Look is used and initially head is at track no 100. Assume head is moving towards outer track for SCAN and C-Look.
- b) State and explain diff approaches of I/O buffering. [6]

OR

- Q6)** a) Describe 3 methods of record blocking with the help of neat diagrams. [9]
- b) Explain different file organization techniques. [9]
- Q7)** a) Explain working of “General Loading Scheme” with advantages and disadvantages. [6]
- b) Draw and explain flowchart of Pass-2 of two pass assembler. [6]
- c) Define following system software components with suitable diagram.[5]
- i) Compiler
 - ii) Loader
 - iii) Editor
 - iv) Linker
 - v) Debugger

OR

- Q8)** a) Explain Phase structure of Compiler with neat diagram. [6]
- b) What is the need of symbol table (ST) and literal table (LT) in two pass assembler? Explain fields of ST and LT with suitable example. [6]
- c) What are types of loaders? Discuss four different functions of loaders. [5]



Total No. of Questions : 8]

SEAT No. :

P821

[Total No. of Pages : 2

[5870]-1142

T.E. (Information Technology)
MACHINE LEARNING
(2019 Pattern) (Semester - I) (314443)

Time : 2½ Hours

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answers 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) Why do we need optimization in Regression? Explain gradient descent optimization technique in detail. [9]
- b) What do you meant by least square method? Explain least square method in the context of linear regression. [8]

OR

- Q2)** a) What is overfitting and underfitting? Explain the reasons of overfitting and underfitting. [9]
- b) What is multivariate and univariate regression state the difference with examples. [8]

- Q3)** a) Explain ID-3 Decision tree algorithm in detail. [9]
- b) Explain the measures of impurity (Information Gain, Gini Index, Entropy) [6]
- c) What are the advantages and limitation of tree-based model. [2]

OR

- Q4)** a) Explain in brief the Bayesian network for learning and inference. [9]
- b) Explain naive bayes algorithm with example. [6]
- c) Enlist any four applications of naive bayes classifier. [2]

P.T.O.

Q5) a) Following is a dataset for weight of teens and whether they like Pizza. [6]

Weight	Like Pizza?
78	YES
54	NO
69	YES
73	YES
59	NO
48	NO
82	NO
65	YES

Using K-Nearest Neighbours (kNN) classification algorithm determine if a teen weighing 63 kgs likely to like pizza? (Use K=3)

- b) Explain Agglomerative hierarchical clustering. [6]
c) Explain association rule mining. Explain the various Approaches to improve the efficiency of Apriori algorithm. [6]

OR

Q6) a) Explain the any two algorithms used for clustering. [6]
b) Explain following terms:
a) Centroid
b) Medoid
c) Dendrogram
c) Explain association rule mining. Comment on role of support and confidence in associations of rule mining? [6]

Q7) a) Explain what is Deep Learning and its different architectures? State the various applications of deep learning? [9]
b) Explain how the learning parameters are updated for Multilayer Perceptron? [9]

OR

Q8) a) Explain the following activation functions. [9]
i) Sigmoid ii) Tanh
iii) ReLU
b) What is the difference between biological neuron and artificial neuron? Explain the simulation of AND gate using McCulloch Pitts Neuron? [9]



Total No. of Questions : 8]

SEAT No. :

P822

[5870] - 1143

[Total No. of Pages : 2

T. E. (Information Technology)
HUMAN COMPUTER INTERACTION
(2019 Pattern) (Semester - I) (314444)

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 side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Compare primary human computer interaction styles? [8]

b) What are differences between menu bar and tool bar? many times user face the problems in understanding/learning tool bar icons? How resolve issue? [9]

OR

Q2) a) Discuss “gulf of execution” & “gulf of evaluation” what are principles of good design suggested by norman in the stages of action model? [6]

b) Illustrate different interaction styles. Explain the advantages & disadvantages of natural language interaction style? [6]

c) What parameters are considered at the time of developing a system menu at designer side? [5]

Q3) a) What is a prototype? Explain different types of rapid prototyping technique? [9]

b) Explain the HCL design process with respect to scenario & prototyping techniques? [9]

OR

Q4) a) Write short notes on: [6]

- i) Wire-Framing
- ii) Mondel-View-Controller (MVC) Framework.

P.T.O.

- b) What is design? what is the golden rule of design? Illustrate the process of interaction design? [6]
- c) Consider two different ATM machines. One giving away the cash & then ejecting the bank card & the other one rejecting the bank card first & then dispensing the cash. Which is a better interface from interaction design point of view? Justify. [6]

- Q5)** a) List & explain the steps of usability testing? What are some of the limitations of such testing? [8]
- b) Explain user interface management system (UIMS) with its architecture? [9]

OR

- Q6)** a) Explain in detail shneiderman's eight golden rules of interface design? with example? [8]
- b) List & explain nielsen's heuristics for common usability problems? [9]

- Q7)** a) Discuss applications meant for computer-mediated communication? [9]
- b) Create a GOMS description of the task of photocopying a paper from a journal. Discuss the issue of closure in terms of your GOMS description? [9]

OR

- Q8)** a) Hierarchical task analysis (HTA) is used to describe the interactions between a user & software system. Draw & explain HTA to online bus reservation system? [9]
- b) You are supposed to design an interface for “on-line video store” or “student admission system”. Perform a detailed task analysis. Identify task domain object & actions. Relate task domain & actions with interface objects & actions? [9]



Total No. of Questions : 8]

SEAT No. :

P2326

[Total No. of Pages : 2

[5870]-1144

T.E. (Information Technology)

DESIGN & ANALYSIS OF ALGORITHMS

(2019 Pattern) (Semester - I) (314445A) (Elective - 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.
- 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) Consider 0/1 knapsack problem N = 3:W=(4,6,8) and P=(10, 12, 15).by using dynamic programming determine the optimal profit for knapsack capacity 10? [9]

b) Explain coin change Making problem in detail? [9]

OR

Q2) a) Explain how dynamic programming is used to obtain optimal solution for travelling salesperson problem. also explain why this technique is not used to solve TSP for large number of cities? [9]

b) What is dynamic programming? Is this the optimization technique? Give reasons what are its drawbacks? [9]

Q3) a) Find all possible solutions for 5 queens problem using backtracking.[9]

b) Current configuration is (7,5,3,1) for 8 queens problem. Find the answer tuple using backtracking method. [8]

OR

Q4) a) State the principle of backtracking. Explain the constraints used in backtracking with an example. [9]

b) What is m colorability optimization problem. Explain with an example.[8]

Q5) a) Differentiate between backtracking & branch and bound. Illustrate with example of Knapsack problem. [9]

P.T.O.

- b) Solve following Job sequencing with deadline problem using Branch and Bound. [9]

Job	P	d	t
1	5	1	1
2	10	3	2
3	6	2	1
4	3	1	1

OR

- Q6) a) Solve the following instance of the knapsack problem by branch and bound algorithm for W=16. [9]

Item	Weight	Value in Rs.
1	10	100
2	7	63
3	8	56
4	4	12

- b) Describe the following with respect to B & B [9]
- The method
 - LC search
 - Control abstraction for LC search
 - Bounding function

- Q7) a) When do you claim that algorithm is polynomial time algorithm? Explain with an example. [9]

- b) Explain i) Complexity Classes ii) Deterministic Algorithms. [8]

OR

- Q8) a) Explain Vertex cover problem is in detail. [9]

- b) What is deterministic algorithm? Write any one deterministic algorithm. [8]



Total No. of Questions : 8]

SEAT No. :

P823

[Total No. of Pages : 2

[5870] - 1145

T.E. (Information Technology)

**ADVANCED DATABASE AND MANAGEMENT SYSTEM
(2019 Pattern) (Semester - I) (Elective - I) (314445B)**

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 side indicate full marks.
- 4) Assume Suitable data if necessary.

- Q1)** a) Compare relational and NoSQL databases. [9]
b) Explain features and advantages of MongoDB. [9]

OR

- Q2)** a) Describe NoSQL database development tools. [9]
b) What is JSON ? Explain data types and features of JSON. [9]

- Q3)** a) What is OLAP? Explain type of OLAP. [9]
b) Draw and explain Datawarehouse Architecture. [8]

OR

- Q4)** a) Explain data warehouse scheme with example. [8]
b) Explain in brief characteristics and limitations of data warehouse. [9]

- Q5)** a) Explain architecture of data mining system. [9]
b) What are different applications of data mining. [9]

OR

PTO.

- Q6)** a) What is data mining? What are different challenges in implementation of data mining. [9]
b) What is data preprocessing? Explain data preprocessing techniques. [9]

- Q7)** a) Compare Spatial and Temporal databases. [8]
b) Explain multimedia databases in detail with respect to characteristics and challenges. [9]

OR

- Q8)** a) Explain Deductive Databases. [8]
b) What are active databases? Elaborate with example. [9]

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Total No. of Questions : 8]

SEAT No. :

P824

[Total No. of Pages : 2

[5870] - 1146

**T.E. (Information Technology)
DESIGN THINKING**

(2019 Pattern) (Semester - I) (Elective - I)(314445C)

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 side indicate full marks.
- 4) Assume Suitable data ,if necessary.

- Q1)** a) “How might we ...” question elaborate? Explain the template of HMW. [8]
b) Explain the use of SCAMPER for Ideation. [9]

OR

- Q2)** a) How context mapping tools help us in design thinking? Which other tools support working with this tool? [6]
b) Explain Brainstorming as an ideation technique? [6]
c) What is a concept in design thinking? Explain using suitable example. [5]

- Q3)** a) What is prototype? Explain the different types of prototyping in detail. [9]
b) What is dark horse prototype how to do it and when we need it. [9]

OR

- Q4)** a) Why is prototyping important? List different Prototyping techniques. [6]
b) Why the prototype is needed and what are the advantages of using prototype in design thinking? [6]
c) How to implement Critical Functional Prototype. [6]

PTO.

Q5) a) Discuss how “Testing Sheet” will help designers to prepare the test sequence and document the test results. [8]

b) What is Structured usability testing? Explain How it is carried out. [9]

OR

Q6) a) Discuss how ‘Feedback Capture Grid’ is used to test my prototyped ideas quickly and simply. [8]

b) Explain How ‘I like, I wish, I wonder’ tool used in Phase Reflect. [9]

Q7) a) Discuss the case study “Reimagining the Trade Show Experience at IBM” in detail. [9]

b) How “Social Networking at MeYou Health” is designed using design thinking tools? [9]

OR

Q8) a) Discuss the case study “Design Thinking in Healthcare with IDEO” in detail. [9]

b) How Design Thinking transformed Airbnb? Explain. [9]

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Total No. of Questions : 8]

SEAT No. :

P2327

[Total No. of Pages : 2

[5870]-1147

**T.E. (Information Technology)
INTERNET OF THINGS**

(2019 Pattern) (Semester - I) (Elective - I) (314445D)

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) 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 Bluetooth? Explain in detail Bluetooth Technology. [8]
b) Explain in detail 6LoWPAN technology. [9]

OR

Q2) a) Explain in detail IEEE 802.15.4. [8]
b) Differentiate between IPv4 and IPv6. How IPv6 is more suitable for IoT implementation? [9]

Q3) a) Explain Arduino. What are the things need to be considered for developing on the Arduino? Which are the official Arduino Boards? [8]
b) Draw and explain interfacing of robotic ARM using raspberry pi with python program. [9]

OR

Q4) a) Compare Arduino Uno & Raspberry Pi Model. [8]
b) Draw and explain interfacing of Bluetooth speaker using raspberry pi with python program. [9]

Q5) a) Explain Cloud Storage models (SaaS, Paas, IaaS) and communication APIs Web server in details. [9]
b) Why to look for the challenges of secure IoT? Explain the challenges of secure IoT? [9]

OR

P.T.O.

- Q6)** a) What are the vulnerabilities of IoT? Explain in detail. [9]
b) What is security model of IoT? Explain in detail why there is a need of security model in IoT? [9]

- Q7)** a) How IoT is used in retail management? Explain in detail. [9]
b) Explain in detail how IoT can be used in agriculture Applications. [9]

OR

- Q8)** a) Explain how IoT plays important role in Logistic management. [9]
b) Elaborate on how you will use IoT for remote health care. [9]



Total No. of Questions : 8]

SEAT No. :

P825

[Total No. of Pages : 2

[5870]-1148

T.E. (Information Technology)
COMPUTER NETWORK & SECURITY
(2019 Pattern) (Semester - II) (314451)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer four questions from the following.
- 2) Figures to the right side indicate full marks.
- 3) Draw the neat sketches wherever required.

- Q1)** a) Explain with diagram layered architecture & clustered architecture for sensor network. [9]
b) Comment on Adhoc Network MAC layer with design issues, Design goal. [9]

OR

- Q2)** a) Explain the issues in designing a Routing protocol for adhoc wireless network. [9]
b) Explain different issues and challenges in designing sensor network. [9]

- Q3)** a) What is the importance & need for security and explain network attack. [8]
b) Explain different block cipher modes. [9]

OR

- Q4)** a) Explain distributed denial of service attacks in details [8]
b) Explain with suitable examples what do you mean by active attacks & passive attacks. [9]

- Q5)** a) Write a short notes on [9]
i) Encryption
ii) Decryption
b) Explain RSA in details [9]

OR

P.T.O.

Q6) a) What is digitel signature? What are application of digital signature [9]

b) Explain following terms. [9]

- i) Cryptograply
- ii) Symmetric key Cryptograply
- iii) Asymmetric key Cryptograply

Q7) a) Write short notes on [9]

- i) Malware
 - ii) Phishing
 - iii) MITA attack
- b) Elaborate different cyber security policies in detail and explain different challenges in internet governance. [8]

OR

Q8) a) Explain the term cyber stalking. How to iderty and detect cyber stalking.

b) Explain the types of cyber-crimes.

❖ ❖ ❖

Total No. of Questions : 8]

SEAT No. :

P826

[5870] - 1149

[Total No. of Pages : 2

T. E. (Information Technology)

**DATA SCIENCE AND BIG DATA ANALYTICS
(2019 Pattern) (Semester - II) (314452)**

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 side indicate full marks.
- 4) Assume the suitable data, if necessary.

- Q1)** a) Explain Big data Ecosystem with suitable diagram. [7]
b) Explain anatomy of File read and write in HDFS. [7]
c) Write and explain any two Hadoop shell commands. [4]

OR

- Q2)** a) Explain Map Reduce with proper diagram for word count example. [7]
b) Explain Google file system. [7]
c) Explain ETL processing. [4]

- Q3)** a) Explain different steps in Data Analytics Project Life cycle [7]
b) Draw and explain Architecture of HIVE. [7]
c) Explain different data transformation techniques. [3]

OR

- Q4)** a) Explain different kinds of Big Data Analysis. [7]
b) How data can be ingested in python. Write syntax in python for the same. [7]
c) Explain role of visualization in big data analytics. [3]

- Q5)** a) Explain different techniques of Big Data visualization. [7]
b) Explain challenges in Big data visualization. [7]
c) Write two data visualization functions from matplotlib. [3]

OR

P.T.O.

- Q6)** a) Explain different tools for data visualization. [7]
b) Explain scatter plot, histogram and heat map with example. [7]
c) Write two data visualization functions from seaborn. [3]

- Q7)** a) How Social Media analytics helps in value creation? Explain with suitable examples. [7]
b) Explain in brief data analytics life cycle. [7]
c) Explain big data value terminology. [4]

OR

- Q8)** a) What is text mining? Draw and explain text mining architecture and its use. [7]
b) Explain Big data analytics in research. [7]
c) Explain big data impact on organizations. [4]



Total No. of Questions : 8]

SEAT No. :

P827

[5870]-1150

[Total No. of Pages : 2

T.E.(I.T.)

**WEB APPLICATION DEVELOPMENT
(2019 Pattern) (Semester - II) (414464A)**

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) Assume suitable data, if necessary.

Q1) a) What is MVC? Explain MVC architecture in detail. [6]

b) Explain event binding and property binding in angular with example. [6]

c) Explain different types of Hooks in ReactJS. [6]

OR

Q2) a) What is TypeScript? List advantages & disadvantages of using it. [6]

b) What is Pipe? Explain with example. [6]

c) Explain Redux - Architecture in detail. [6]

Q3) a) Explain ExpressJS as middleware with example. [5]

b) What is NoSQL? Explain different features of MongoDB. [6]

c) Explain callbacks in NodeJS with suitable example. [6]

OR

Q4) a) Explain concept of routes in express with example. [5]

b) Write code to create collection, insert data & delete data in MongoDB using NodeJS. [6]

c) Explain NodeJS events with example. [6]

- Q5)** a) What is Mobile-First and Mobile Web? List different Mobile Devices. [6]
b) What is jQuery Mobile? Explain Mobile jQuery Framework in detail. [6]
c) Explain any 3 events in jQuery Mobile with example? [6]

OR

- Q6)** a) Compare jQuery with jQuery Mobile. [6]
b) What is jQuery Mobile? What are the advantages and disadvantages of jQuery Mobile? [6]
c) Write a code to create a header and footer in jQuery Mobile. [6]
- Q7)** a) Explain in detail types of Elastic Load Balancer. [6]
b) What are the different components of VPC? [5]
c) What is elastic beanstalk and enlist the advantages of using it? [6]

OR

- Q8)** a) Explain any three AWS Storage services. [6]
b) What is Elastic Load Balancer and explain its working. [5]
c) What is AWS cloud? List different services provided by it. [6]

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Total No. of Questions : 8]

SEAT No. :

P828

[Total No. of Pages : 2

[5870]-1151

**T.E. (Information Technology)
ARTIFICIAL INTELLIGENCE**

(2019 Pattern) (Semester-II) (Elective II) (314454-A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Differentiate between Propositional versus First Order Predicate Logic. [4]

- b) List the techniques used for Knowledge Representation? Explain any one of it. [6]
- c) Explain with an example Forward Chaining. [8]

OR

Q2) a) Differentiate between Forward Chaining and Backward Chaining. [4]

b) Brief about Semantic Nets. [6]

c) Write a note on Non-Monotonic Reasoning. [8]

Q3) a) What is NLP? List the steps of in NLP? Explain Lexical Analysis with an example. [8]

b) Write about Semantic Analysis with the reference of Semantic Grammer, Case Grammar. [9]

OR

Q4) a) What is Parsing? Discuss Syntactic Analysis with the reference of Grammars and parsers. [8]

b) Discuss about Probabilistic Language Models. [9]

Q5) a) Describe Mini-Max Search Procedure with an example. [9]

b) Explain Iterative Deepening algorithm with an example. [9]

OR

Q6) a) What is Game Playing? Write in detail Alpha-Beta Pruning. [9]

b) Illustrate Goal-Stack Planning with an example. [9]

P.T.O.

- Q7)** a) Write brief note on (Any Two) [12]
i) Convolutional Neural Networks (CNNs)
ii) Deep belief Network
iii) Restricted Boltzmann Machines
b) Explain in brief Tensor Flow. [5]

OR

- Q8)** a) Write brief note on (Any Two) [12]
i) Computer Vision in AI
ii) AI-Neural Networks
iii) AI-IOT
b) Describe in short AI-Robotics. [5]



Total No. of Questions : 8]

SEAT No. :

P829

[Total No. of Pages : 2

[5870] - 1152

T. E. (Information Technology)

CYBER SECURITY

(Semester-II) (2019 Pattern) (Elective-II) (314454 B)

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 side indicate full marks.
- 4) Assume the suitable data, if necessary.

Q1) a) What is cyber forensics? Explain different processes in cyber forensics investigation process. [6]

b) Explain any three challenges faced by Forensic expert in cyber forensics. [6]

c) Write a short note any two tools for Network forensics analysis. [6]

OR

Q2) a) What is Malware Analysis and its key benefits? Explain different types of Malware Analysis. [6]

b) Explain any three challenges in E-mail Forensics? Explain any three Forensic Investigations techniques used in E-mail Forensic? [6]

c) How does Computer Forensics differ from data recovery? [6]

Q3) a) What is Digital Forensics and its application? Explain any two forensic Hardware/Software tool. [6]

b) Describe the process followed in preserving the Digital Evidence in Digital Forensic. [5]

c) What is the role of digital forensics in face and fingerprint recognition? [6]

OR

Q4) a) Write a short on following methods used to preserve the evidence in digital forensic before starting the analysis. [6]

- i) Drive Imaging
- ii) Hash Value

P.T.O.

- b) Why do we need digital forensics? Where can digital evidences are found? [5]
c) Explain any three forensic Tools used in Digital Forensics. [6]

- Q5)** a) Explain Social Engineering attack spiral model with the help of Diagram. [6]
b) What is mean by Insider Attack? What are types of it? [6]
c) What is “Phishing”. And How it works? Explain Phishing Attack with the help of one example. [6]

OR

- Q6)** a) Which all preventive strategies can be used to prevent social engineering attack. [6]
b) Explain any three Social engineering attacks with example. [6]
c) What are the risk associated with social engineers and physical access to computers? [6]

- Q7)** a) Enlist any offences and related punishment under I.T act 2000. [6]
b) Explain in details Intellectual Property Rights in Cyberspace. [5]
c) What are Positive Aspects and weak areas of ITA 2000? [6]

OR

- Q8)** a) What is mean by Security Audit? Explain its Steps. [6]
b) Write a short note on:
 i) E-Commerce
 ii) E-Governance
c) Explain the role of Certifying Authority and Controller. [6]



Total No. of Questions : 8]

SEAT No. :

P830

[Total No. of Pages : 2

[5870] - 1153

**T. E. (Information Technology)
CLOUD COMPUTING**

(Elective-II) (2019 Pattern) (Semester-II) (314454 C)

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 side indicate full marks.
- 4) Assume the suitable data, if necessary.

Q1) a) Write short note on following standards of application developer [6]

- i) LAMP
- ii) LAPP

b) Explain steps to launch an EC2 instance in AWS. [6]

c) Define Atom and RSS and differentiate between Atom and RSS. [6]

OR

Q2) a) Explain SAML and OAuth as standards for Security. [6]

b) Define Bucket in Amazon S3 and differentiate between DynamoDB and Amazon S3. [6]

c) Write short note on Windows Azure Platform architecture. [6]

Q3) a) Draw & explain General Architecture of Google File System (DFS)?[6]

b) Discuss the terms: Big Table, HBase and Dynamo cloud data stores in cloud computing. [6]

c) Discuss the terms Business Continuity and Disaster Recovery in cloud Computing? [5]

OR

Q4) a) Draw & explain General Architecture Hadoop Distributed File System (HDFS)? [6]

b) Differentiate between Big Table and HBase of cloud computing. [6]

c) What are the General Security Advantages of Cloud-Based Solutions?[5]

P.T.O.

- Q5)** a) Explain Cloud Mashups for Agility & Scalability in detail. [6]
b) Explain Data-Intensive Scalable Computing. Differentiate between Conventional Supercomputer and Data Intensive Scalable Computing.[6]
c) Write a short note on Wireless Sensor Networks (WSN). [6]

OR

- Q6)** a) Explain Social Networking site Twitter. [6]
b) Explain the different Technologies to build IOT infrastructure. [6]
c) Explain the Applications of the Internet of Things. [6]
i) Inventory Management
ii) Route Generation & Scheduling

- Q7)** a) Write a short Note on: Location Aware Application. [6]
b) Explain architecture of mobile cloud computing with diagram. [6]
c) Explain following Concept with diagram: Automatic cloud engine. [5]

OR

- Q8)** a) Draw and Explain multimedia cloud? [6]
b) Explain key issues related to energy efficiency in cloud computing? [6]
c) Explain the Concept of jungle Computing with a diagram? [5]



Total No. of Questions : 8]

SEAT No. :

P831

[5870]-1154

[Total No. of Pages : 2

T.E. (Information Technology)
SOFTWARE MODELING AND DESIGN
(2019 Pattern) (Semester-II) (Elective - II) (314454 D)

Time : 2 1/2 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.*
- 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 the notations of synchronous asynchronous, return, Create object and destroy object messages in the context of sequence diagram [8]
b) Draw a state machine diagram for coffee vending machine which prepare the coffee by adding material of coffee. Assume suitable data. [9]

OR

- Q2)** a) Explain in brief UML diagrams used for dynamic modeling, [6]
b) What are swim lines? What is its use? Illustrate. [6]
c) Construct sequence diagram for ATM banking system for invalid pin use case. [5]

- Q3)** a) Explain the design process of access layer classes with flow charts assuming suitable application. [9]
b) Draw and explain deployment diagram for a Railway Reservation System. [9]

OR

- Q4)** a) What is OCL? Explain syntaxes for pre and post conditions with suitable examples. [9]
b) Explain the Macro-level process of identification of view layer classes by analyzing use cases by using suitable example. [9]

- Q5)** a) Explain Strategy and State patterns with suitable examples. [8]
b) Describe Introduction and Information Expert pattern with suitable examples. [9]

OR

P.T.O.

Q6) a) Elaborate on Pure Fabrication pattern and Protected variation pattern with suitable examples. [5]

b) Write a note on usage of following patterns [12]

- i) Singleton pattern
- ii) Adapter pattern
- iii) Facade pattern

Q7) Write short notes on [18]

- a) Software product line architecture
- b) Real time software architecture
- c) Component based software architecture

OR

Q8) a) Discuss in detail design of Client/ Server software architecture. [9]

b) What is object oriented software architecture. Discuss key features of the same. [9]



Total No. of Questions : 8]

SEAT No. :

P832

[5870] - 1156

[Total No. of Pages : 2

T.E. (Printing)

**OFFSET PRINTING TECHNOLOGY
(2019 Pattern) (Semester - I) (308282)**

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.
- 4) Neat diagrams must be drawn whenever necessary.

Q1) Explain Feeder Mechanism in details with all parts. [18]

OR

Q2) Explain all the Drive Concepts of Web offset machine. [18]

Q3) Explain the following [17]

- a) Revolving Reel stands
- b) Dancer roller
- c) Y type configuration.
- d) Tower press used in newspaper printing.

OR

Q4) Explain the following: [17]

- a) Describe parts of reel with help of neat diagram.
- b) Describe any 3 splice patterns.

Q5) Explain the use of: [18]

- a) Ink doctor and oscillator in offset.
- b) Anilox short inking system used on web offset machines.

OR

P.T.O.

Q6) Explain troubles due to following: [18]

- a) Wet and dry tensions.
- b) Incorrect temperatures of ink roller train, dampening solution.

Q7) What is the use of antistatic devices in web offset. Why pre-heaters are required on web presses. [17]

OR

Q8) Explain various tension zones in the web press. [17]



Total No. of Questions : 8]

SEAT No. :

P1010

[Total No. of Pages : 2

[5870]-1157

T.E. (Printing)

COLOR SCIENCE & MEASUREMENT

(2019 Pattern) (Semester - I) (308283)

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.
- 4) Neat diagrams must be drawn wherever necessary.

- Q1)** a) What is subtractive color system? [6]
b) Where subtractive color system is used? [6]
c) Which color system is applicable to monitor display? [5]

OR

- Q2)** a) Comment on CIE System. [6]
b) Explain HSL color system. [5]
c) Comment on color systems based on uniform color perception. [6]

- Q3)** a) What are the devices employed for color measurement? [6]
b) Explain the working of colorimeter. [6]
c) Compare different color measurement devices. [6]

OR

- Q4)** a) Comment on illuminants. [6]
b) Discuss Viewing geometry. [6]
c) What are measurement modes available for color measuring instruments? [6]

P.T.O.

- Q5)** a) Explain methods of color evaluation. [6]
b) What parameters affect visual color evaluation? [6]
c) Explain the color difference equation. [5]

OR

- Q6)** a) What are standard illumination conditions? [6]
b) What is color instrumental assessment? [5]
c) Discuss color tolerance. [6]

- Q7)** a) Discuss Pigments colorants. [6]
b) What is metamerism? [6]
c) What is application of Kubelka Munk Theory for color matching? [6]

OR

- Q8)** a) Explain color inconstancy. [6]
b) Discuss KM theory. [6]
c) What are special colorants? [6]



Total No. of Questions : 8]

SEAT No. :

P1011

[Total No. of Pages : 2

[5870]-1158
T.E. (Printing)
INK TECHNOLOGY
(2019 Pattern) (Semester - I) (308284)

Time : 2½ Hours] **[Max. Marks : 70**

Instructions to the candidates :

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

- Q1)** a) What is rheology? [6]
b) What do you mean by Newtonian and Non-Newtonian behavior? [6]
c) Comment on Thixotropic behaviour. [5]

OR

- Q2)** a) Explain Shear thinning and shear thickening properties of liquids. [6]
b) Discuss factors affecting rheology. [5]
c) How to measure viscosity of liquid ink? [6]

- Q3)** a) How solvent based inks dry? [6]
b) Explain drying mechanism of offset inks. [6]
c) What are IR, UV and EB curing processes? [6]

OR

- Q4)** a) How news inks dry? [6]
b) Compare heat set and cold set ink drying. [6]
c) What are physical processes for ink drying? [6]

- Q5)** a) What are factors to be considered while formulating printing ink? [6]
b) Discuss Ink manufacturing step by step. [6]
c) Give typical formulaton of solvent based gravure ink. [5]

OR

P.T.O.

- Q6)** a) Explain Test for pigment dispersion. [6]
b) What is solid content? How it is measured? [5]
c) How to measure pigment particle size? [6]

- Q7)** a) Discuss Ink Proofing. [6]
b) Explain VOC and its relevance in printing industry. [6]
c) How to measure mottle? [6]

OR

- Q8)** a) How to ascertain shade, color and strength of ink? [6]
b) What is hazardous waste in printing? [6]
c) Comment on ink related troubles in offset. [6]



Total No. of Questions : 8]

SEAT No. : _____

P833

[5870] - 1160

[Total No. of Pages : 2

T.E. (Printing Engineering)

WOOD, GLASS AND METAL BASED PACKAGING
(2019 Pattern) (Semester - I) (308286B) (Elective-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) Figures to the right indicate full marks.
- 3) Assume suitable data , if necessary.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Use of electronic pocket calculator is allowed.

Q1) a) Write down properties of packaging. [9]

b) Write down types of glass. [9]

OR

Q2) a) Explain process of forming Glass Containers with applications. [9]

b) Explain evaluation parameters in glass containers. [9]

Q3) a) Describe testing procedures of glass packaging. [8]

b) Explain gauging of glass testing. [9]

OR

Q4) a) Explain Pressure Test, and Density Test of glass packaging. [9]

b) Explain chemical resistance testing of glass packaging. [8]

PTO.

- Q5)** a) Explain introduction of metal containers with advantages. [9]
b) Explain Tin canister packaging used in food industry. [9]

OR

- Q6)** a) Which type of Metals box used in Industrial packaging in automotive sector as returnable packaging. [5]
b) Explain about Metal box used for Lithium - Ion packaging used in electronic goods and EV. [5]
c) Explain about testing protocols for Hazmat packaging based on United Nation (UN) protocol. [8]

- Q7)** a) Explain quality control procedure of drums and closures. [8]
b) Write down the essential Functions of drums and closures. [9]

OR

- Q8)** a) Explain parts and types of closures. [8]
b) Write down about plastic drums and steel drums. [9]

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Total No. of Questions : 8]

SEAT No. :

P1012

[Total No. of Pages : 2

[5870]-1162

T.E. (Printing)

FLEXO PRINTING TECHNIQUES

(2019 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Explain the purpose and effects of Back-exposure. [6]
b) Explain the purpose and effects of Main-exposure. [6]
c) What is Post-exposure and Light Finishing? Why we required these. [5]

OR

- Q2)** a) Why we use developing solution and explain different type of washout solution. [6]
b) Explain purpose and effects of Drying mechanism of plate. [5]
c) Discuss Environmental concerns in flexo industry. [6]

- Q3)** a) How to prepare Digital Flexo Plates. [8]
b) Explain Digital Workflow in detail. [5]
c) What is file format and its type? Discuss in detail. [5]

OR

- Q4)** a) Define Ablation Technique. [6]
b) Explain different type of dots generated on flexo plate. [6]
c) Discuss difference between digital plate and conventional plate. [6]

- Q5)** a) Explain flexography process with diagram. [6]
b) Define stack narrow web press and its advantages. [6]
c) Define central impression narrow web press and its advantages. [5]

P.T.O.

OR

- Q6)** a) Discuss on flexography product and application. [6]
b) Explain UV dryer in detail with diagram. [5]
c) Explain EB dryer in detail with diagram. [6]

- Q7)** a) “Anilox is heart of flexography”, If you agree then explain it in detail.[6]
b) Explain different method of Anilox cleaning. [6]
c) Explain doctor blade in detail with diagram. [6]

OR

- Q8)** a) How to select anilox roller in flexography? [6]
b) Explain anilox cell and Explain different type of anilox cell with diagram? [6]
c) Explain fountain roller and its specification. [6]



Total No. of Questions : 8]

SEAT No. :

P1013

[Total No. of Pages : 2

[5870]-1163
T.E. (Printing)
COLOR MANAGEMENT
(2019 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Attempt 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.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagram must be draw wherever necessary.

- Q1)** a) Explain CRT display technology. [6]
b) How display profiling is done? [6]
c) How to choose monitor? [5]

OR

- Q2)** a) Explain CRT display technology. [6]
b) Comment on color correction environment for monitor display. [5]
c) Discuss setting of display and application interfaces to middle grey. [6]

- Q3)** a) What is printer calibration setting? [6]
b) What is profile conversion? [6]
c) What are parameters to be considered for flexographic printer profiling? [6]

OR

- Q4)** a) How to ensure consistency of printing output? [6]
b) Can you apply your knowledge to construct profile for given printing device? [6]
c) What is rendering intent? Explain types of rendering intents. [6]

- Q5)** a) Where device link is used? [6]
b) What are steps of proofer profiling? [6]
c) Discuss importance of soft proofing. [5]

P.T.O.

OR

- Q6)** a) What is proof to press color management? [6]
b) State importance of Hard Proofing. [5]
c) Compare proofing methods in color management. [6]

- Q7)** a) Importance of grey background for visual color evaluation. [6]
b) What should be illumination condition required for visual color evaluation. [6]
c) State importance of Gray balance. [6]

OR

- Q8)** a) How do you set conditions for visual evaluation of print? [6]
b) Explain TRC. [6]
c) Comment on Gray balance and color management. [6]



Total No. of Questions : 8]

SEAT No. :

P834

[5870]-1164

[Total No. of Pages : 4

**T.E. (Printing Technology)
DESIGN OF EXPERIMENTS
(2019 Pattern) (Semester - II) (308291)**

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.
- 4) Neat diagrams must be drawn wherever necessary.

Q1) a) A cup manufacturer has reported average sale to 500 printing presses that he has to deal with during a month amount to Rs. 36,000/- with a standard deviation of Rs. 10,000/-. Assuming that the sale in these businesses is normally distributed, find :

The number of businesses the sale is over Rs. 40,000. [6]

- b) Also find if the percentage of business the fine is likely to range between Rs. 30,000 and Rs. 40,000. [6]
- c) Describe t-test [5]

OR

Q2) a) Hourly output of 1000 workmen sticking the labels on the bottles are normally distributed around a mean of 70 and with a standard deviation of 5. Estimate the number of labels whose hourly sticking/pasting of labels will be:

Between 70 and 72 [6]

- b) Between 69 and 72 [5]
- c) Define following terms : Independent variables and dependent variables. [6]

Q3) a) To adjust the contact pressure between plate cylinder and blanket cylinder, which move towards each other at a fixed axial clearance, the plate or the blankets are underlaid, a process which results in a 0.05-0.15 mm radial deformation of the blanket. The changes in the underlay resulted in variations in tone value increase in the highlight areas and print contrast. The operator collected data for 6 of its treatments of underlay.

P.T.O.

0.01	0.05	0.075	0.08	0.1	0.2
27	29.3	29.3	29.45	30.11	34.7
26.7	27	28.99	30.33	33.47	31.77
28	28.01	29.02	31.1	31.55	32.98
27.3	25.9	29.1	31	34	33.0

Using the data given below for TVI, test whether the mean tone value increase due underlay is same for all thicknesses at 0.05 level of significance.

- b) Explain background variables and primary variables. [6]

OR

- Q4) a)** A CTP unit manufacturer is experimenting on time required for imaging in CTP plates. It is of interest for the researcher to study the effects of following factors: types of laser diodes and the coating type. Each factor is run at 3 levels. The setup is that of a completely randomized design. The data are given in table. The time measured is in microseconds. [12]

Factors	Coating type	
	A	B
Laser Power in Watt	39.5	47.4
	45.7	43.5
	49.8	39.8
	50.2	36.1
	63.8	41.2
	33.5	44
60	36.7	41.2
	42	47.3
	38.1	45.3
	31.2	42.7
80		

Prepare ANOVA Table [4]

- b) 1. What effect does coating type have on the time to image?
 2. What effect does power have on the time to image?
 3. Do both coating types behave in the same manner in the two different power types? [6]

- Q5)** a) Consider a 2^2 factorial with factors A and B and n experimental observations per factor combination. Prepare a geometric view and in tabular form of the 2^2 . Define Contrast A, B and AB among treatment totals. [6]
- b) Offset Industries statistics report states information of 276 packaging presses and 24 publication presses facing strong environmental issues due to air pollutants released from the presses. Explain with the help of a cause-and-effect diagram his problem in order to reduce emissions. [6]
- c) Explain general full factorial in DOE. [5]

OR

- Q6)** a) In 2^k series consider following factors polymer1. and polymer 2. Each run at 2 levels low and high indicating concentration of the polymers. These experiments are conducted to test additives to inks. Data given is change in plastic viscosity which is a rheological measure reflecting the change in thickness of the ink. Various polymers are added to the ink to increase the viscosity.

Prepare and display treatment combinations in graphical form.

	Polymer 1			
Polymer 2	Low		High	
Low	3	3.5	11.3	12.0
High	11.7	12.0	21.7	22.4

[11]

Calculate main effect and interaction effect.

- b) Write a short note on factorial design. [6]

- Q7) a)** A book making machine is set to deliver packets of a given weight, 10 samples of size 5 each were recorded. Below given are relevant data:[18]

Sample No	1	2	3	4	5	6	7	8	9	10
Mean xbar	15	17	15	18	17	14	18	15	17	16
Range	7	7	4	9	8	7	12	4	11	5

Calculate the values for the central line and control limits for mean chart and range chart and then comment on the state of control.

OR

- Q8) a)** [6]

345	530	556	354	590
395	515	479	494	420
563	444	629	440	485
505	604	490	445	605
402	406	730	506	516
472	475	610	586	523
691	520	465	468	545
523	582	570	578	505
461	575	420	605	527
624	440	585	420	384

Construct a frequency distribution table with appropriate class limits and class boundaries. With reference to G chart divide the measurement scale into 8 groups.

- b) Draw histogram to represent the above frequency distribution. [6]
 c) Comment on the results. [6]

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Total No. of Questions : 08]

SEAT No. :

P835

[5870]-1165

[Total No. of Pages : 2

T.E. (Printing)

**MAINTENANCE MANAGEMENT OF PRINTING MACHINES
(2019 Pattern) (Semester-II) (Elective-II) (308293 A)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.No. 1 or Q.No. 2, Q.No. 3 or 4, Q.No. 5 or 6, Q.No. 7 or Q.No. 8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

Q1) a) Prepare a Monthly Preventive Maintenance check sheet for Offset Printing Press? [6]

b) What are the Characteristics of Preventive Maintenance? [6]

c) Important Steps for Establishing a Corrective Maintenance Program. [5]

OR

Q2) a) Write a Brief Note on Corrective Maintenance for Offset Compressor. [6]

b) What are the Elements of Corrective Maintenance? [6]

c) What are the Types Lubricants. [5]

Q3) a) What is Condition Based Monitoring. [6]

b) Explain in detail about Air Leakage testing for Offset Press. [6]

c) How Condition Based Monitoring helps to build data mine. [6]

OR

Q4) a) How Vibration Tester & Ultrasonic Digital Cameras are used in Condition Based monitoring? [6]

b) Describe in Detail the Predictive Maintenance with respect to Diesel Generator used for Offset Printing press. [6]

c) Explain any 3 Instruments used for Different Condition Monitoring. [6]

Q5) a) What is OEE, Explain with respect to Quality. [6]

b) How Need for Effectiveness Maintenance Important. [6]

c) What are the Key Performance Indicators for Gravure Maintenance. [5]

OR

P.T.O.

- Q6)** a) What are the Safety Measures taken during Maintenance. [6]
 b) What is significance of 5s in Maintenance Management. [6]
 c) What is MTTR and MTBF [5]

- Q7)** a) Describe the Replacement or Repair Decision Making Policy with respect to LCC Model Technique. [6]
 b) What is Kaizen. Explain with suitable example for Offset Printing Machine. [6]
 c) Conclude Replacement or Repair Decision by Calculating Average Maintenance Cost for a Single Color Flexo Machine & Write a Statement Considering Below Mentioned Data for Calculation. [6]

Year	1	2	3	4	5	6	7	8
Maintenance Cost	1500/-	1700/-	1900/-	2100/-	2300/-	2500/-	2700/-	3000/-
Resale Value	2000/-	1700/-	1500/-	1300/-	1200/-	1100/-	1000/-	900/-

OR

- Q8)** a) What is TPM. Explain with respect to Single color Offset Press. [6]
 b) What are the Pillars of TPM. Explain with suitable example. [6]
 c) What is Critical Spares. [6]



Total No. of Questions : 8]

SEAT No. :

P2328

[Total No. of Pages : 2

[5870]-1166

T.E. (Printing Engineering)

**BASIC COMMUNICATION SYSTEMS AND ELECTRONIC
INSTRUMENTATION**

(2019 Pattern) (Semester - II) (Elective - II) (308293B)

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) *Figures to the right indicates full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) Differentiate between the Active Tags and Passive Tags used in RFID. [6]
b) Differentiate between the Barcode and RFID. [6]
c) Describe the FHSS and DSSS techniques used in communication system. [6]

OR

- Q2)** a) Explain the RTS and CTS mechanism used in Wi-Fi Communication system. [9]
b) State the applications of RFID in detail. [9]

- Q3)** Describe static characteristics of measurement system. [17]

OR

- Q4)** a) Explain the Types of errors in measurement system. [8]
b) Define : [9]
 - i) Hysteresis
 - ii) Drift
 - iii) Dynamic error
 - iv) Fidelity
 - v) Speed of response
 - vi) Range and Resolution

P.T.O.

Q5) Explain the working of displacement sensor. [18]

OR

Q6) a) Describe working of thermocouple and its applications in printing. [9]

b) Describe the working principle of strain gauge sensor used in printing industry. [9]

Q7) Mention the application of sensors and Transducer in printing industry. [17]

OR

Q8) Describe the working of RTD and its applications in printing industry. [17]



Total No. of Questions : 08]

SEAT No. :

P836

[5870]-1167

[Total No. of Pages : 1

T.E. (Printing)

ELECTRONICS PUBLISHING

(2019 Pattern) (Semester-II) (Elective-II) (308293C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.No. 1 or Q.No. 2, Q.No. 3 or 4, Q.No. 5 or 6, Q.No. 7 or Q.No. 8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

- Q1)** a) What is Computing and Computing Environment. [10]
b) Explain any 4 types of Computing. [8]

OR

- Q2)** a) Draw with the diagram and explain Practical history of internet. [10]
b) Explain classification of Web Technology. [8]

- Q3)** Explain the advantages and disadvantages of Online Writing versus Print Media, Radio and Television. [17]

OR

- Q4)** Explain various image file formats used for Web. Also explain the purpose behind selection of particular file format. [17]

- Q5)** Explain in details roles and responsibilities of Content Generators, Content Writers and Content Manager. [18]

OR

- Q6)** Develop a sitemap for newly opened photography Studio. The sitemap should contain 3 levels of pages. Explain the purpose of your sitemap. [18]

- Q7)** Explain with workflow diagram of how Online Payment System works. [17]

OR

- Q8)** Explain web to Print Workflow with diagram. [17]



Total No. of Questions : 8]

SEAT No. :

P837

[Total No. of Pages : 2

[5870]-1168

T.Y. (Biotechnology)

ANALYTICAL TECHNIQUES

(2019 Pattern) (Semester - I) (315461)

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) Assume suitable data if necessary.

Q1) Explain the process of Native gel Electrophoresis with the help of following points :- **[18]**

- a) Theory
- b) Working principle
- c) Instrumentation & Application

OR

Q2) Explain the process of Agarose gel Electrophoresis with the help of following points :- **[18]**

- a) Theory
- b) Working principle
- c) Instrumentation & Application

Q3) Write short notes on -

[17]

- a) Ultracentrifugation
- b) Gradient centrifugation

[10]

[7]

OR

Q4) Define filtration & Explain the process for constant pressure & constant volume filtration. **[17]**

P.T.O.

Q5) Explain the instrumentation of spectrophotometer in details. [18]

OR

Q6) In details explain the working principle of colorimeter & write the process for determination of molecular extinction coefficient. [18]

Q7) Write the working principle of Mass spectrometry. Explain LC-MS for determination of molecular weight of protein. [17]

OR

Q8) Write the working principle of NMR. Explain the technique for molecular structure determination of natural product. [17]



Total No. of Questions : 8]

SEAT No. :

P838

[5870] - 1169

[Total No. of Pages : 4

T.Y. (Biotechnology)

**MATERIAL BALANCES AND STOICHIOMETRY
(2019 Pattern) (Semester - I) (315462)**

Time : 2½ Hours]

[Max. Marks : 70

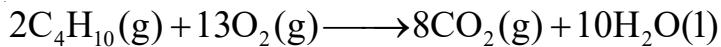
Instructions to the candidates:

- 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) A stream of nitrogen flowing at a rate of 100 kmol/h is heated from 303 K to 373 K, Calculate the heat that must be transferred. [6]

Data : C_p^0 for nitrogen = $29.5909 - 5.141 \times 10^{-3} T + 11.1829 \times 10^{-6} T^2 - 4.968 \times 10^{-9} T^3$

- b) Define and Explain Latent heat Phase Change. [6]
- c) Calculate the enthalpy change between reactants and products if both are at 298.15 K if 60 mol CO₂ is produced according to the following reaction: [6]



Data:

Component	$\Delta H_0^f, kJ / mol$
C ₄ H ₁₀ (g)	-125.79
CO ₂ (g)	-393.51
H ₂ O(l)	-285.83

OR

Q2) a) A stream of carbon dioxide flowing at a rate of 100 kmol/h is heated from 298 K to 383 K, Calculate the heat that must be transferred using C_p^0 data, $C_p^0 = a + bT + cT^2 + dT^3$. [6]

Gas	a	b*10 ³	c*10 ⁶	d*10 ⁹
CO ₂	21.3655	64.2841	-41.0506	9.7999

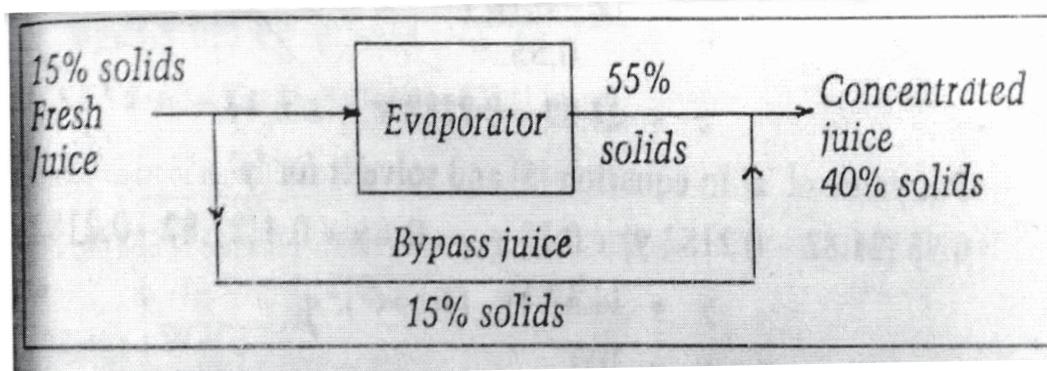
P.T.O.

- b) Write a note on [4]
 i) Sensible Heat
 ii) Latent Heat
- c) A stream flowing at a rate of 15000 mol/h containing 25 mole% N₂ and 75 mole% H₂ is to be heated from 298 K to 473 K. Calculate the heat that must be transferred using C_p^0 data given below. [8]

$$C_p^0 = a + bT + cT^2 + dT^3$$

Gas	a	b*10 ³	c*10 ⁶	d*10 ⁹
N ₂	29.5909	-5.41	13.1829	-4.968
H ₂	28.6105	1.0194	-0.1476	0.769

- Q3) a) Fresh juice contains 15% solids and 85% water by weight and is to be concentrated to contain 40% solids by weight. [9]



In single evaporation system, it is found that volatile constituents of juice escape with water leaving the concentrated juice with a flat taste. To overcome this problem, part of the fresh juice bypasses the evaporator. Calculate:

- i) The fraction of juice that bypasses the evaporator.
 ii) The concentrated juice produced (containing 40% solids) per 100 kg of fresh juice fed to the process.
- b) The analysis of the gas entering the converter in a sulphuric acid plant is 4% SO₂, 13% O₂ and 83% N₂ on a volume basis. Gas leaving the converter contains 0.45% SO₂ on SO₃ free basis (by vol). Calculate % SO₂ entering the converter getting converted to SO₃. [8]

OR

- Q4) a)** The waste acid from a nitrating process containing 20% HNO_3 , 55% H_2SO_4 and 25% H_2O by weight is to be concentrated by addition of concentrated sulphuric acid containing 95% H_2SO_4 and concentrated nitric acid containing 90% HNO_3 to get desired mixture containing 26% HNO_3 and 60% H_2SO_4 . Calculate the quantities of waste and concentrated acids required for 1000 kg of desired mixed acid. [9]
- b) The carbon monoxide is reacted with hydrogen to produce methanol. Calculate from the reaction [8]
- The stoichiometric ratio of H_2 to CO.
 - Kmol of CH_3OH produced per kmol CO reacted.
 - The weight ratio of CO to H_2 if both are fed to reactor in stoichiometric proportion.
 - The quantity of CO required to produce 1000kg of CH_3OH .

- Q5) a)** Calculate the heat of formation of phenol crystals from its elements using the following data. [9]

Standard heat of formation of $\text{CO}_2(\text{g}) = -393.51 \text{ kJ/mol}$

Standard heat of formation of $\text{H}_2\text{O}(\text{l}) = -285.83 \text{ kJ/mol}$

Standard heat of combustion of Phenol crystals at 298.15 K = -3053.25 kJ/mol .

- b) Calculate the heat of formation of liquid ethyl acetate at 298K [9]

Data:

Standard heat of formation of $\text{CO}_2(\text{g}) = -393.51 \text{ kJ/mol}$

Standard heat of formation of $\text{H}_2\text{O}(\text{l}) = -285.83 \text{ kJ/mol}$

Standard heat of combustion of liquid ethyl acetate $\text{C}_4\text{H}_8\text{O}_2 = \Delta H_c^0 = -2230.91 \text{ kJ/mol}$.

OR

- Q6) a)** Calculate the heat of formation of ethane gas at 298.15 K from its elements using Hess's law [8]

Standard heat of formation of $\text{CO}_2(\text{g}) = -393.51 \text{ kJ/mol}$

Standard heat of formation of $\text{H}_2\text{O}(\text{l}) = -285.83 \text{ kJ/mol}$

Standard heat of combustion of ethane gas at 298.15 K = -1560.69 kJ/mol .

- b) Write a note on [10]
i) Hess's Law of Constant Heat Summation.
ii) Effect of temperature on heat of reaction.

Q7) a) Write a note on GHV and NHV. State and explain relation between them. [7]

- b) The purge gas obtained from ammonia synthesis loop has following composition on mole basis:

H_2 : 69%, N_2 : 23%, Ar: 2.7%, and CH_4 : 5.3%

It is burnt with 20% excess air. Calculate theoretical air required and molar composition of the dry flue gases. [10]

OR

Q8) a) Write a note on [8]

- i) Theoretical oxygen and Theoretical air.
ii) Excess Air and Percent excess air

- b) A furnace is fired with fuel oil. The orsat analysis of flue gases by volume is as given below: [9]

CO_2 : 10.6%, O_2 : 6%, and N_2 : 83.4%

Calculate:

- i) The percentage excess air and
ii) The C:H ratio in the fuel oil, assuming that fuel does not contain nitrogen.



Total No. of Questions : 8]

SEAT No. :

P839

[Total No. of Pages : 2

[5870]-1170

**T.E. (Biotechnology)
Genetic Engineering**

(2019 Pattern) (Semester - I) (315463)

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.

- Q1)** a) Describe hybridization as strategy for screening of libraries. What is the basic principle of hybridization? [9]
b) What are genomic libraries? What is their significance? [9]

OR

- Q2)** a) Explain in detail screening of recombinants using the blue white selection method. [9]
b) Describe PCR cloning. [9]

- Q3)** Write short notes on
a) Competency. [5]
b) Broad host range. [7]
c) Copy number of plasmid and its significance. [5]

OR

- Q4)** a) Describe cloning in *S. cerevisiae*, What are the different problems in cloning in yeast? Which vectors are more suitable and preferred for yeast-based cloning? [10]
b) Write a note on *Yeast Artificial Chromosomes* or *YAC*. [7]

- Q5)** a) How is the transformation of the plant cells carried out using particle bombardment? What are the advantages? [9]
b) Discuss “recombinant protein expression in *E. coli*: advances and challenges”. [9]

P.T.O.

OR

- Q6)** a) Write a note on transfection. [9]
b) Describe the technique of electroporation in detail. [9]

- Q7)** a) How is DNA marker technology used in crop improvement? Explain with examples. [9]

- b) What are the applications of animal transgenics? [8]

OR

- Q8)** a) How is the rDNA technology in Hep B production? [8]
b) Golden Rice - need, process of production and significant steps. [9]

□□□

Total No. of Questions : 8]

SEAT No. :

P840

[Total No. of Pages : 2

[5870] - 1171

Third Year B.Tech. (Biotechnology)
INTRODUCTION TO IMMUNOLOGY
(2019 Pattern) (Semester - I) (315464)

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.

- Q1)** a) What is Immunoglobulins? Draw structure of IgG antibody. [9]
b) Compare between monoclonal Vs polyclonal antibodies. [9]

OR

- Q2)** a) Explain factors affecting antigenicity. [9]
b) Describe Hybridoma Technology with its applications. [9]

- Q3)** a) What is Complement system? How it works in CMI. [9]
b) Write short note on Antigen presentation to immune system. [8]

OR

- Q4)** a) Explain mechanism of transplantation immunology. [9]
b) What happens during inflammatory response? [8]

- Q5)** a) What is Anaphylaxis? Explain its mechanism. [9]
b) Describe with example Organ Specific autoimmunity. [9]

OR

- Q6)** a) What is hypersensitivity? Give features of different types of hypersensitivity reactions. [9]
b) Write short note on Allergy test. [9]

P.T.O.

- Q7)** a) Explain principle and applications of Complement fixation test. [9]
b) Give the examples of active & passive immunization. [8]

OR

- Q8)** a) Describe the agglutination test with its applications. [9]
b) What are vaccines? How vaccines are designed for active immunization.[8]



Total No. of Questions : 8]

SEAT No. :

P841

[5870] - 1172

[Total No. of Pages : 2

Third Year B.Tech. (Biotechnology)

ENZYME TECHNOLOGY

(2019 Pattern) (Semester - I) (315465A) (Elective - 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.
- 2) Neat diagrams must be drawn whenever necessary.

Q1) Describe the role of following coenzyme with one suitable reaction.

- a) Thiamine diphosphate. [9]
- b) Pyridine nucleotides. [9]

OR

Q2) Illustrate the role of following coenzyme with one suitable reaction.

- a) Biotin. [9]
- b) Lipoic acid. [9]

Q3) Answer the following:

- a) Draw a Lineweaver - Burk plot for competitive, non-competitive and uncompetitive type of inhibition and comment on K_m and V_{max} of same. [9]
- b) Differentiate between competitive and noncompetitive type of inhibition. [8]

OR

Q4) Analyze the given data and answer the questions.

An enzyme has a K_m of 4.7×10^{-5} M. If the V_{max} of the preparation is 22 micromoles/liter/min, what velocity would be observed in the presence of 2×10^{-4} M substrate and 5×10^{-4} M of

- a) a competitive inhibitor
- b) an uncompetitive inhibitor and
- c) an uncompetitive inhibitor? K_i in all three cases is 3×10^{-4} M
- d) What is the degree of inhibition in all three cases? [17]

PTO.

Q5) Answer the following

- a) Draw a neat diagram showing immobilization of enzyme by entrapment method. Discuss the advantages and disadvantages of entrapment method. [9]
- b) Differentiate between crosslinking and entrapment method of immobilization. [9]

OR

Q6) Answer the following

- a) What kind of changes occurs in properties of enzymes after immobilization? Justify the changes with proper explanation? [9]
- b) What are the parameters which are been checked to know the successful immobilization of enzyme? Describe any one in detail. [9]

Q7) a) Illustrate the process of production of high fructose corn syrup (HFCS) by using immobilized enzyme. [9]

b) Describe the process of preparation of Tagatose by using immobilized enzyme. [8]

OR

Q8) a) Illustrate the advantages of immobilized enzyme over free enzyme. [9]

b) Describe the role of any one immobilized enzymes in the pharmaceutical industry. [8]

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Total No. of Questions : 8]

SEAT No. :

P842

[Total No. of Pages : 2

[5870]-1175

T.Y. B.Tech. (Biotechnology)
FERMENTATION TECHNOLOGY
(2019 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, Q.7 or Q.8
- 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) How does Penicillin work? Explain the process of fermentative production of Penicillin in detail. **[18]**

OR

Q2) a) Explain microbial production of Vitamin B2 and B12. **[9]**

b) Write a note on antifungal antibiotics with a generalized protocol for their industrial productin. **[9]**

Q3) a) Write a note on Single Cell Protein production with a case example. **[10]**

b) Explain the production of glucose using an enzyme. **[7]**

OR

Q4) Enlist the different methods of enzyme immobilization. Explain the “Entrapment method of Immobilization of enzymes” in detail. **[17]**

Q5) What is an Air-lift bioreactor? Describe the design and functioning of the bioreactor for industrial application. Support the answer with a list of current industrial applications of Air-lift bioreactors for the production fo bioproducts. **[18]**

OR

P.T.O.

Q6) What will be the effect of the growth of fungus in a mimicked environment like its natural habitat on the production of different biomolecules? How this idea can be conceptualized for industrial processes explain the model system in detail. **[18]**

Q7) a) Write a note on Good Manufacturing Practices (GMPs) **[7]**

b) How upstream and downstream processing is economically related to each other for any industrial bioprocess? Give example and explain. **[10]**

OR

Q8) Enlist the parameters for scaling up of bioprocess. If these scale-dependent parameters deviate from the scale what can be the overall effect on the process? Enlist the impact parameter-wise. **[17]**



Total No. of Questions : 8]

SEAT No. :

P843

[Total No. of Pages : 2

[5870]-1176

T.Y. (Biotechnology)

Mass Transfer

(2019 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) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Give Classification of crystallizers and explain: [12]

- i) Swenson walker crystallizer
- ii) Vacuum crystallizer

b) Write mass balance equation for batch crystallizer. [6]

OR

Q2) a) What is the effect of impurities in crystal formation? How can we reduce impurities in crystal formation? [8]

b) Calculate the yield of $MgSO_4 \cdot 7H_2O$ crystals when 1000kg saturated solution of $MgSO_4$ at 353 K is cooled to 303K assuming 10% of the water is lost by evaporation during cooling. [10]

Solubility of $MgSO_4$ at 353K = 64.2 kg/100 kg water

Solubility of $MgSO_4$ at 303 K = 40.8 kg/100 kg water

At. Wt. Mg=24, S=32, H=1 and O=16

Q3) a) What is optimum reflux ratio? Draw and explain diagram showing relationship of cost versus reflux ratio. [9]

b) Explain differential distillation operation with a neat diagram. [8]

OR

Q4) a) If we consider $y = ax/(1 + (a-1)x)$ in terms of relative volatility, then derive Rayleigh equation in terms of relative volatility. [8]

b) What are azeotropes? Explain types of azeotropes? [9]

P.T.O.

- Q5)** a) A simple batch still is used to distill 1000 kg of a mixture containing 60 mass % ethyl alcohol and 40 mass% of water. After distillation the bottom product contains 5 mass% of alcohol. Determine the composition of the overhead product, its mass and mass of the bottom product. Equilibrium data is with respect to weight percentage values. Data is given as, [12]

x	5	10	20	30	40	50	60
y	36	51.6	65.5	71	74	76.7	78.9

- b) Write a short note on condensers and reboilers. [6]

OR

- Q6)** a) Write material balance over distillation column and derive an expression of operating line in rectifying and stripping section. [12]
- b) Write short notes on “Flooding in Distillation Column”. [6]

- Q7)** a) What is the difference between absorption and stripping? Why absorption is much preferred operation? [9]
- b) What are different methods of absorption? Explain it with neat diagrams and concentration profiles. [8]

OR

- Q8)** a) How packing height is transformed into NTUs? Give equations for gas and liquid phase. [5]
- b) 5000 kg/hr of a SO_2 -air mixture containing 10% by volume of SO_2 is to be scrubbed with 2,00,000 kg/hr of water in a packed tower. The exit conc. of SO_2 is reduced to 0.20%. The tower operates at 1 atm. The equilibrium relation is given by: $Y^* = 30X$, Where Y = Mole SO_2 /Mole Air and X =Mole SO_2 /Mole water. If the packed bed height of tower is 0.52 m, Calculate the height of transfer unit. [12]



Total No. of Questions : 8]

SEAT No. :

P844

[5870]-1177

[Total No. of Pages : 2

T.E. (Biotechnology)
BIOSEPARATION ENGINEERING
(2019 Pattern) (Semester - II) (315473)

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) Assume suitable data if necessary.

- Q1)** a) What is adsorption? Give different types of adsorption isotherms? [9]
b) What are the different types of adsorbents used in various applications?
Give some examples. [9]

OR

- Q2)** a) Write difference between physical and chemical adsorption. [6]
b) How adsorption occurs in fixed beds? Explain it with adsorption breakthrough curve. Highlight bed exhaustion portion in breakthrough curve and write its significance. [12]

- Q3)** a) Explain the terms and write significance: [9]
i) Partition co-efficient
ii) Retention Volume
iii) Capacity factor

b) Discuss the principle involved in the practice of Thin Layer Chromatography (TLC). Explain TLC with one case study. [8]

OR

- Q4)** a) What are the different types of detectors? Describe FID in detail. [8]
b) Explain different peak broadening effects. How Van Deemter plot correlates peak broadening effect? [9]

P.T.O.

- Q5)** a) What is ultrafiltration? How is it useful in bioseparations? Explain with 1-2 examples. [9]
b) Enlist the factors affecting the performance of membranes? How are they minimized? [9]

OR

- Q6)** a) Draw the diagram of membrane separation process and explain all components in the diagram with one detailed application. [9]
b) Write short note on:
i) Dialysis and Electrodialysis
ii) Pervaporation

- Q7)** a) What are the different types of molecular sieves? Give one recent application from literature where it is applied. [9]
b) Write a short note on protein precipitation methods. [8]

OR

- Q8)** a) What is supercritical extraction? Explain the phenomenon with suitable examples. How is it different from liquid-liquid extraction? [9]
b) What is the purpose of using mass spectrometry in combination with GC and LC? Explain it with one case study of GC-MS and LC-MS.[8]

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Total No. of Questions : 08]

SEAT No. :

P845

[5870]-1179

[Total No. of Pages : 2

Third Year B. Tech. (Biotechnology)

FOOD BIOTECHNOLOGY

(2019 Pattern) (Semester-II) (Elective-II) (315474B)

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 side indicate full marks.

- Q1)** a) Write a note on UHT treatment and its application in food. [9]
b) What are the factors taken in consideration while calculating the pasteurization time? [9]

OR

- Q2)** a) What is the thermal death kinetics of micro-organisms? What is its significance in the canning industry? [9]
b) What are the performance parameters of food processing? Enlist the advantages and disadvantages of food processing. [9]

- Q3)** a) Which bacteria are commonly used in the food industry give examples of bacteria and the food where they are used? [7]
b) What are the different types of cheese made and which bacteria are used for that? Give the detailed steps in cheese making. [10]

OR

- Q4)** a) Write a note on yeasts used in fermentation industry. What are the different types of products made using yeast? [7]
b) Enlist and describe briefly the steps involved in bread making. Discuss the significant step in bread making. [10]

- Q5)** a) Describe the role of enzymes in the bakery industry. [9]
b) Pectinases and cellulases have an important role in the vegetable and fruit processing Discuss. [9]

OR

P.T.O.

- Q6)** a) Discuss the importance of enzymes in the food industry in general. [9]
b) Give the application of amylase in the food industry. Name any five microbial enzymes other than amylase used in the food processing industry with their applications. [9]

Q7) How is food waste classified? Explain in detail. What are the types? How is the disposal different for different types? [17]

OR

Q8) Write notes on :

- a) Physical methods of waste disposal [9]
b) Chemical methods of waste disposal [8]



Total No. of Questions : 8]

SEAT No. :

P846

[Total No. of Pages : 2

[5870]-1181

T.E. (Production)

ENGINEERING METROLOGY & INSTRUMENTATION
(2019 Pattern) (Semester - I) (311081 A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn whenever necessary.*
- 2) *Use of electronic pocket calculator is allowed.*
- 3) *Assume suitable data, if necessary.*

Q1) a) Differentiate clearly between [8]

- i) Change causes & Assignable causes
- ii) Variable data & attribute data

b) Following data shows value of sample mean X & range R for 10 sample of size 5 each. Calculate control limits for mean chart & range chart. Determine whether the process is in control or not. For sample size of 5, $A_2 = 0.577$, $D_3 = 0$, $D_4 = 2.115$. [10]

Sample No	1	2	3	4	5	6	7	8	9	10
X	11.2	11.8	10.8	11.6	11	9.6	10.4	9.6	10.6	10
R	7	4	8	5	7	4	8	4	7	9

OR

Q2) a) Explain the parameters of the O.C. curve and explain its characteristic.[8]

b) The no. of rivets missing in the assembly of rail coaches is found as follows. [10]

No. of units	1	2	3	4	5	6	7	8	9	10
No. of rivets missing	8	16	19	11	14	07	27	16	17	15

Find the control limit for C chart. Find the control limits for the C chart.

P.T.O.

- Q3)** a) Explain Juran's approach in quality. [9]
b) Explain seven quality tools. [9]

OR

- Q4)** a) Explain Deming's approach for quality. [9]
b) Explain kaizen and six sigma. [9]

- Q5)** a) Define measurement and state the significance of measurement. [7]
b) Differentiate between Sensor and secondary Transducer. [10]

OR

- Q6)** a) Explain different measurement methods. [10]
b) State the explain inductive transducer. [7]

- Q7)** a) State and explain various type of strain gauges. [8]
b) Discuss the basic methods of force measurements. [9]

OR

- Q8)** a) What is stress & strain measurement and discuss electrical resistance strain gauge. [8]
b) Explain the laws, construction & working of thermocouple temperature measurement. [9]



Total No. of Questions : 8]

SEAT No. :

P847

[Total No. of Pages : 2

[5870] - 1182

T.E. (Production)

**MATERIAL FORMING TECHNOLOGY
(2019 Pattern) (Semester - I) (311082 A)**

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) Describe Rod drawing machine set up with neat sketch. Describe the die used. [8]

b) Wire of 3 mm diameter is reduced to 1.5 mm diameter. Calculate drawing stress and drawing load. The die angle is 8° and the coefficient of friction at die and wire interface is 0.1. The flow stress of wire material is 250 N/mm^2 . Also calculate motor power required if the drawing speed is 0.7 m/s. [9]

OR

Q2) a) Describe Tube sinking process with neat sketch. [5]

b) Tube of 10 mm external diameter and 1 mm thickness is reduced to 8 mm external diameter and 0.75 mm thickness. The die angle is 16° and plug angle is 14° . The coefficients of friction at die and tube interface and tube and plug (mandrel) interface is 0.1. The flow stress of tube material is 250 N/mm^2 . Also calculate and compare the drawing load if the tube drawing operation is carried out using [12]

- i) Fixed plug
- ii) Floating plug
- iii) Moving cylindrical Mandrel

Q3) a) Friction is essential in rolling. State true or False with analytical justification. [8]

b) Explain the following [9]
i) Automatic Gauge Control
ii) Mill spring

OR

P.T.O.

- Q4)** a) Describe Roll bending with neat sketch. Explain various rolling defects occurs due to Roll bending. [9]
b) Explain the process to manufacture angle shaped component using rolling process. [9]

- Q5)** a) Explain and differentiate between Hot forward extrusion and Hot backward extrusion with neat sketch. [9]
b) Explain the process to manufacture Aluminum can with neat sketches. [9]

OR

- Q6)** a) Explain and differentiate between Direct Hot extrusion and Indirect Hot extrusion with neat sketch. [9]
b) Explain various defects occurs in extruded product during extrusion process. [9]

- Q7)** a) Explain important process parameters of Explosive forming with neat sketch. State types of explosives. [9]
b) Explain important process parameters of Electro Magnetic forming with neat sketch. State types of coils. [9]

OR

- Q8)** Write short notes on [18]
a) Dies used in Explosive forming.
b) Process to manufacture fender.
c) Drive and field shaper in Electro Magnetic forming



Total No. of Questions : 8]

SEAT No. :

P848

[Total No. of Pages : 2

[5870]-1183

**T.E. (Production Engineering)
Machining Science and Technology
(2019 Pattern) (Semester - I) (311083(A))**

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 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) Discuss formation of primary and secondary shear zone in metal cutting with suitable sketches. [9]

b) Which factors are affecting the tool life? Discuss in detail. [9]

OR

Q2) a) Discuss selection of cutting fluids in metal cutting. [9]

b) The useful tool life of a HSS tool machining mild steel at 20 m/min is 4 hours. Calculate the tool life when the tool operates at 30 m/min. $n=0.125$. [9]

Q3) a) Explain wear by plastic shear and diffusion with suitable sketches. [8]

b) Discuss effect of cutting parameters on tool life. [9]

OR

Q4) a) What are the types of tool damages? Describe any two type of tool damage with suitable sketch. [9]

b) For a metal machining, the following information is available: [8]

Tool change time = 10 min. Tool re-grind time = 6 min.

Machine running cost = Rs. 8 per hour, Tool depreciation per re-grind = 40 paise, $n=0.25$, $C=150$. Calculate the optimum cutting speed.

P.T.O.

- Q5)** a) Explain American National Standards Institutes (ANSI) insert specification method in detail. [9]
b) What are the shapes of inserts? Draw any two shapes and comment on strength, power requirement and vibration tendency. [9]

OR

- Q6)** a) Explain types of chip breakers with suitable sketches. [9]
b) Design a single point cutting tool to turn a M S bar with a linear cutting speed of 50 m/min on a lathe equipped with a 12 kW motor. Safe stress for tool material is 250 MPa and efficiency of machine tool is 75%. [9]

- Q7)** a) Draw the sketch of reamer showing fluted section, neck and shank. Explain how to calculate length of flute and number of teeth in reamer. [8]
b) With suitable example, explain the procedure to be followed in designing of flat form tool by graphical method. [9]

OR

- Q8)** a) Explain with suitable example the procedure to be followed in designing a circular form tool by graphical method. [9]
b) Discuss various guidelines to be used in design of broach. [8]



Total No. of Questions : 8]

SEAT No. :

P849

[Total No. of Pages : 4

[5870] - 1184

T.E. (Production Engineering)

KINEMATICS AND DESIGN OF MACHINES

(2019 Pattern) (Semester - I) (311084(A))

Time : 2½Hours]

[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 wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam table is allowed.*

Q1) a) Explain following terms related to cam with suitable sketch: [6]

i) Prime circle ii) Pitch curve iii) Base circle

b) Following data relate to a cam profile, in which the follower moves with simple Harmonic Motion during the out stroke and return stroke. [12]

The minimum cam radius = 45 mm.

The diameter of a roller = 18 mm.

Lift of roller follower = 40 mm.

Offset of follower axis = 10mm towards right.

Angle of ascent = 110°

Angle of dwell between ascent and descent = 50°

Angle of descent = 120°

Angle of remaining dwell = 80°

Cam speed = 200rpm. Draw cam profile.

OR

Q2) a) Explain the following terms: [8]

- i) Coefficient of fluctuation of energy.
- ii) Coefficient of fluctuation of speed
- iii) Maximum fluctuation of energy.

P.T.O.

- b) A 5 kW motor running at 900 rpm operates a riveting machine. It has flywheel fitted to it of mass 100 kg and radius of gyration 0.4 m. Each riveting takes 1 seconds and required 10 kW. Determine i) Number of rivets closed per hour ii) Fall in the speed of flywheel after riveting operation. [10]

Q3) a) What is the stress concentration? What are the various causes of stress concentration? [7]

- b) A cantilever beam of circular cross section, made of alloy steel with ultimate tensile strength of 1500N/mm^2 is fixed at one end and subjected to a completely reversed force of 1000N at free ends. The force is perpendicular to beam axis. The distance between free and fixed end of beam is 400 mm. The theoretical stress concentration factor and notch sensitivity are 1.33 and 0.85 respectively. The surface finish factor and size factor are 0.79 and 0.85 respectively. The temperature factor and reliability factor are 0.975 and 0.868 respectively. The desired life of beam is 50000 cycles. If the required factor of safety is 1.5, determine diameter of beam. [10]

OR

Q4) a) Explain various factors influencing the fatigue strength of the component. [7]

- b) A transmission shaft made of cold drawn steel having ultimate tensile strength of 630 N/mm^2 and tensile yield strength 360 N/mm^2 is subjected to a fluctuating torque which varies from 600 Nm clockwise to 100 Nm anticlockwise. The surface finish factor and size factor are 0.8 and 0.85 respectively. The reliability factor is 0.897. If the factor of safety is 2, determine diameter of shaft. Use distortion-energy theory of failure. [10]

Q5) a) Explain the terms: [6]

- i) Population ii) Sample iii) Random Variable

Also explain the concept of reliability based design.

- b) A batch of 100 helical compression springs is tested for deflection under the axial load. The results are tabulated as follows : [12]

Deflection of springs, mm	Number of springs
26 - 28	2
28 - 30	12
30 - 32	50
32 - 34	32
34 - 36	4

If the permissible deflection for the springs is between 29 mm and 33 mm, determine the percentage of the springs likely to be rejected.

The areas below standard normal distribution curve from zero to z are as follows.

Z	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Area	0.3159	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452

OR

- Q6)** a) Give comparison between normal distribution and standard distribution curves. [6]

- b) A shaft and hole assembly of nominal diameter 30 mm have the following dimension [12]

$$\text{Shaft diameter} = 30_{-0.15}^{+0.1} \text{ mm} \quad \text{Hole diameter} = 30_{+0.0}^{+0.1} \text{ mm}$$

Assuming shaft and hole diameters are normally distributed, determine the percentage of assemblies having clearance less than 0.14 mm.

The areas below standard normal distribution curve from zero to z are as follows.

Z	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
Areas	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554	0.4641	0.4713

Q7) a) Explain the following terms used in Johnson's method of optimum design: [6]

- i) Functional requirement parameter
- ii) Geometrical parameter
- iii) Material parameter

b) A tensile bar of length 500 mm is subjected to constant tensile force of 3000 N. If the factor of safety is 2, design the bar diameter using Johnson's method, with a objective of minimizing the material weight using optimum material form the list given below. [11]

Material	Mass density kg/m ³	Material cost per unit mass, Rs/kg	Yield strength N/mm ²
Steel	7800	28	400
Aluminium Alloy	2800	132	150
Titanium Alloy	4500	2200	800

OR

Q8) a) Explain the guidelines to be followed in the design of casting parts. [7]

b) What is design for manufacture (DFM)? Explain the general principles to be followed while designing parts for manufacture. [10]



[5870]-1185

T.E. (Production)

FINITE ELEMENT ANALYSIS

(2019 Pattern) (Elective - I) (Semester - I) (311085(A)-1)

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.
- 2) Use of scientific calculator is allowed.
- 3) Figures to the right side indicate full marks.

Q1) Fig. 1 shows a bar of cross-sectional area of 250 mm^2 , fixed at one end and free at other end. It is subjected to an axial force of 60 kN at the mid-point of bar. if the modulus of elasticity for the bar material is $20 \times 10^3 \text{ N/mm}^2$, determine: [16]

- i) the nodal Displacement
- ii) the Stresses in each part of bar
- iii) the support reactions

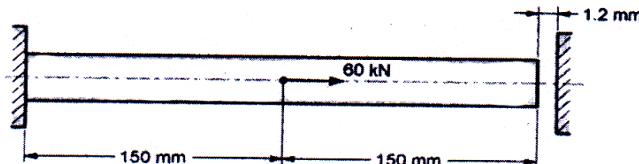


Fig.1

OR

Q2) Fig. 2 Shows a cluster of six springs. One end of the assembly is fixed and a force of 2000 N is applied at the other end. Using finite element method, determine [16]

- i) the deflection of each spring
- ii) the reaction force at the support

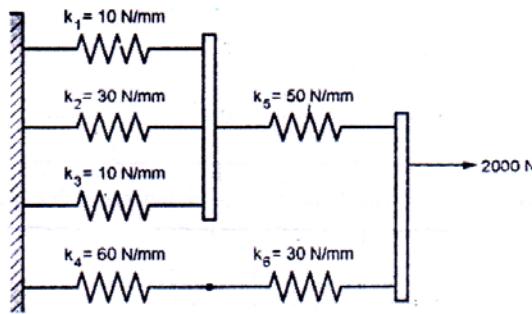


Fig.2

P.T.O.

Q3) a) A three bar truss is subjected to loading, as shown in fig. 3. The modulus of elasticity for bar material is 300×10^3 N/mm 2 . The cross sectional area of each bar used for truss is 60 mm 2 . If the length of the horizontal and vertical bars are 100 mm and 750 mm respectively, determine : [14]

- i) the element stiffness matrix for
- ii) global stiffness matrix
- iii) nodal displacements
- iv) stress in each element
- v) reaction force at the support

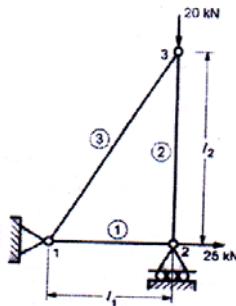


Fig.3

- b) Explain the types of Coordinate systems. [5]

OR

Q4) a) The two bar truss is shown in fig. 4. The modulus of elasticity for bar material is 70×10^3 N/mm 2 and cross sectional area of each element is 200 mm 2 . Determine : [14]

- i) the element stiffness matrix
- ii) the global stiffness matrix
- iii) the nodal displacement
- iv) the stress in each element
- v) the reaction forces

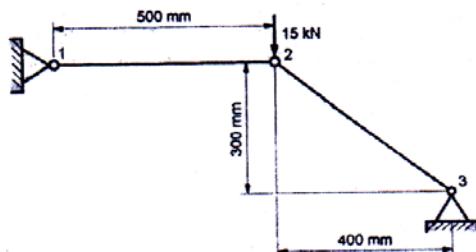


Fig.4

- b) Explain the basics steps in modeling of 1-D problem using finite element method. [5]

- Q5)** A triangular plate of size $100 \times 75 \times 12.5$ mm is subjected to the loads as shown in fig.5. The modulus of elasticity and Poisson's ratio for the plate material are 2×10^5 N/mm 2 and 0.3 respectively. Model the plate with CST element and determine : [17]

Element stiffness matrix and nodal displacements.

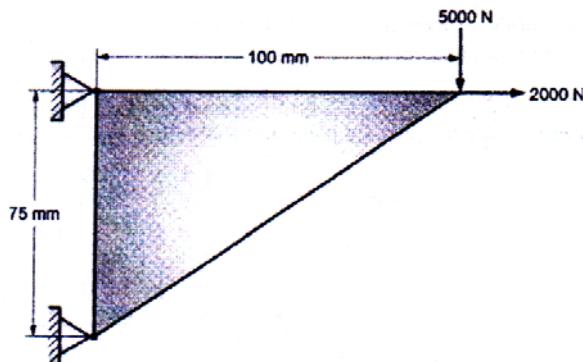


Fig.5

OR

- Q6)** A triangular plate subjected to various loads as shown in fig.6. The modulus of elasticity is 70×10^3 N/mm 2 , the poisson's ratio is 0.3 and thickness of plate is 10 mm. Model the plate with CST element and determine Element stiffness matrix and nodal displacements. [17]

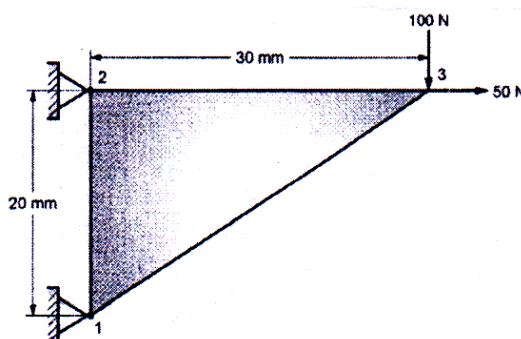


Fig.6

- Q7)** a) Explain the modes of heat transfer. [6]
b) Determine the Cartesian coordinate of the point $P(\xi = 0.5, \eta = 0.6)$ shown in Fig. 7. [6]

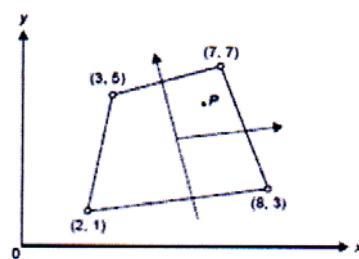


Fig.7

- c) Enlist the quality checks during the meshing. Explain any two of them. [6]

OR

- Q8)** a) In triangular element, the node 1,2,3, have Cartesian co-ordinates as (30, 40), (140, 70), (80, 140) respectively. The displacements in mm at nodes 1, 2, 3 are (0.1, 0.5), (0.6, 0.5) and (0.4, 0.3) respectively. The point P with in the element has Cartesian co-ordinates (77, 96). For Point P, determine : [6]
- i) Natural coordinates
 - ii) Shape function and
 - iii) Displacement
- b) For the quadrilateral element Cartesian co-ordinates of points 1, 2, 3, 4 are (3, 1), (6, 1), (8, 6), (2, 5), respectively. Determine local co-ordinate of point Q Which has Cartesian coordinates (7, 4). [6]
- c) What are the Types of dynamic analysis? [6]



Total No. of Questions : 8]

SEAT No. :

P850

[5870] - 1186

[Total No. of Pages : 2

T.E. (Production)

**ADVANCES IN MANUFACTURING PROCESSES
(2019 Pattern) (Semester - I) (311085(A) - II) (Elective - 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.
- 2) Neat diagrams must be drawn whenever 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 with neat sketch metal mould casting. [8]

b) Explain with neat sketch Evaporative pattern casting process. [8]

OR

Q2) a) What is vaccum mold casting? Write its advantages, disadvantages and applications. [8]

b) Explain the Ceramic shell casting with neat sketch. [8]

Q3) a) Explain the weld distortion and its prevention. [9]

b) Write short note on thermal cycles in welding. [9]

OR

Q4) a) Describe with sketch, inspection and testing of welding. [9]

b) Write short note on various types of welding joints. [9]

PTO.

Q5) a) What is the principle of Magnetic Abrasive Finishing (MAF) process, explain its working in details. [9]

b) Explain with neat sketch Magneto Rheological Abrasive Finishing (MRAF) [9]

OR

Q6) a) Write the advantages, disadvantages and applications of Magnetic Abrasive Finishing (MAF) process. How the Magnetic Abrasive Particle (MAP) is prepared? [9]

b) Write the advantages, disadvantages and applications of Magneto Rheological Abrasive Finishing (MRAF) process. [9]

Q7) a) Explain with neat sketch gear shaping process. [9]

b) Write short note on broach geometry. [9]

OR

Q8) a) Explain with neat geometry of broaching tool and its parts. [9]

b) Write short note on thread cutting process. [9]

❀ ❀ ❀

Total No. of Questions : 8]

SEAT No. :

P3836

[Total No. of Pages : 3

[5870]-1187

T.E. (Production)
MECHATRONICS

(2019 Pattern) (Semester - I) (Elective - I) (311085(A)-III)

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 wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) How does an algorithm ADC works? [8]
b) How to calculate voltage based on analog inputs (ADC)? [9]

Assume the following values for the ADC clock frequency = 1 MHz;
VT = 0.1 mV; DAC has F.S. output= 10.23 V and a 10-bit input.
Determine the following values.

- i) The digital equivalent obtained for VA = 3.728 V.
- ii) The conversion time.
- iii) The resolution of this converter.

OR

- Q2)** a) How does an algorithm DAC works? [8]
b) What is quantization error? [9]

Assume the following values for the ADC clock frequency = 1 MHz;
VT= 0.1 mV; DAC has F.S. output = 10.5 V and a 10-bit input. Determine
the following values.

- i) The digital equivalent obtained for VA = 3.628 V
- ii) The conversion time.
- iii) The resolution of this converter

P.T.O.

- Q3)** a) Do the Comparison between Open-loop and Closed-loop control systems. Give suitable example of each system. [8]
- b) Expand the following equation of Laplace transform in terms of its partial fractions and obtain its time-domain response. [9]

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

OR

- Q4)** a) Determine the transfer function of the system shown in Figure. [9]

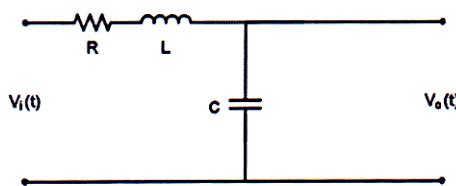


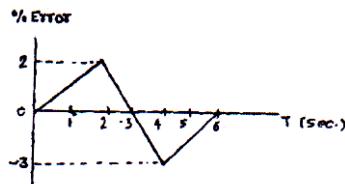
Fig. a system in time domain

- b) Expand the following equation of Laplace transform in terms of its partial fractions and obtain its time-domain response. [8]

$$Y(s) = \frac{2s+1}{(s+1+j)(s+1-j)}$$

- Q5)** a) Explain PD control action with suitable example. [8]
- b) Draw the neat sketches showing the control actions of various controllers and write the equations for their output. A PID controller has $K_p = 1.0$, $K_I = 2.0 \text{ s-I}$, $K_D = 2 \text{ s}$.

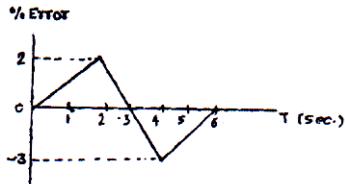
Controller output for zero error is 30%. Plot the controller output for the error shown in figure [10]



OR

- Q6)** a) Explain PID control actions with suitable example. [8]
 b) Draw the neat sketches showing the control actions of various controllers and write the equations for their output. A PID controller has $K_p = 1.0$, $K_I = 2.0 \text{ s-i}$, $K_D = 2 \text{ s}$.

Controller output for zero error is 40%. Plot the controller output for the error shown in figure [10]



- Q7)** a) Construct the ladder logic diagrams for (i) the NAND gate and (ii) the NOR gate. Also develop a truth table for both logics. [8]
 b) Explain application of PLC system for Bottle Filling Machine. [10]

OR

- Q8)** a) Explain the basic structure of Programmable logic controller. [8]
 b) Construct the ladder logic diagrams for (i) the NAND gate and (ii) the Ex-NOR gate. Also develop a truth table for both logics. [10]



Total No. of Questions : 8]

SEAT No. :

P2329

[Total No. of Pages : 2

[5870]-1188

**T.E. (Production Engineering)
SUPPLY CHAIN MANAGEMENT**

(2019 Pattern) (Semester - I) (Elective - I) (311085(A)-IV)

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 in black indicates full marks.
- 4) Assume suitable data if necessary.

Q1) a) What is supply chain management (SCM) and why is it important? [10]

b) What are the drivers of supply chain performance? [6]

OR

Q2) a) Explain the impact of responsiveness and efficiency on each of the major drivers of supply chain performance. [10]

b) What are the objectives of a supply chain? [6]

Q3) a) Explain how to manage supply chain cycle inventory. [10]

b) Why are RFID tags used in warehouse? [8]

OR

Q4) a) Explain the different models of inventory used by warehouses to effectively stock the goods. [10]

b) Why are RFID tags used in warehouse? [8]

Q5) a) Define supply chain management. What are the differences/similarities between logistics and supply chain management? [12]

b) How can supply chain cost be reduced? [6]

OR

P.T.O.

Q6) a) What is demand planning in supply chain management? [6]

b) What is the impact of a mismatch in supply and demand? [12]

Q7) a) What are the current trends in supply chain management? [12]

b) How do you manage risk in supply chain? [6]

OR

Q8) a) What are the major categories of supply chain risk? [12]

b) What are the common food supply chain issues? [6]



[5870]-1189

T.E. (Production Engineering)
PRODUCTION TOOLING

(2019 Pattern) (Semester - II) (311088(A))

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 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)** To design drawing die for a component as shown in figure no.1, calculate following values for a sheet of thickness 2 mm and yield strength 300 MPa.
 i) Blank size, ii) Percentage reduction, iii) Number of draws required,
 iv) Cup diameter and height in each draw, v) Die and punch dimensions
 in each draws, vi) Press capacity required in each draw. **[12]**

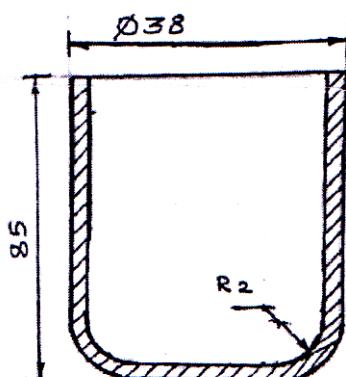


Figure No.1. All dimensions in mm.

- b)** Calculate bending force required for steel sheet 3mm thick and width 2 meter to be bent in a wiping die. The upper and lower die radius is 6 mm and UTS is equal to 650 MPa. **[6]**

OR

- Q2) a)** What is the meaning of bend allowance in sheet bending? Explain working of types of bending dies with suitable sketches. **[9]**
- b)** With suitable example, explain use of Area Method in calculation of blank size. **[9]**

P.T.O.

- Q3)** a) What is the outcome of edging operation in forging? With suitable example explain design of edging impression in forging die design. [8]
b) With suitable sketches, explain how provisions of flash and gutter are useful in forging die design. [9]

OR

- Q4)** a) How to calculate stock size in closed die forging? [8]
b) Why fullering operation is needed in forging? Explain design of fuller with suitable sketches. [9]

- Q5)** a) What are the types of dies in die casting? Explain various types of die casting dies in detail. [9]
b) Explain working of cold chamber die casting machine with suitable sketches. [9]

OR

- Q6)** a) Discuss die casting defects with causes and remedies. [9]
b) Explain working of air - injection type die casting machine with suitable sketch. [9]

- Q7)** a) Explain with the help of neat sketches side gate, diaphragm gate and spoke gate. [9]
b) Describe working principle of blow moulding with suitable sketches. [8]

OR

- Q8)** a) Determine, i) Shot capacity with Nylon 66. ii) Number of cavities for a mould by shot capacity method for a given data. Material = Nylon 66, Mass of the component = 38 g., Swept volume = 100 cm³, Density = 1.14 g/cm³, Constant = 0.85. [9]
b) Explain working of screw type injection moulding with suitable sketch. [8]



Total No. of Questions : 8]

SEAT No. :

P2330

[Total No. of Pages : 3

[5870]-1190

T.E. (Production)

PRODUCTION AND OPERATIONS MANAGEMENT

(2019 Pattern) (Semester - II) (311089(A))

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) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8*
- 4) *Use of electronic pocket Calculator is allowed.*
- 5) *Assume Suitable data, if necessary.*

Q1) a) What is the difference between Production Planning and Production Control? [6]

b) Explain in brief the Pre-Planning functions of Production Planning and Control (PPC). [6]

c) What are the 10 functions of PPC? [6]

OR

Q2) a) What are the prerequisites for effective PPC' ? [6]

b) What are the advantages and limitations of PPC? [6]

c) What are the difference between Centralized and Decentralized PPC System? [6]

Q3) a) List basic types of Plant Layout. Explain all with diagram. [8]

b) What is the function of Material Handling? Explain importance and objectives ul material handling. [9]

OR

Q4) a) Explain the meaning and significance of plant location. How will you decide the location of a mini steel plant in India? [8]

b) List and explain various principles of material handling. [9]

P.T.O.

Q5) a) Explain in detail ‘P’ system and ‘Q’ system of Inventory control. [8]

b) Arijeet Industries requires 18,000 units/year which will be used in its main product. The ordering cost is Rs. 138 per order and the carrying cost per unit per year is 22% of the purchase price per unit which is Rs. 78. [9]

Find

- i) Economic order quantity.
- ii) Number of orders per year.
- iii) Time between successive orders.

OR

Q6) a) What is selective inventory control? Explain ABC analysis in brief. [8]

b) A company makes bicycles. It produces 480 bicycles a month. It buys the tires for bicycles from a supplier at a cost of Rs. 21 per tire. The company’s inventory carrying cost is estimated to be 17% of cost and the ordering is Rs. 55 per order. [9]

- i) Calculate the EOQ.
- ii) What is the number of orders per year?
- iii) Compute the average inventory.
- iv) Compute the total cost.

Q7) a) What is Material Requirement Planning (MRP)? How does MRP system works? [8]

b) What are the advantages of having MRP system? [5]

c) What are the stages in drawing Line of Balance? [5]

OR

- Q8)** a) What are the wastes considered in Lean Manufacturing? [5]
- b) What are the characteristics of Agile Manufacturing? [5]
- c) A company is engaged in the assembly of a Machine on a continuously moving conveyor, 24 Machine assemblies are required per shift of 8 hours. The other information is given below regarding assembly steps and precedence relationship. [8]

Operation Number	Immediate Precedence Task	Duration (Min)
1	---	5
2	1	3
3	1	7
4	1	5
5	3	6
6	3,4	3
7	2	4
8	5,6	6
9	4	12
10	7,8,9	9

- i) Draw the precedence diagram.
- ii) What is the desired cycle time?
- iii) What is the theoretical number of work stations?
- iv) What is the efficiency and balance delay of the solution obtained?

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Total No. of Questions : 8]

SEAT No. :

P851

[5870]-1191
T.E. (Production)

[Total No. of Pages : 2

PROCESS ENGINEERING AND RESOURCE PLANNING
(2019 Pattern) (Semester - II) (311090 A)

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) Use of electronic pocket calculator is allowed. Assume suitable data, if necessary.

- Q1)** a) What do you mean by Equilibrium theories? [8]
b) Explain the causes of work piece Variation? [9]

OR

- Q2)** a) Explain the Mechanical Control. [8]
b) What are variables influencing work piece Control. [9]

- Q3)** a) What are factors to be considered while selecting the tooling? [9]
b) Explain the term process sheet design. [8]

OR

- Q4)** a) What are factors to be considered while selecting the Machine or equipment? [9]
b) Explain the Types of tooling. [8]

- Q5)** a) What are the factors affecting process selection. [9]
b) Explain capacity planning? [9]

OR

- Q6)** a) What is mean by capacity utilization? [9]
b) What do you mean by OEE. [9]

- Q7)** a) How the CAPP (Computer Aided Process planning) is useful in Industry. [9]
b) Explain Generative process planning? [9]

OR

- Q8)** a) Explain Knowledge based process planning. [9]
b) What are advantages of CAPP over manual process planning. [9]

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Total No. of Questions : 8]

SEAT No. :

P1015

[Total No. of Pages : 2

[5870]-1192

T.E. (Production)

**PRODUCT DESIGN AND DEVELOPMENT
(2019 Pattern) (Elective - II) (311091(A)-I) (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, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Explain genetic product development process. [10]
b) Sketch Spiral & Complex system product development process flow.[6]

OR

- Q2)** a) Explain in detail product planning process with flow chart. [10]
b) Explain any one types of product development project with example.[6]

- Q3)** a) Draw the Kano model for customer requirement. How time affects the customer requirements. [10]
b) Discuss concurrent engineering in product development. [8]

OR

- Q4)** a) What are the steps of benchmarking? Explain the competitive performance benchmarking. [10]
b) Explain in details the product life cycle. [8]

- Q5)** a) Explain overview of DFM (Design for Manufacturing) process. Also list the guideline of Design for Manufacturing. [12]
b) Explain the guideline of DFA (Design for Assembly) [6]

OR

P.T.O.

- Q6)** a) Short note on Quality Function Deployment. [6]
b) Select one product from following list that you intend design & answer the questions. [12]

Sr. No.	Name of Product
1.	Wrist Watch
2.	Water bottle
3.	Washing machine

- I) Identify primary function of the product.
- II) Develop the correlation matrix for the selected product.
- III) Construct the house of quality for the selected product.

- Q7)** a) Explain in details the Design for Casting. [12]
b) Explain role of standardization in DFMA. [6]

OR

- Q8)** a) Explain Design for Manufacturing guidelines with example. [12]
b) Explain components of product life cycle management (PLM). [6]



Total No. of Questions : 8]

SEAT No. :

P2331

[Total No. of Pages : 2

[5870]-1193

T.E. (Production)

NANO MANUFACTURING

(2019 Pattern) (Semester - II) (Elective - II) (311091(A)-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, Q. 7 or Q. 8.
- 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 are the different energy sources used in nonconventional machining processes? [10]

b) What are the needs of unconventional manufacturing process? [6]

OR

Q2) a) What is the reason for using unconventional or advanced machining? [10]

b) Which non-conventional machining process has highest material removal rate? [6]

Q3) a) What are the different types of nano finishing process? [10]

b) Why finishing is necessary on metal surface? [8]

OR

Q4) a) What is the purpose of nano finishing process? [10]

b) What is the need for nano finishing process? [8]

P.T.O.

Q5) a) What are the difference between bottom-up fabrication and top-down fabrication? [12]

b) What are the approaches used in nano fabrication. [6]

OR

Q6) a) What are the two fundamental approaches to nanomanufacturing? [6]

b) What are the key issues in the synthesis of nanomaterials? [12]

Q7) a) Which device can be used for nano measurement? [12]

b) What is the role of size in nanomaterials? [6]

OR

Q8) a) What are the different methods of measurement of nano materials? [12]

b) What is importance of Nanometrology? [6]



Total No. of Questions : 8]

SEAT No. :

P852

[Total No. of Pages : 2

[5870]-1194

T.E. (Production)

STATISTICS AND NUMERICAL METHODS

(2019 Pattern) (Semester - II) (311091 A/III) (Elective - 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, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume Suitable data if necessary.

Q1) a) Discuss types of errors in detail. [9]

b) If $x=3.26426$, Find absolute, relative & percentage error if [9]

i) x is truncated to 4 decimal places.

ii) x is rounded off to 4 decimal places

OR

Q2) a) What is Newton Raphson method? And write procedure of it. [9]

b) Find the roots of equation $2x^3+4x^2-8$ using bisection method. Do three iterations. [9]

Q3) a) Explain various methods of curve fitting. [9]

b) How is a power equation fitted in curve? Discuss in detail. [8]

OR

Q4) a) Explain various methods of least square criteria's. [9]

b) Discuss exponential curve fitting. [8]

P.T.O.

- Q5)** a) A set of values of x and $f(x)$ are given below, using Lagrange interpolation formula, find y_g at $x_g=9$ [9]

X	5	7	11	13	17
$Y = f(x)$	150	392	1452	2866	5202

- b) From following table. Calculate $f(3.5)$ using forward difference formula. [9]

x	2	3	4	5	6
y	19	48	99	178	291

OR

- Q6)** a) Evaluate $\int_0^3 2x - x^2 . dx$, taking 6 intervals by Trapezoidal rule [9]

- b) Evaluate $\int_0^{0.8} \ln(x+1) + \sin(2x) . dx$ where x in radians. Using Simpson's 1/3 rule, derive entire interval in 8 strips. [9]

- Q7)** a) What is optimization? Explain multiple optimization in detail. [9]

- b) Discuss Genetic Algorithm (GA) with one of case study. [8]

OR

- Q8)** a) How is multiple optimization useful for manufacturing? Explain in detail. [9]

- b) What is classical optimization? Discuss Simulated Annealing (SA) optimization [8]



Total No. of Questions : 8]

SEAT No. :

P1016

[Total No. of Pages : 4

[5870] - 1195

T.E. (Production Engineering)

FINANCIAL MANAGEMENT AND COSTING

(2019 Pattern) (311091(A)- IV) (Semester - II) (Elective - II)

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 wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) What is the trade-off between long-term and short-term financing of working capital? [6]

b) Prepare an estimate of working capital requirement from the following information of a trading concern. [6]

Projected annual sales ₹ 6,50,000

Percentage of net profit on sales 25%

Average credit period allowed to debtors 10 Weeks

Average credit period allowed by creditors 4 Weeks

Average stock holding in terms of sales requirements 8 Weeks

Allow 20% for contingencies

c) What is meant by fixed or permanent working capital? [5]

OR

Q2) a) What should be the mix of short and long-term sources in financing current assets? [6]

b) The current market price of the shares of A Ltd. is ₹ 95. The floatation costs are ₹ 5 per share amounts to ₹ 4.50 and is expected to grow at a rate of 7%. You are required to calculate the cost of equity share capital. [6]

c) Is there a difference between the project's and the firm's cost of capital? Explain. [5]

P.T.O.

- Q3)** a) What are the important techniques of costing? Explain in brief. [6]
- b) From the following details of stores receipts and issues of materials in a manufacturing unit, prepare the stores ledger using Base Stock Method of valuing the issues of LIFO; assume base stock 200 tonnes. [6]
- | | |
|-----------|---------------------------------------|
| 1.1.2021 | Purchased 500 tones at ₹ 2 per ton |
| 10.1.2021 | Purchased 300 tones at ₹ 2.10 per ton |
| 15.1.2021 | Issued 600 tons |
| 20.1.2021 | Purchased 400 tones at ₹ 2.20 per ton |
| 25.1.2021 | Issued 300 tons |
| 27.1.2021 | Purchased 500 tons at ₹ 2.10 per ton |
| 31.1.2021 | Issued 200 tons |
- c) Ramesh Ltd. has three production departments A, Band C and six service departments. The following figures are extracted from the records of the company: [5]

Production Departments		Service Departments	
A	₹ 16,000	Stores	₹ 2,000
B	₹ 10,000	Timekeeping	₹ 3,000
C	₹ 12,000	Maintenance	₹ 1,000
	₹ 38,000	Power	₹ 2,000
		Welfare	₹ 1,000
		Supervision	₹ 2,000
		Total	₹ 49,000

The other information available in respect of the production departments:

Particulars	Production Departments		
	A	B	C
No. of Employees	40	30	20
No. of Stores Requisition	30	20	10
Horse Power of Machines	500	500	600
Machine Hours	2500	1500	1000

You are required to apportion the costs of various service departments to production departments.

OR

- Q4)** a) Discuss the various methods of pricing materials issued to production. [6]
- b) Calculate the earnings of workers A and B under Straight Piece Rate System and Taylor's Differential Piece Rate System from the following particulars : [6]
- Standard time allowed 50 units per hour.
- Normal time rate per hour 100.
- Differentials to be applied.
- 80% of Piece rate below standard.
- 120% of Piece rate at or above standard.
- In a day of 8 hours A produced 300 units and B produced 450 units.
- c) Following information is made available from the costing records of a factory: [5]
- i) The original cost of the machine : ₹ 1,00,000
- Estimated life : 10 years
- Residual Value : ₹ 5,000
- Factory operates for 48 hours per week : 52 weeks in a year.
- Allow 15% towards machine maintenance down time. 5% (of productive time assuming unproductive) may be allowed as setting up time.
- ii) Electricity used by the machine is 10 units per hour at a cost of 50 paise per unit.
- iii) Repair and maintenance cost is ₹ 500 per month.
- iv) Two operators attend the machine during operations along with two other machines. Their total wages including fringe benefits, amounting to ₹ 5,000 per month is paid.
- v) Other overheads attributable to the machine are ₹ 10,431 per year.
Using above data, calculate machine hour rate.

- Q5)** a) Define Standard Costing. What do you understand by Standard Cost and Standard Costing? [6]
- b) Discuss the preliminary steps for determination of Standard Cost. [6]
- c) Calculate Material Cost Variance from the following information : [6]
- Standard Price of material per kg = ₹ 4
- Standard Usage of materials = 800 kgs
- Actual Usage of materials = 920 kgs
- Actual Price of materials per kg = ₹ 3
- Actual Cost of materials ₹ 2,760
- Standard cost of material for actual production ₹ 3,200

OR

Q6) a) What are the differences between Standard Costing and Estimated Costing? [6]

b) Explain the different types of Material Cost Variance. [6]

c) From the following particulars, calculate Labour Variance : [6]

Standard hours = 200

Standard rate for actual production = ₹ 1 per hour

Actual hour = 190

Actual Rate = ₹ 1.25 per hour

Q7) a) What do you understand by Marginal Costing? Define Marginal Costing. Briefly explain the features of marginal costing. [6]

b) What are the merits and demerits of process costing? [6]

c) From the following information, calculate the amount of profit using marginal cost technique : [6]

Fixed cost ₹ 3,00,000

Variable cost per unit ₹ 5

Selling price per unit ₹ 10

Output level 1,00,000 units

OR

Q8) a) What is meant by Cost Driver? Explain role of Cost Driver in tracing costs to products. [6]

b) Write Short notes on : [6]

i) Normal Process Loss.

ii) Abnormal Process Loss.

iii) Abnormal Gain.

c) In Process A, 1,000 units were introduced at a cost of ₹ 20,000, the other expenditure incurred in the process were materials ₹ 10,000 and wages ₹ 5,000. 10% is the normal loss during production and possess a scrap value of ₹ 3 each. The output of process A was only 800 units. Find out the value of Abnormal Loss. [6]



Total No. of Questions : 8]

SEAT No. :

P1017

[Total No. of Pages : 2

[5870]-1196

T.E. (Production Engineering (Sandwich))
MANUFACTURING TECHNOLOGY (SELF STUDY)
(2019 Pattern) (Semester - I) (311122(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve 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.*
- 5) *Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.*

- Q1)** a) Describe in Brief Condition Based Maintenance using Vibration Signature. [5]
- b) How Infrared Camera is useful in Security System? What are the parameters considered for signal acquisition? [5]
- c) Find out the system reliability for a serial and parallel configuration with 2 Components. [7]

OR

- Q2)** a) With a block diagram explain Quantum Debris Analysis using Particle Analyzers. [8]
- b) What is availability and how can it be increased? [9]

- Q3)** a) Brief with example Deming's PDCA Cycle and PDSA Cycle. [8]
- b) Write Short Notes (Any two) : [9]
- i) 5 S
 - ii) Concurrent Engineering
 - iii) JIT

OR

- Q4)** a) Describe House of Quality with suitable example. [10]
- b) Explain in Brief Quality Circle Structure. [7]

P.T.O.

- Q5)** a) Explain the steps involved in Material Requirement Planning. Also brief on types of Data considered by Material Requirement Planning. [10]
b) Write Short Notes (Any Two) [8]
i) Computer Aided Process Planning.
ii) Scheduling and Dispatching.
iii) Money market

OR

- Q6)** a) Explain the requirements of Man, Material Machine Methods while selecting for Casting operation. [10]
b) Enlist types of charts and forms used in production planning And explain any two charts with neat sketch. [8]

- Q7)** a) Explain the Objectives of Cost estimation. What are the different factors considered for cost optimization of Smartphone? [9]
b) Write Short Notes : [9]
i) Provision for Scrap
ii) Estimation of Volume
iii) Need of Depreciation

OR

- Q8)** a) Brief the objectives and functions of cost estimation. [9]
b) Enlist the types of Depreciation and Explain Declining Balance Depreciation and Units of Production Depreciation. [9]



Total No. of Questions : 8]

SEAT No. :

P853

[Total No. of Pages : 4

[5870] - 1197

T.E. (Production Sandwich)

KINEMATICS AND DESIGN OF MACHINES

(2019 Pattern) (Semester - II) (311084(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Figures to right indicates full marks.*
- 2) *Neat Diagram must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*
- 4) *Use of Logarithmic Table, Slide rule and pocket calculator is allowed.*
- 5) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*

Q1) a) Define the following terms as applied to cam with neat sketch: [8]

i) Base Circle ii) Pitch Circle iii) Pressure angle iv) Stroke of the follower

b) The turning moment diagram for a multicylinder engine has been drawn to a scale $1\text{mm} = 600 \text{ Nm}$ vertically and $1 \text{ mm} = 3^\circ$ horizontally. The intercepted areas between the output torque curve and the mean resistance line, taken in order from one end, are as follows:

+52, -124, +92, -140, +85, -72, and +107mm², when the engine is running at a speed of 600rpm. If the total fluctuation of speed is not to exceed $\pm 1.5\%$ of the mean speed , find the necessary mass of the fly wheel of radius 0.5m. [10]

OR

Q2) a) Sketch different types of cams and follower and name it. [6]

b) A machine, punching 38mm holes in 32mm thick plate requires 7 Nm of energy per sq. mm of sheared area, and punches one hole in every 10 seconds. Calculate the power of the motor required. The mean speed of the flywheel is 25 meters per second. The punch has a stroke of 100mm.

Find the mass of the flywheel required if the total fluctuation of speed is not to exceed 3% of the mean speed. Assume that the motor supplies energy to the machine at uniform rate. [12]

P.T.O.

Q3) a) Define the following terms: [6]

i) Notch sensitivity ii) Endurance Limit iii) Stress Concentration

b) A cantilever beam of circular cross section, which is made up of alloy steel, having $S_{ut} = 1400\text{N/mm}^2$ fixed at one end and subjected to a completely reverse force of 1000N at the free end. The force is perpendicular to the axis of the beam. The distance between the fixed and free end of the cantilever beam is 400mm. If the desired life of the beam is 50000 cycles. Determine the diameter of the beam. [11]

Use following data

Theoretical stress concentration factor = 1.33

Notch sensitivity = 0.85

Surface finish factor = 0.79

Size factor = 0.85

Temperature factor = 0.975

Reliability factor = 0.868

OR

Q4) a) Explain the Modified Goodman Diagram for fluctuating axial/bending stresses with neat sketches. [8]

b) A mechanical component is subjected to two dimensional stresses. The tensile stress in X -direction varies from 50 to 150 N/mm². The stress in Y-direction varies from 20 N/mm² compressive to 100N/mm² tensile. The shear stress in XY plane varies from 20N/mm² to 80 N/mm². The frequency of variation of these stresses is equal. The corrected endurance strength of component is 300 N/mm². The ultimate tensile strength is 700 N/mm². Determine the factor of safety using distortion energy theory. [9]

Q5) a) Explain the following terms used in the statistical analysis of the engineering problems: [6]

i) Arithmetic Mean ii) Median iii) Standard deviation

b) A batch of 100 helical compression springs are tested for the deflection under the axial load. the results are tabulated as follows : [12]

Deflection of springs in mm	Number of springs
26 - 28	2
28 - 30	12
30 - 32	50
32 - 34	32
34 - 36	4

If the permissible deflection for the springs is between 29mm and 33mm, determine the % of the springs likely to be rejected

Z	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Area	0.3159	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452

[Use linear interpolation for values in between.]

OR

- Q6)** a) Explain the difference between 'design tolerance' and 'natural tolerance'. [6]
 b) A shaft and assembly of nominal diameter 30mm have the following dimensions : [12]

$$\text{Shaft diameter} = 30_{-0.15}^{+0.1} \text{ mm} \quad \& \quad \text{Hole diameter} = 30_{+0.0}^{+0.1}$$

Assuming the shaft and hole diameters are normally distributed, determine:

- i) the percentage of assemblies having clearance less than 0.14mm; and
- ii) the percentage of assemblies having clearance greater than 0.20mm

Use linear interpolation for values in between.

Z	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
Area	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554
Z	1.8	1.9	2.0	2.1	2.0	2.1	2.2	2.3
Area	0.4641	0.4713	0.4772	0.4821	0.4772	0.4821	0.4861	0.4893
Z	2.4	2.5						
Area	0.4918	0.4938						

- Q7)** a) What is design for manufacture (DFM)? Explain the general principles to be followed while designing the parts for manufacture. [8]
 b) Explain desirable, undesirable effects and functional requirement parameter in optimum design. State various step involved in optimum design for normal specification. [9]

OR

Q8) a) Define adequate design & optimum design. [3]

b) A tensile bar of length 200 mm is subjected to the constant tensile force of 5000 N If the factor of safety is 3, design the bar with the objective of minimizing the material cost, out of the following materials : [14]

Material	Mass density ρ kg/m ³	Material cost per unit Mass c, Rs/kg	Yield strength Syt, N/mm ²
Steel	7800	14	400
Aluminium Alloy	2800	66	150
Titanium Alloy	4500	1100	800
Magnesium Alloy	1800	75	100



Total No. of Questions : 8]

SEAT No. :

P1018

[Total No. of Pages : 4

[5870]-1198

T.E. (Production S/W)

MATERIAL FORMING AND MOLD DESIGN
(2019 Pattern) (Semester - II) (311124A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicates full marks.

Q1) a) Comparison of different rolling mill arrangement and also draw the sketch of [8]

- i) Two high mill
- ii) Two high reversing mill
- iii) Three high rolling mill
- iv) Four high rolling mill
- v) Cluster Rolling mill

b) Determine the maximum reduction possible on a piece of steel 250 mm thick during cold rolling. When $\mu = 0.1$ and during Hot rolling $\mu = 0.6$ what would be the effect on the maximum draft if the roll radius was changed from 500 mm to 1.5 m? [8]

c) Draw only sketch of

- i) Planetary rolling mill
- ii) Ring rolling

[2]

OR

Q2) a) Calculate the rolling load to reduce steel 600mm wide and 30 mm thick by 20% Roll diameter 800 mm Flow stress of steel 150N/mm^2 Assume $\mu = 0.15$. What would be rolling road if [8]

- i) Sliding friction occurs
- ii) Sticking friction occurs

P.T.O.

b) Draw the Geometry of Rolling process define following. [8]

- i) Forward slip
- ii) Backward slip
- iii) Neutral point N
- iv) Angle of contact α
- v) Angle of Bite β

Also show on sketch h_0 , v_0 , v_1 , h_1 , V_r , Δh , lagging zone, leading zone, α , N , β .

c) Draw only sketch of [2]

- i) Sendizmer rolling mill
- ii) Tandem rolling mill

Q3) a) Explain the following parameter of Gating system Design.

- i) Pouring time for different metal [2]
- ii) Choke Area [2]
- iii) Types of gates (with figure) [3]
- iv) Sprue - Gating system design [2]
- v) Gating ratio [1]

b) A mold sprue is 20cm long and cross sectional area at its base is 2.5cm^2 . The sprue feeds a horizontal runner leading into a mold cavity whose volume is 1560cm^3 determine [6]

- i) Velocity of the molten metal at the base of sprue
- ii) Volume rate of flow
- iii) Time to fill the mold

Write the only formula of

c) i) Energy Balance equation like Bernnoullis equation.
ii) Continuity equation. [2]

OR

Q4) a) A cylindrical riser must be designed for a sand casting mold. The casting itself is a steel rectangular plate with dimensions $7.5\text{cm} \times 12.5\text{cm} \times 2.0\text{cm}$. The total solidification time (TST) for casting = 1.6 min the cylinder for the riser will have a diameter to height ratio (D/n) = 1.0. Determine the dimensions of the riser so that it's TST = 2.0 min. Take $n = 2.0$. [10]

- b)** Explain with sketch different types of gating system.
- i) Top Gate (Wedge, Finger, pencil gate)
 - ii) Parting Gate
 - iii) Bottom Gate
- [8]

Q5) a) Explain with neat sketch on aspect of forging [10]

- i) Open die forging
 - ii) Closed die forging
 - iii) Incremental forging
 - iv) Isothermal forging
 - v) Roll forging
- b)** Draw neat sketch following forging press. [7]

- i) Crank
- ii) Knuckle joint
- iii) Screw
- iv) Hydraulic

OR

Q6) a) Explain with neat sketch different types of forging hammers (each 2 marks) [8]

- i) Board type hammer
- ii) Belt type hammer
- iii) Chain type hammer
- iv) Air type hammer

- b) Explain forging Die design on aspect of [9]
 - i) Die material used/manufacturing [2]
 - ii) Die material requirement [2]
 - iii) Die design parameter [2]
 - iv) Draft angles [1]
 - v) Selection of die material [1]
 - vi) Die Lubrication [1]

- Q7)** a) Enumerate the types of Gates used in Injection molding draw the sketches. [8]
- b) Explain with neat sketch types of runner used in Injection molding. [5]
- c) Draw the sketches of Guide pillar and bushes used in plastic Injection molding. [4]

OR

- Q8)** a) What is the difference between toggle clamping and ram clamping in injection molding machines. [8]
- b) Enumerate the types of molding defects injection molding machine what are their causes. [4]
- c) Draw plastic injection molding machine. Label all parts. [5]



Total No. of Questions : 8]

SEAT No. :

P854

[5870]-1199

[Total No. of Pages : 2

**T.E. (Production Sandwich Engineering)
METROLOGY & QUALITY CONTROL
(2019 Pattern) (Semester - II) (311125 A)**

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) *Figures to the right side indicate full marks.*
- 3) *Use of Calculator is allowed.*
- 4) *Assume Suitable data, if necessary.*

UNIT - I

- Q1)** a) Explain the construction and working of a laser telemetric system with a neat sketch. [9]
b) What are the benefits of using CMM? Discuss features of CMM software. [8]

OR

- Q2)** a) Explain the construction and working of a laser telemetric system with a neat sketch. [9]
b) Explain the working of DC laser interferometer. [8]

UNIT - II

- Q3)** a) Explain the analysis of surface finish being carried out by [9]
i) The average roughness method.
ii) Peak to valley height method
iii) Form factor
b) Explain with neat sketch Talyor-Hobson-Talysurf. [8]

OR

- Q4)** a) What are the types of Methods of measuring surface finish for Inspection by comparison and Direct Instrument Measurements? [9]
b) Determine the chordal thickness of a gear tooth of a gear with 45 teeth and module 4mm and pressure angle 20 degree. Also determine the value of constant chord. [8]

P.T.O.

UNIT - III

- Q5)** a) Explain the method of measuring force using strain gauge load cell. [9]
b) Describe briefly the following. [9]
i) Venturimeter
ii) Rotameter

OR

- Q6)** a) Explain the following with neat sketch. [9]
i) Pitot Tube
ii) Optical Pyrometer
b) Describe the working principle of hydraulic dynamometer for measuring the shaftpower. [9]

UNIT - IV

- Q7)** a) What are the different types of control chart? What are the assignable causes of variation? [9]
b) Compare X bar and R chart. [9]
What is the difference between variable chart and attribute chart?

OR

- Q8)** a) What do you mean by Sampling inspection? What are the advantages of Sampling inspection? What are the limitations of Sampling inspection? [9]
b) Define:
Acceptance Quality Level
Process Average Fraction Defective
Producer's risk
Consumer's risk

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Total No. of Questions : 8]

SEAT No. :

P855

[Total No. of Pages : 3

[5870]-1200

T.E. Production Engineering (Sandwich)

STATISTICS AND NUMERICAL OPTIMIZATION METHODS

(2019 Pattern) (Semester - II) (311088 (A))

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) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume Suitable data if necessary.*
- 5) *Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.*

Q1) a) Determine the root of the given equation $X^2-3=0$ for $X= [1, 2]$, using bisection Method and correct through three decimal places. **[9]**

b) Find a root of an equation $f(x)=X^3-X-1$ using Newton Raphson method. **[8]**

OR

Q2) a) Solve following equation using gauss elimination method **[8]**

$$2X + 2Y + 4Z = 18$$

$$X + 3Y + 2Z = 13$$

$$3X + Y + 3Z = 14$$

b) Solve following equation using gauss Seidal method upto three approximations. **[9]**

$$83X + 11Y - 4Z = 95$$

$$7X + 52Y + 13Z = 104$$

$$3X + 8Y + 29Z = 71$$

P.T.O.

Q3) a) Fit a curve $y = a b^x$, using least square method to the following data. [8]

x	1	2	3	4	5	6	7
y	87	97	113	129	202	195	193

b) Evaluate $\sqrt{155}$ by Using Lagrange's Interpolation formula from the following data. [9]

x	150	152	154	156
$y = \sqrt{x}$	12.247	12.239	12.410	12.490

OR

Q4) a) State the order of the polynomial which might be suitable for the following function. Calculate $f(3)$ using Newton Forward Difference Method. [9]

x	0	2	4	6	8	10
y	0	4	56	204	496	980

b) Fit a straight line $y = ax + b$, using least square method to the following data. [8]

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

Q5) a) State the order of the polynomial which might be suitable for the following function. Calculate $f(42)$ using Newton Backward Difference Method. [9]

x	20	25	30	35	40	45
$f(x)$	354	332	291	260	231	204

b) Find the value of y at $x = 10$ by using Newton Divided Difference Method formula from the following data. [9]

x	05	06	09	11
y	12	13	14	16

OR

Q6) a) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Trapezoidal Method by taking 6 divisions. [9]

b) Use Simpsons 1/3rd rule to evaluate $\int_1^2 \frac{dx}{x^2}$ correponding to five intervals. [9]

Q7) a) Describe in brief Method of Lagrange's Multipliers. [9]

b) Explain the Steepest Decent Method used in manufacturing. [9]

OR

Q8) a) Write in brief implantation of Genetic Algorithm with suitable example. [9]

b) Brief on: Generalized reduced gradient Method. [9]



Total No. of Questions : 8]

SEAT No. :

P5979

[Total No. of Pages : 2

[5870] - 1201

**T.E. (Production Engineering S/W)
ADVANCED MATERIAL**

(2019 Pattern) (Elective - II) (Semester - II) (311126 (A)-1)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Figures to the right indicate full marks.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Assume suitable data if necessary.*
- 4) *Use of logarithmic tables, slide rule is electronic pocket calculator is allowed.*
- 5) *Solve Q.No.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*

- Q1)** a) Explain dual phase steel with application and microstructure. [9]
b) Explain High Strength Low alloy with its properties. [8]

OR

- Q2)** a) Explain Maraging Steel with its microstructure. [9]
b) Discuss Micro alloyed steels with its application. [8]

- Q3)** a) Classification of Composite material with Advantage and Disadvantage. [9]
b) Explain Natural composite with its application? [8]

OR

- Q4)** a) Explain Metal matrix composite with its diverse application [9]
b) What is metal matrix composites? Explain with advantage and disadvantage. [8]

- Q5)** a) Explain with neat diagram Autoclave manufacturing process. [9]
b) Draw schematic diagram of Shape memory alloys. Explain with application. [9]

P.T.O.

OR

- Q6)** a) Explain Nanomaterial in comparison with bulk material. [9]
b) Explain the bio metallic alloys like : Ni-Ti, Co-Cr-Mo alloys with Application. [9]

- Q7)** a) Why to Aluminium is used in the aero plane Industry. [9]
b) Explain Iron base, nickel base and cobalt base super alloys. [9]

OR

- Q8)** a) Explain biocompatibility in the biomedical industry. [9]
b) Explain cobalt base super alloys. [9]



Total No. of Questions : 8]

SEAT No. :

P2332

[Total No. of Pages : 3

[5870]-1202

**T.E. (Production Engineering - Sandwich)
COSTING AND COST CONTROL**

(2019 Pattern) (Semester - II) (311126 (A) - II) (Elective - II)

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) *Figures to the right side indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume Suitable data, if necessary.*

Q1) a) A factory produces 100 bolts and nuts per hour on a machine. Material cost is Rs. 375, labour Rs. 245 and direct expenses is Rs. 80. The factory on cost is 150% and office on cost is 30%. If sales price is Rs. 11.30 find whether company incurs profit or loss. [12]

b) List the various sections that will be normally found in a foundry shop. [6]

OR

Q2) a) State and explain various losses which are to be considered in a forging shop. [4]

b) Two 1 m long M.S. plates of 10 mm thickness are to be welded by a lap joint with a 8 mm electrode. Calculate the cost of welding. Assume the following data. [14]

- i) Current used = 30 amperes
- ii) Voltage = 300 V
- iii) Welding speed = 10 m/hr
- iv) Electrode used = 0.1 kg/m of welding
- v) Labour charges = Rs. 4.00/hr
- vi) Power charges = Rs. 0.2/kWh
- vii) Cost of electrode = Rs. 40.00/kg
- viii) Efficiency of machine = 70%

P.T.O.

- Q3)** a) What are the principal factors to be considered when fixing a machine hour rate? Give a specimen computation. [9]
 b) What is meant by absorption of overheads? What factors should be considered in obtaining a rate for absorption of overheads? [9]

OR

- Q4)** a) In a factory where machine hour rates are used for recovering overhead expenses, state what information would be necessary to compute these rates? [9]
 b) Distinguish between allocation, apportionment and absorption in connection with factory overhead expenses. [9]

- Q5)** a) What are the specific aspects and recording of transactions of contract costing? [7]
 b) Draw up a job cost-sheet for a simple product, to find out the cost of a product. [10]

OR

- Q6)** The cost of sales of product A is made up as follows: [17]

	Rs.
Materials used in manufacturing	5,500
Materials used in packing materials	1,000
Materials used in selling the product	150
Materials used in the factory	75
Materials used in office	125
Labour required in production	1,000
Labour required for supervision of the management of factory	200
Expenses - direct, factory	500
Expenses - indirect, factory	100
Expenses - office	125
Depreciation - office building and equipment	75
Depreciation - factory	175
Selling expenses	350
Freight	500
Advertising	125

Assuming that all the products manufactured are sold, what should be the selling price to obtain a profit of 25% on selling price?

Q7) a) What is a principal budget factor? Give a list of such ‘principal budget factors’ and state the effect of the existence of two or more budget factors in a business. [8]

b) What do you understand by master budget? Into what sections is it usually divided, and what are the purposes of the divisions? [9]

OR

Q8) a) The cost of an article at capacity level of 5,000 units is given under A below. For a variation of 25% in capacity above or below this level, the individual expenses vary as indicated under B below: [12]

A	Rs.	B
Material cost	25,000	(100% varying)
Labour cost	15,000	(100% varying)
Power	1,250	(80% varying)
Repairs and Maintenance	2,000	(75% varying)
Stores	1,000	(100% varying)
Inspection	500	(20% varying)
Depreciation	10,000	(100% fixed)
Administration overheads	5,000	(25% varying)
Selling overheads	3,000	(50% varying) 62,750
Cost per unit	12.55	

Find the unit cost of the product under each individual expense at production levels of 4,000 units and 6,000 units.

b) Differentiate between Traditional Budgeting and Zero-Base Budgeting [5]



[5870]-1203**T.E. (Production Sandwich)****ADVANCED JOINING TECHNOLOGY****(2019 Pattern) (Semester - II) (Elective - II) (311126(A)-III)***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) Figures to the right side indicate full marks.
- 3) Draw neat diagrams wherever necessary.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain diffusion bonding process stating its advantages, disadvantages, and applications of the process. [10]
- b) Explain Brazing and soldering process stating its advantages, disadvantages, and applications. [8]

OR

- Q2)** a) Explain Ultrasonic Welding stating its advantages, disadvantages, and applications of the process. [9]
- b) Explain Friction Welding stating its advantages, disadvantages, and applications of the process. [9]

- Q3)** a) Explain Friction Stir Welding stating its advantages, disadvantages, and applications of the process. [10]
- b) Describe the concept of Cold Metal Transfer and its applications. [7]

OR

- Q4)** a) Explain Electron Beam Welding stating its advantages, disadvantages, and applications of the process. [8]
- b) Write short notes on :
- i) Welding automation in aerospace
 - ii) Robotic Welding.
 - iii) Under Water welding

- Q5)** a) Describe various types of joints used in welding with sketch in short. [9]
b) Describe in short, the Magnetic Particle Testing of weldments. [9]

OR

- Q6)** a) Write short notes on : [9]
i) Radio graphs of weldments
ii) Life assessment of weldments
b) Describe in short, the liquid penetration test of weldments. [9]

- Q7)** a) Write Short notes on : [8]
i) Weld thermal cycles and their effects
ii) Concept of HAZ
b) What do you understand by weldability? Explain how weldability is assessed in short. [9]

OR

- Q8)** a) Explain the following weld defects ,their causes and remedies. [9]
i) Lack of penetration
ii) Cracks
iii) Lack of fusion
b) What are different weldability test? Describe any one in short. [8]



Total No. of Questions : 8]

SEAT No. :

P1019

[Total No. of Pages : 2

[5870]-1204

T.E. (Production Sandwich)

WORLD CLASS MANUFACTURING

(2019 Pattern) (Elective - II) (Semester - II) (311126(A)- IV)

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) *Figures to the right indicates full Marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data if necessary.*
- 5) *Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.*

Q1) a) What is meant by cellular manufacturing? Explain in detail, single-linkage clustering algorithm used for cell formation. [9]

b) State and explain benefits and applications of Group Technology. [8]

OR

Q2) a) State and explain Group Technology. Its methods of Codification & Classification of Systems. [9]

b) What is Production Flow Analysis? List the steps involved in carrying out PFA. [8]

Q3) a) State & explain the concept of Total Productive Maintenance with the help of pillars. [9]

b) What is Overall Equipment Effectiveness (OEE). State and explain it. [8]

OR

Q4) a) What is Resource Levelling? State and explain its importance with suitable example. [9]

b) State and explain the concept of Autonomous Maintenance. [8]

P.T.O.

Q5) a) What is the theory of constraints process? Explain its important with suitable example. [9]

b) What is Bottleneck Scheduling? Explain its applications in industry. [9]

OR

Q6) a) What is Drum-Buffer-Rope Approach? Explain it in detail. [9]

b) What is throughput accounting in Theory of Constraints? What are the limitations of throughput accounting? How do you calculate throughput in accounting? [9]

Q7) a) What are the components of Industry 4.0? Explain globalization and Emerging issues with suitable example. [9]

b) What do you mean by Lean Logistics? What is the benefit of lean processes in the logistics operation? [9]

OR

Q8) a) What is Lean Thinking? How it can be applied to logistics? [9]

b) What are Cyber-Physical Systems? Write down benefits of Cyber Physical Systems. [9]



Total No. of Questions : 8]

SEAT No. :

P6518

[Total No. of Pages : 2

[5870]-1205

T.E.

**HONORS IN ARTIFICIAL INTELLIGENCE AND MACHINE
LEARNING**
Computational Statistics
(2019 Pattern) (Semester - I) (310301)

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 side indicate marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) What are different methods for performing statistical analysis? Explain hypothesis testing and sample size determination. [8]
b) What is confusion Matrix? Explain the True Positive, False Positive, False Negative and True Negative with example. [10]

OR

- Q2)** a) Write short note on
 - i) AUC and ROC
 - ii) Sensitivity and Specificity[8]
b) State the Characteristics of good Hypothesis statement. [5]
c) Write differences between null and alternate hypothesis. [5]

- Q3)** a) What are different feature scaling techniques? Explain Normalization and Standardization in depth [8]
b) What is bias and variance? Explain bias-variance trade-off [5]
c) Comment on Overfitting and Underfitting of the mode. [4]

OR

- Q4)** a) What is Regularization? How does it solve the overfitting problem in Machine Learning? Explain the LASSO (Least Absolute shrinkage and Selection Operator) Regularization Method. [8]
b) Define cross fold validation with its different types. Elaborate the K fold validation method [9]

P.T.O.

- Q5)** a) What is feature Selection? What are the advantages of performing feature selection before training machine learning models [6]
b) What are the advantages of dimension reduction techniques? Explain PCA in short [8]
c) Explain with example oversampling [4]

OR

- Q6)** a) Write short note on [10]
i) LDA
ii) PCA
b) What is imbalance dataset? What are different Resampling Techniques? Explain any one method in depth. [8]

- Q7)** a) What is regression? Explain the Linear and logistic regression in depth. [8]
b) Explain the Gradient Descent method. State and explain the different types of gradient descent [9]

OR

- Q8)** a) Describe the Monte Carlo Method in depth with its limitation. State the different real time applications of Monte Carlo Method. [8]
b) Explain Bay's Theorem [4]
c) Elaborate the Least Square Regression Method. [5]



Total No. of Questions : 8]

SEAT No. :

P2333

[Total No. of Pages : 2

[5870]-1206

T.E. (Computer / Honors)
CYBER SECURITY
Information and Cyber Security
(2015 Pattern) (Semester - I) (310401)

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 indicates full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) List the requirements for good hash function. And explain how it ensures the integrity of data. [8]
b) List difference between MD5 & SHA. [4]
c) Explain Diffe-Hellman key exchange algorithm with example. [5]

OR

- Q2)** a) Explain the RSA algorithm with an example. [8]
b) Explain MD5 with an example. [9]

- Q3)** a) What are the main similarity and differences between qualitative risk analysis Vs quantitative risk analysis? [9]
b) What is cyber stalking and how to prevent it? Enlist example of cyber stalking. [9]

OR

- Q4)** a) What do you mean by ethics in information security? How ethics is important in information security? What are the ethical issues in information security? [9]
b) Describe classification of cyber crime in detail. [9]

- Q5)** a) What is SSL? Explain handshake protocol of SSL? [8]
b) What are various types of firewall? Discuss limitations of firewall. [9]

OR

P.T.O.

- Q6)** a) Explain p~p algorithm in details. [8]
b) Describe briefly how IPsec works and enlist it's applications. Distinguish between tunnel and transport mode of IPsec. [9]

- Q7)** a) Explain need and challenges of intrusion detection system. Define signature based IDS. [9]
b) What is computer worm and virus? How does computer virus spread? How to protect against computer virus and worms. [9]

OR

- Q8)** a) Differentiate spyware, Adware & Ransomware. [9]
b) Define phishing. Explain phishing with types and examples. [9]



Total No. of Questions : 8]

SEAT No. :

P3838

[Total No. of Pages : 2

[5870] - 1207

T.E. (Computer Engineering)

HONORS - DATA SCIENCE

Data Science and Visualization

(2019 Pattern) (Semester - I) (310501)

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) Assume suitable data if necessary.
- 5) Use of Scientific Calculator is permitted.

Q1) a) Explain the following terms : [10]

- i) Apriori property.
- ii) Support.
- iii) Confidence.
- iv) Residual sum of square.
- v) Regression sum of square.

b) Differentiate between : [8]

- i) Simple linear and multiple linear regressions.
- ii) Classification and Regression.

OR

Q2) a) What is Association rule? What are the applications of Association rule mining? [8]

b) Consider the following set of points : $\{(-2, -1), (1, 1), (3, 2)\}$ [10]

- i) Find the least square regression line for the given data points.
- ii) Plot the given points and the regression line in the same rectangular system of axes.

P.T.O.

Q3) a) Write a note on following : [8]

- i) Feed forward neural network.
- ii) Backpropogation.

b) Explain the Major steps of decision tree classification. [9]

OR

Q4) a) List and explain the attribute selection measures used by the ID3 algorithm to construct a Decision Tree. [8]

b) Explain with example. How map reduce can be used for word count application? [9]

Q5) a) Explain the following terms : [9]

- i) Dashboard.
- ii) Dashboard Principles.
- iii) Dashboard types.

b) List the few data visualization tools and discuss any four applications of data visualization along with the use of the various plots with Python/R or a suitable tool. [9]

OR

Q6) a) List the challenges of Data Visualization. Explain the types of visualization with examples. [9]

b) Illustrate Data Visualization of [9]

- i) Scatter Plot and Box Plot using Python.
- ii) Elbow Plot.
- iii) Histogram.

Q7) a) Explain Entity-Relationship (ER) Data modelling. [6]

b) List the disadvantages of multi-dimensional data model. [6]

c) Discuss the challenges of clustering High-dimensional data. [5]

OR

Q8) a) What are the key steps in data modelling process? [6]

b) Explain multidimensional data model with one example. [6]

c) What do you mean by Principal Component Analysis? [5]



Total No. of Questions : 8]

SEAT No. :

P6519

[Total No. of Pages : 2

[5870]-1208

T.E. (Honors) (Computer Engineering)
EMBEDDED SYSTEMS AND INTERNET OF THINGS
(2019 Pattern) (Semester - I) (310601)

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) Assume suitable data, if necessary.
- 4) Use of Non-Programmable scientific Calculators is allowed.

Q1) a) What are the active and passive types of sensors? Discuss and provide suitable examples. [6]

b) Draw and describe the components of Raspberry Pi development board. [6]

c) What is the need of Interfacing of sensors with development boards? How is it done? [5]

OR

Q2) a) Draw and describe the components of Arduino. [6]

b) What are the analog and digital types of sensors? Discuss and provide suitable examples. [6]

c) Explain the working of sensors and different types of sensors. [5]

Q3) a) What is the need of Integrated Development Platform for application development? Explain with suitable example. [6]

b) Describe any one open-source IDE for ES Application development. [6]

c) Explain SDLC-Requirements of embedded systems application. [5]

OR

Q4) a) What are the limitations of IDEs for ES applications? Discuss disadvantages of open-source IDEs for ES applications. [5]

b) Explain Design, Components and Coding requirements of embedded systems application? [6]

c) What are the testing and deployment requirements of embedded systems applications. [6]

P.T.O.

- Q5)** a) Define Internet of Things (IoT). Enlist and explain its characteristics. [6]
b) With the help of neat diagram, explain technical building blocks of IOT. [6]
c) Write a brief note on communication models of IOT and Communication APIs. [6]

OR

- Q6)** a) Draw and distinguish between physical design and logical design of IoT. [6]
b) Enlist and explain issues and challenges of IOT. [6]
c) Explain IoT functional blocks in detail. [6]

- Q7)** a) Explain the usability of MQTT protocol for IoT applications. Comment on the QoS supported in MQTT. [6]
b) Define Radio-Frequency Identification. Explain the role of Radio-Frequency Identification in Internet of Things. [6]
c) List and explain any 3 communication technologies used in IoT. [6]

OR

- Q8)** a) What is CoAP? How it is suitable for IoT application? Discuss in detail. [6]
b) Write a short note on AMQP protocol for IoT. [6]
c) Write a short note on “Zigbee” protocol. [6]



Total No. of Questions : 8]

SEAT No. :

P1020

[Total No. of Pages : 2

[5870]-1209

T.E. (Computer Engineering)

**HONORS - VIRTUAL REALITY AND AUGMENTED
REALITY**

Virtual Reality

(2019 Pattern) (Smester - I) (310701)

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 and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Describe Physiology of the human eye with diagram. [9]

b) Write note on Geometry of Virtual Worlds. [8]

OR

Q2) a) Explain different type of eye movements. [9]

b) What is Orthographic projection and Perspective projection. [8]

Q3) a) Explain following term w.r.t monocular depth cues with diagram [6]

- i) Retinal image size
- ii) Height in the visual field
- iii) Motion parallax

b) Explain perception of motion in detail. [6]

c) What is Rasterization? [6]

OR

P.T.O.

- Q4)** a) What is Ray Tracing and Shading Models? Explain. [6]
b) What are the different strategies used to reduce the latency and to minimize the side effects of it? [6]
c) Explain perception of color. [6]

- Q5)** a) Define the following terms w.r.t 2D Tracking system. [9]
i) Calibration
ii) Integration
iii) Registration
iv) Drift error
b) Explain vestibular system in detail. [9]

OR

- Q6)** a) State and explain different types ofvection. [9]
b) What is tracking? Explain 3D tracking system. [9]

- Q7)** a) What are Design considerations interaction mechanism for virtual reality? [9]
b) Describe Physiology of human hearing with diagram. [8]

OR

- Q8)** a) Explain Locomotion and Manipulation for interaction mechanism of virtual reality. [9]
b) Explain in short Auditory Perception and Auditory Rendering. [8]



Total No. of Questions : 8]

SEAT No. :

P2334

[Total No. of Pages : 2

[5870]-1210

T.E. (Mechanical Engineering / Honors)

**302041 - MJ : FOUNDATIONS OF SYSTEMS & SYSTEMS
ENGINEERING**

(2019 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) *Assume suitable data, if necessary.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicates full marks.*

Q1) a) Describe Enabling Systems. Illustrate the relationship of system of interest (SoI), enabling systems and other systems in the operational environment. [9]

b) Explain the concept of systems science with a case study. [9]

OR

Q2) a) Explain the nature of systems science and illustrate the relationships between systems science, systems thinking, and general systems approach as applied to engineered systems. [9]

b) List and discuss any five challenges that influences the Engineering of systems of systems (SoS). [9]

Q3) a) How would you define the term “architecture”? Give your own examples of architectural variants. [9]

b) Give a few examples of principles of good design characteristics for good architectures. [8]

OR

Q4) a) State and explain the examples of Architecture variants of systems. [9]

b) Explain the role of Systems Architects. [8]

P.T.O.

Q5) a) Name the two main elements of Block Definition Diagram and illustrate these two elements using an example with diagram. [9]

b) Explain the concept of Abstracting the system. [9]

OR

Q6) a) What is SysML. List and explain the various SysML diagrams. [9]

b) Illustrate the difference between MBSE and traditional systems engineering. [9]

Q7) a) Explain the concept of system Dynamics with an example and neat sketch. [8]

b) List the various steps in the modelling and simulation in systems Engineering Life cycle and explain any two steps. [9]

OR

Q8) a) Explain the role modelling in Decision Making. [8]

b) Explain the working of Discrete-Event Simulation with a Queueing example. [9]



Total No. of Questions : 8]

SEAT No. :

P1021

[Total No. of Pages : 2

[5870]-1211

T.E. (Mechanical)

HONORS - ENERGY MANAGEMENT IN UTILITY SYSTEMS

Energy Management

(2019 Pattern) (Smester - I) (302021MJ)

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 and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data wherever necessary and mention the same clearly.
- 5) Use of steam tables, Mollier chart and calculator is allowed.

Q1) a) What are the salient features of Energy Conservation Act-2001. [10]

b) What do you understand by designated consumers? [8]

OR

Q2) a) What are the different energy saving opportunities during designing of a building? [10]

b) How sustainable development is possible with energy efficiency programs? [8]

Q3) a) Explain ten step methodology to carryout detailed energy audit. [5]

b) Define ‘Energy management’ and state the objectives of energy management. [5]

c) Explain preliminary energy audit. [7]

OR

P.T.O.

Q4) a) What are the main contents of Energy Audit report. [10]

b) What is need of Energy Audit? What are different types of Energy Audit.[7]

Q5) a) Explain ‘Return on Investment.’ What are the advantages and limitations of it? [8]

b) Write a note on Risk and sensitivity analysis. [10]

OR

Q6) a) Explain ‘Internal Rate of Return’ method of financial analysis with its advantages and disadvantages? [8]

b) Annual savings after replacement of boiler for three years is Rs. 5,00,000, Rs. 5,50,000, Rs. 6,50,000. Total project cost is Rs. 13.5 lakh. Considering cost of capital as 12%, what is the net present value of the proposal? [10]

Q7) a) What is the concept of CDM? [7]

b) Discuss Kyoto Protocol and role of developing countries in the implementation of protocol. [10]

OR

Q8) a) Explain environmental degradation due to greenhouse effect. [10]

b) Explain the importance of various international agreements for protecting the environment. [7]



Total No. of Questions : 8]

SEAT No. :

P1022

[Total No. of Pages : 2

[5870] - 1212

T.E. (Mechanical/Automobile)

HONORS - ELECTRIC VEHICLES

e - Vehicle Technology

(2019 Pattern) (Semester - I) (302031MJ)

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) *Figures to the right indicate full marks.*
- 3) *Draw the neat sketch wherever necessary.*

- Q1)** a) Write a short note on li-ion battery with its working principal. [4]
b) What are the different chemistries of li-ion batteries? Make its comparative analysis on basis of power, energy and lifespan. [8]
c) Explain the advantages and disadvantages of li-ion batteries. [8]

OR

- Q2)** a) Explain the following parameters of li-ion batteries in short (any two). [4]
i) C-rate
ii) E-rate
iii) Storage capacity
b) What is battery cell balancing? Explain the Issues and remedies for battery balancing. [8]
c) What are the effects of overcharging and termination voltage accuracy on pack capacity of li-ion battery? Explain with suitable graph. [8]

- Q3)** a) Explain nickel-bromide batteries with advantages, disadvantages and applications. [8]
b) Explain lead acid batteries with advantages, disadvantages and applications. [8]

OR

P.T.O.

- Q4)** a) Explain Nickel-Metal Hydride Batteries with advantages, disadvantages and applications. [8]
b) Explain li-ion supercapacitor with advantages, disadvantages and applications. [8]

- Q5)** a) What do you mean by drive system in electric vehicles? Explain with its significance for manufacturers and drivers. [8]
b) Write in short different types of motors used in electric vehicle. Differentiate between AC motors and DC motors. [8]

OR

- Q6)** a) What are the factors to be considered while Selection and sizing of the motor? [8]
b) Explain different types of drives used in electric vehicle with neat sketches. [8]

- Q7)** a) Explain the significance of implementation of IOT in electric vehicle on basis of wireless sensor network with neat sketch wherever required.[10]
b) List out the customer related issues for use of electric vehicles. Also explain Need for IOT in EV. [8]

OR

- Q8)** a) Explain the Significance of IOT for modes of fast and efficient charging in electric vehicles. [8]
b) Write a short note on intelligent transport system with its advantages.[10]



Total No. of Questions : 8]

SEAT No. :

P2335

[Total No. of Pages : 2

[5870]-1213

T.E. (Mechanical) / (Honors)

3D PRINTING

**Additive Manufacturing Technology
(2019 Pattern) (Semester - I) (302011 MJ)**

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) Draw suitable neat diagrams, whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if required.

Q1) a) What is VAT Polymerization? Write Printing Principle of Photopolymerization & its classification. [8]

b) What is basic principle of Digital Light Processing? Explain Digital Light Processing (DLP) process with its Mechanism and Process Parameter, Advantages & Applications. [10]

OR

Q2) a) Classify the Photopolymer Material. Explain Continuous Liquid Interface Production (CLIP) process with its schematic diagram and Process Parameter, Advantages & Applications. [10]

b) Explain the Direct Laser Writing (DLW) process with its advantages, disadvantages and applications. [8]

Q3) a) Explain the Electron Beam Additive Manufacturing (EBAM) process with neat sketch working principle. [7]

b) What is mean by Sintering? Explain in detail the process and mechanism of Direct Metal Laser Sintering (DMLS) process with schematic diagram, its process parameters, advantages, limitations & applications. [10]

OR

P.T.O.

- Q4)** a) Write the basic principle of Selective Laser Sintering (SLS) process. Explain the Selective Laser Sintering (SLS) process with its schematic diagram, Advantages and limitations. [7]
- b) Write short note on any two : [10]
- Selective Laser Melting (SLM)
 - Laser Wire Deposition
 - Laser Engineering Net Shaping

- Q5)** a) What is Printing principle of binder jetting process? Explain the binder jetting process with its process parameters, benefits & applications. [8]
- b) Explain in short with its advantages of any two following processes.[10]
- Multi Jet Modelling
 - Polyjet Printing
 - Multi Jet Fusion

OR

- Q6)** a) What is Nanoparticle jetting? Explain the Color Jet Printing in detail with its neat sketch, advantages & applications? [10]
- b) Explain 3D Laser Cladding and Direct Metal deposition in short with its advantages and applications. [8]

- Q7)** a) Explain the 4D Printing Technology in short. Compare 3D Printing with 4D Printing and write application of 3D Printing in Automotive Industry. [10]

- b) Explain the applications of additive manufacturing technology in Art, fashion jewellery & Toy industry. [7]

OR

- Q8)** a) What are different Bio Materials used in additive manufacturing. Explain the Health care applications & biomedical applications of additive manufacturing technology. [10]
- b) Explain the use of additive manufacturing in Food Processing & Construction & Architecture Applications. [7]



Total No. of Questions : 8]

SEAT No. :

P1023

[Total No. of Pages : 3

[5870] - 1214

**T.E. (Electronic and Telecommunication)
ROBOTICS**

Principles of Robotics (Honors)
(2019 Pattern) (Semester - I) (304181 HR)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory. i.e. Solve 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.
- 4) Neat diagrams must be drawn wherever necessary.

- Q1)** a) What are the different types of Grippers? Explain Mechanical Grippers with specification. [6]
- b) Enlist what are the various process tools which can be used as end effectors. Explain any one in detail. [6]
- c) A block of weight having 1400N is to be gripped as shown. Find the clamping force. Assuming safety factor = 2, Coefficient of friction $\mu = 0.2$. Center of gripping does not coincide with center of gravity. (Refer fig.1). [5]

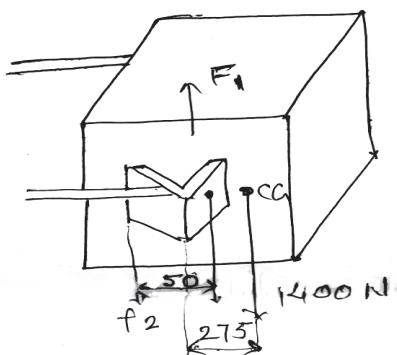


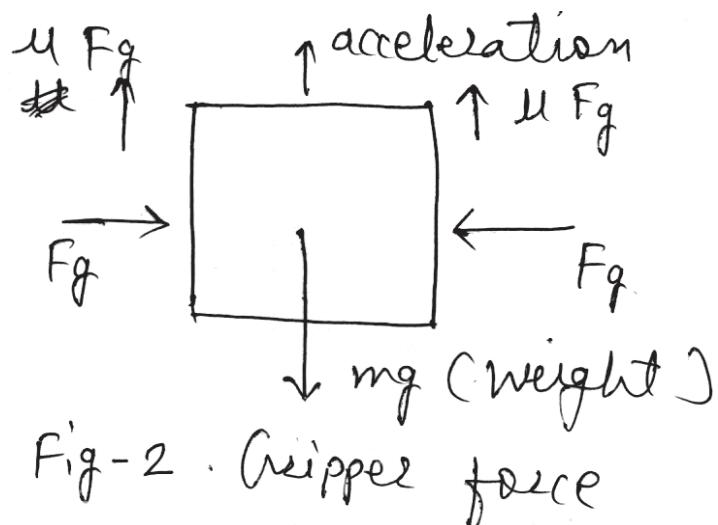
Fig. 1. Gripper Force Analysis.

OR

- Q2)** a) Compare pneumatic & Hydraulic grippers. [6]
- b) Which devices can be used as end effector in robotics? How to achieve end effector interface? [6]

PTO.

- c) A 5kg rectangular block is to be gripped in the middle & lifted vertically at a velocity 1m/s. If it accelerates to this velocity at 27.5 m/s^2 & the coefficient of friction between gripping Pads & block is 0.48, Calculate the minimum force that would prevent slippage (Refer fig.2) [5]



- Q3)** a) What are different types of Safety sensor used in Robotics? Explain any one of them with the help of neat sketch. [6]
 b) With the help of neat diagram explain the operation of Ultrasonic range finder. [6]
 c) What are the different position sensors used in robotic applications? Explain any one in detail. [6]

OR

- Q4)** a) Write short note on : [8]
 i) Thermocouple
 ii) Piezoelectric transducer
 iii) Incremental encoder
 iv) Photovoltaic transducer
 b) What are the different types of proximity sensors used in robotics applications? Explain capacitive proximity sensor in detail. [5]
 c) Explain working principle of piezoelectric sensor. How to use it in Robotic applications? [5]

- Q5)** a) Explain how to use Joint Co-ordinate system for Robotic Manipulator. [6]
b) What is the difference between forward & reverse Kinematics? Explain in detail. [6]
c) Explain forward & reverse transformation of 4 DOF Manipulator. [5]

OR

- Q6)** a) Explain with the block diagram different parameters involved in Trajectory planning problem? Explain different steps in Trajectory planning? [6]
b) What is the importance of transformation matrix in coordinate transformation. [6]
c) How do you find the Jacobian Matrix of Robotic Manipulator? [5]

- Q7)** a) Explain design of robot for object recognition & categorization using vision system. [6]
b) What are the various robotic applications? What is significance of Microcontroller while designing these applications? [6]
c) Explain designing of material handling robot for industrial application with suitable diagram. [6]

OR

- Q8)** a) Explain the different safety considerations for robot based manufacturing system. [6]
b) Explain how to use robot for defence & surveillance industry application. [6]
c) Write a short note on robotics applications like arc welding, spot welding, spray painting, assembly operation. [6]



Total No. of Questions : 8]

SEAT No. :

P1024

[5870]-1215

[Total No. of Pages : 2

T.E. (Electronics and Telecommunication)

BLOCK CHAIN TECHNOLOGY

Introduction to Block Chain (Honors)

(2019 Parten) (Semester-I) (304181 HBCT)

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) 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 Permissionless blockchain? What are its advantages. [6]
b) Explain the Incentive mechanism in block chain technology. [6]
c) Write a note on consortium blockchain [5]

OR

- Q2)** a) Explain the following core components of blockchain [6]
i) Distributed Ledger
ii) Peer-to-peer Networks
b) Compare Public and Private types of blockchains. [6]
c) Explain the following wrto blockchain technology [5]
i) Security
ii) Cost saving

- Q3)** a) Explain “Smart Contract” wrto Hyperledger [6]
b) How does Hyperledger Composer work in Practice? Explain. [6]
c) How blockchain is used in building Trust in Healthcare System? explain [5]

OR

- Q4)** a) Explan the basic Transaction flow of Hyperledger Fabric. [6]
b) What are the Prominent applications of blockchain? Explain Security sharing of medical data. [6]
c) What are the benefits of Hyperledger Fabric? [5]

P.T.O.

- Q5)** a) What is R3 Corda? Explain R3 Corda wrto blockchain technology? [6]
b) Explain Sandbox blockchain in detail [6]
c) Explain following wrto Blockchain technology [6]
i) Stellar
ii) Ripple

OR

- Q6)** a) What is Go Ethereum? How to use it? [6]
b) Explain Ripple and bitcoin wrto blockchain technology? [6]
c) What are the benefits of using blockchain API'S? [6]

- Q7)** a) What is Supply chain management? Explain efficiency and transparency wrto supply chain management [6]
b) How the blockchain is used in election and voting? [6]
c) Explain the blockchain based “Loyalty programs”? [6]

OR

- Q8)** a) How the blockchain technology is transforming the Healthcare industry? explain [6]
b) Explain the Remittance in the blockchain technology? [6]
c) How the blockchain is used in Renewable energy? explain. [6]



Total No. of Questions : 8]

SEAT No. :

P1025

[5870]-1216

[Total No. of Pages : 2

T.E. (Civil)

HONORS : METRO CONSTRUCTION

Surveying in Metro Construction

(2019 Pattern) (301301) (Semester-I)

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 and Q.7 or Q.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary and clearly state.
- 5) Use of cell phone is prohibited in the examination hall.
- 6) Use of electronic pocket calculator is allowed.

- Q1)** a) Write a short note on Importance of Good Alignment. [5]
b) Explain Modern surveying techniques for difficult terrain. [6]
c) Write a short note on Reconnaissance survey for metro construction. [6]

OR

- Q2)** a) Explain Traffic survey for Metro project. [5]
b) Explain on need for construction of a new Metro line. [6]
c) Explain Final Location Survey for Metro project. [6]

- Q3)** a) Explain the types of track moduli. [5]
b) Explain the various stresses generated in Metrorail track? [4]
c) Difference between Track Modulus and Track stiffness. [4]
d) Explain Vertical track stiffness and its measurement techniques. [5]

OR

- Q4)** a) Track Structure should fulfil which conditions & requirements? [8]
b) The technical standards for Track structure deals with which components?
Explain any two in detail. [5]
c) Explain Operating requirement of turnout, Scissor crossover [5]

- Q5)** a) Explain the criteria for selection of site for a metro railway station. [5]
b) Explain functions of Main Building Areas for different Types of Metro
Stations? [7]
c) Explain the objectives in station planning? [5]

OR

P.T.O.

- Q6)** a) Explain kind of facilities should provide at metro station? [5]
b) Explain construction types of Metro station? [5]
c) Explain the criteria are for selection of Site for a Metro Railway Station? [7]

- Q7)** a) Explain on (Any 2) [12]
i) Lighting of tunnel
ii) Tunnel approaches
iii) Tunnel alignment and grade
b) Explain various methods for ‘Tunnel Ventilation’ [6]

OR

- Q8)** a) Enlist the various factors controlling the alignment of metro track. Explain any two in detail. [5]
b) Explain on ‘Safety Precautions in tunneling’. [4]
c) Enlist advantages and disadvantages of tunnels. [4]
d) Explain drainage is necessary in tunnel? Discuss various drainage systems for Tunnel. [5]



Total No. of Questions : 8]

SEAT No. :

P1026

[Total No. of Pages : 2

[5870] - 1217

T.E. (Civil Engg.)

HONORS - ARCHITECTURE AND TOWN PLANNING

Urban Housing and Infrastructure Planning

(2019 Pattern) (Semester - I) (301401)

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

Q1) a) Elaborate the role of Cooperative Housing sectors. [6]

b) Explain in detail objectives and function of housing board HUDCO. [6]

c) What is the need of Housing Policies to fulfill demand of housing? [5]

OR

Q2) a) Illustrate need of housing demand model. [6]

b) Explain the strategy of Rural Housing Finance. [6]

c) Elaborate the role of National Housing Bank. [5]

Q3) a) Which data required for provision and planning of urban infrastructure? [6]

b) Enlist the different types of urban infrastructure and its impact on urban development. [6]

c) Which factors affect while planning of urban infrastructure? [5]

OR

Q4) a) How urban infrastructure change overall scenario of area as well as community? [6]

b) What are the norms and financial strategy follow while planning of infrastructure activity? [6]

c) Write a short note on area allocation for infrastructure activity as per URDPFI. [5]

P.T.O.

- Q5)** a) Write a short note on urban services system. [6]
b) How to design water and drainage network to urban area? [6]
c) What is the significance of urban services? [6]

OR

- Q6)** a) Explain in detail design, operation of any one infrastructural unit. [6]
b) Which are the techniques used to generate cost recovery from infrastructure? [6]
c) Which are the components and appropriate technology required for planning of road network activity? [6]

- Q7)** a) Which factors to be considered while planning of city network scenario? [6]
b) How to design network scenario for storm water management system? [6]
c) Explain in detail policies and norms of any one infrastructural network. [6]

OR

- Q8)** a) Which are the policies and norms follow for storm water management system? [6]
b) How infrastructure city network scenario affect on land use pattern of city? [6]
c) Explain briefly about the social impacts on the infrastructure network development along with the example. [6]



Total No. of Questions : 8]

SEAT No. :

P3839

[Total No. of Pages : 2

[5870] - 1218

**T.E. (Honours) (Artificial Intelligence and Machine)
ARTIFICIAL INTELLIGENCE
(2015 Pattern) (Semester - II) (310303)**

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.

Q1) a) Represent the following sentences into formulas in predicate logic. [9]

- i) John likes all kinds of food.
- ii) Apples are food.
- iii) Chicken are food.
- iv) Anything anyone eats and isn't killed by is food.
- v) Bill eats peanuts and is still alive.
- vi) Sue eats everything Bill eats.

b) Explain Bayesian inference using a suitable example. [8]

OR

Q2) a) Explain Unification algorithm with suitable example. [9]

b) Write a note on probability reasoning. [8]

Q3) a) Explain linear regression. Find linear regression equation for the following two sets of data : [6]

X	Y
2	3
4	7
6	5
8	10

P.T.O.

- b) Explain the architecture of Artificial Neural Network. [6]
 c) Explain how Support Vector Machines are used for classification with suitable example. [6]

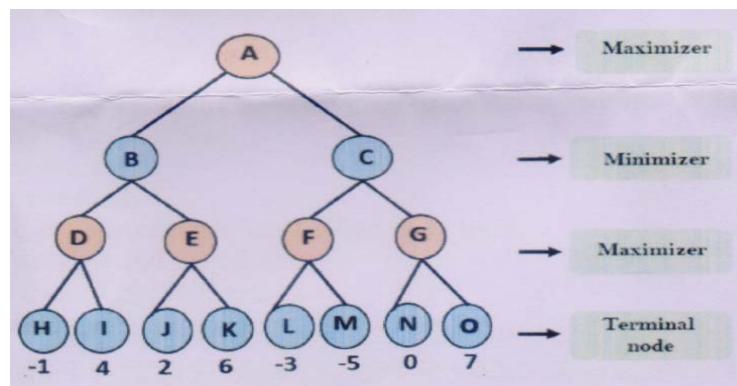
OR

- Q4)** a) Explain : [6]
 i) Supervised Learning.
 ii) Unsupervised Learning.
 b) Explain how Decision Trees are used in Learning? [6]
 c) What is Artificial Neural Network? Give two applications of artificial neural networks in detail. [6]

- Q5)** a) Illustrate Mini-Max search for the tic-tac-toe game. [9]
 b) Explain Alpha - Beta Pruning with an example. [8]

OR

- Q6)** a) Write a note on : [9]
 i) State-of-the-art Game Programs.
 ii) Types of Games in AI.
 b) Solve the given game tree using min max algorithm. [8]



- Q7)** a) Explain general framework for computer vision applications. [9]
 b) Explain forward chaining and backward chaining for a simple example. [9]

OR

- Q8)** a) Explain how sentiment analysis using Natural Language Processing techniques. [9]
 b) What is NLP? Explain all five phases of NLP. [9]



Total No. of Questions : 8]

SEAT No. :

P1027

[Total No. of Pages : 2

[5870]-1219

T.E. (Engineering) (Honors - Cyber Security)
ENTERPRISE ARCHITECTURE AND COMPONENTS
(2015 Pattern) (Semester - II) (310403)

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.

Q1) a) Explain the following : [9]

- i) Delivery Channels and External Data Providers.
- ii) Infrastructure Security Component.
- iii) Presentation Services.

b) Explain application service agent along block diagram in details. [9]

OR

Q2) a) Explain the following : [9]

- i) Business Performance Presentation Services.
- ii) Embedded Analytics.
- iii) Search and Query Presentation Services.

b) List the components of information architecture. Explain information architecture in details along with its goals. [9]

Q3) a) What is operational model? Explain various types of operational model level. [6]

b) Write a short note on standards of specified nodes. [6]
c) Explain the standards used for operational model. [5]

OR

Q4) a) Draw block diagram of operational model design technique in detail. [6]
b) What is Service Quality? Explain various types of Service Quality. [6]
c) What is Information Service Layer? Explain in details. [5]

P.T.O.

- Q5)** a) What is Service Quality of MDM? Explain the Service Quality in detail. [6]
b) What is Metadata Management? Explain in detail. [6]
c) Write a Short Note on Component Interaction Diagram. [6]

OR

- Q6)** a) What are the Service Quality of Metadata Management? [6]
b) Draw block diagram of MDM service Component in detail. [6]
c) Write a Note on Component Interaction Diagram of MDM. [6]

- Q7)** a) Write a Short Note on COBIT. [6]
b) Draw Block Diagram of Enterprise Security Architecture in Detail. [6]
c) What are the principle of COBIT? [5]

OR

- Q8)** a) Explain TOGAF with Example. [6]
b) Explain SABSA Lifecycle with Example. [6]
c) Explain TOGAF Content Meta Model. [5]



Total No. of Questions : 8]

SEAT No. :

P2336

[Total No. of Pages : 2

[5870] - 1220

**T.E. (Computer Engineering)
HONOURS - DATA SCIENCE
Statistics & Machine Learning
(2015 Pattern) (Semester - II) (310503)**

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.

- Q1)** a) What is linear equation? What are the different method to solve system of linear equation. Explain with suitable example. [9]
b) What is the difference between the Jacobian, Hessian and the gradient function. Explain with example the applications of each function. [9]

OR

- Q2)** a) What is the difference between eigen value and eigen vector? How do you find the eigen value of a eigen vector? [9]
b) What is the significance of chain rule in calculus? Explain chain rule with suitable example. [9]

- Q3)** a) Explain different types of machine learning. Explain any one model of machine learning. How do you evaluate accuracy of a machine learning model? [9]
b) Explain how machine learning models can be applied for NETFLIX usage. [8]

OR

- Q4)** a) Explain Reinforcement Learning. Explain with suitable diagram the various stages of Reinforcement learning. [9]
b) Explain perspective and issues in machine learning. What are the various applications of machine learning? [8]

P.T.O.

- Q5)** a) What is Regression? How do you train a machine learning model? How is machine learning model evaluated? Explain in brief. [9]
- b) Explain cost function and gradient descent terms with respect to linear Regression algorithm. What is the significance of Initialization of weights. [9]

OR

- Q6)** a) Explain how machine learning can be applied for Health Data Analytics? What are the benefits and limitations of machine learning for Data Aalytics. [9]
- b) What are the different types of Regression model? Explain any one regression type in brief with suitable example. [9]

- Q7)** a) What is Decision tree? Write various steps for constructing a decision tree? How feature selection can be done using decision tree? [8]
- b) Explain hypothesis space search in decision tree learning. Give suitable example. [9]

OR

- Q8)** a) Explain working of Naive Bayes Classifier? What are types of NB classifier. Explain in brief. [8]
- b) What are advantages and disadvantages of NB model. What are various applications of NB model. Explain in brief. [9]



Total No. of Questions : 8]

SEAT No. :

P4562

[Total No. of Pages : 2

[5870]-1221

T.E. (Computer Engineering)
HONORS / INTERNET OF THINGS
Internet of Things Architectures, Protocols and Systems
Programming
(2019 Pattern) (Semester - II) (310603)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q 4, Q 5 or Q 6.
- 2) Neat Diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.
- 4) Use of Non-Programmable scientific Calculator is allowed.

Q1) a) Describe in brief transport layer protocols. [6]

b) Explain in detail DCCP. [6]

c) Describe in detail SCTP. [5]

OR

Q2) a) Explain the working of DTLS. [6]

b) Explain in brief session layer protocols. [6]

c) Explain in detail CoAP. [5]

Q3) a) Explain in detail vulnerabilities security requirements and threat analysis. [6]

b) What is IoT Security Tomography? Explain. [6]

c) Describe IoT layered attacker model in detail. [6]

OR

Q4) a) Describe Identity Management and Establishment in detail. [6]

b) Describe IoT Security Models. [6]

c) Explain in brief IoT Security Protocols. [6]

P.T.O.

- Q5)** a) Describe the components of Arduino. [6]
b) Describe the role of Web/Cloud Services for IoT development. [6]
c) Explain the use of APIs. [5]

OR

- Q6)** a) Describe the components of Raspberry Pi. [6]
b) Explain essential features of web APIs. [6]
c) Describe the components of Intel Galileo [5]

- Q7)** a) Describe the role of IoT for Home Automation. [6]
b) Describe the role of IoT for Agriculture applications. [6]
c) Describe the role of IoT for Telecom/5G. [6]

OR

- Q8)** a) Describe role of IoT for Smart Cities development. [6]
b) Describe the role of IoT for Industry. [6]
c) Describe the role of IoT for Health and Lifestyle [6]



Total No. of Questions : 8]

SEAT No. :

P1028

[Total No. of Pages : 2

[5870]-1222

T.E. (Computer Engg.)

HONORS - VIRTUAL REALITY AND AUGMENTED REALITY
Augmented Reality
(2019 Pattern) (Semester - II) (310703)

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.*

- Q1)** a) Explain the different characteristics of tracking technology. [9]
b) What are multiple cameras infrared tracking in AR? [8]

OR

- Q2)** a) What are major software components used in AR? [9]
b) Explain outdoor tracking in details. [8]

- Q3)** a) Explain marker based tracking in detail. [6]
b) What are different types of markers? [6]
c) What is scene generator? [6]

OR

- Q4)** a) What is localization based Augmentation? [6]
b) Explain feature based tracking method. [6]
c) Explain virtual retinal system in detail. [6]

- Q5)** a) What is Mixed Reality? [5]
b) What are different Projection displays? [4]
c) Explain AR monitoring system in detail. [8]

OR

P.T.O.

- Q6)** a) What is SLAM? [7]
b) Explain all AR devices with suitable example. [10]

- Q7)** a) What is Semi-direct monocular Visual Odometer (SVO)? [6]
b) Explain the different applications of mixed reality. [6]
c) What are input and output in Mixed Reality? [6]

OR

- Q8)** a) Explain the difference between computer vision and mixed reality. [8]
b) Explain the different variants of SLAM in detail. [10]



Total No. of Questions : 8]

SEAT No. :

P2337

[Total No. of Pages : 2

[5870]-1223

T.E. (2019 Pattern)

Honors : MODEL BASED SYSTEMS ENGINEERING

Honors in Systems Engineering
(Semester - II) (302043MJ)

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) Assume suitable data, if necessary.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicates full marks.

- Q1)** a) Explain the General diagram concept with a sample SysML diagram. [9]
b) Differentiate between Diagram and Model with Example. [9]

OR

- Q2)** a) Write short notes on SysML diagrams. [9]
b) List the kinds of structural features that a block can own and explain any two features. [9]

- Q3)** a) Define Process, Method, Tool, and environment and depicts the relationship between them. [9]
b) Explain the basic structure of OOSEM with a neat sketch. [8]

OR

- Q4)** a) Write down the difference between Modeling tool and diagramming tool. [8]
b) List the different types of SysML formats and explain any one format in detail. [9]

- Q5)** a) Explain in brief the system engineering process. [9]
b) Explain process context with example. [9]

P.T.O.

OR

- Q6)** a) Describe different process groups. [9]
b) Explain in brief process artifacts and process behaviour. [9]

- Q7)** a) List and explain the main views of Approach to Context-based Requirements Engineering (ACRE) that are needed according to the framework with a neat sketch. [8]
b) Write short notes on the model-based requirements engineering ontology with a neat sketch. [9]

OR

- Q8)** a) Explain the Requirement concept with a neat sketch of Simple taxonomy for types of requirement. [8]
b) What is Requirement Validation? Explain any three Requirement validation techniques. [9]



Total No. of Questions : 8]

SEAT No. :

P1029

[Total No. of Pages : 2

[5870]-1224

T.E. (Mechanical)

**HONORS - ENERGY MANAGEMENT IN UTILITY
SYSTEMS**

**Energy Efficiency in Thermal Utilities
(2019 Pattern) (Semester - II) (302023MJ)**

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) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right of each question indicate full marks.
- 4) Assume suitable data wherever necessary and mention the same clearly.
- 5) Use of steam tables, Mollier chart and calculator is allowed.

- Q1)** a) Explain, why de-superheating is done after pressure reduction? [5]
b) Explain why low-pressure steam is preferred for indirect heating? [5]
c) Explain the major causes for steam trap blowing? [8]

OR

- Q2)** a) Define dry saturated steam and why dry saturated steam is preferred for heating applications? [5]
b) Explain any five energy saving opportunities in the steam distribution system. [5]
c) Explain the need of providing slope to steam main line in the direction of steam flow. [8]

- Q3)** a) What are the factors affecting the Furnace Efficiency? [7]
b) Explain Hot Air Generator. [5]
c) Explain Heat Transfer in Furnaces. [5]

OR

P.T.O.

- Q4)** a) Explain any five important properties of Ceramic Fibers used in furnaces. [7]
b) Explain the need of high emissivity coating. [5]
c) Efficiency of furnaces is comparatively lower than boiler. Explain? [5]

- Q5)** a) What are the benefits of Cogeneration? How it helps in improving efficiency of power plant? [8]
b) List down all the Important Technical Parameters for Cogeneration. [5]
c) Explain Quality of Thermal Energy and Load Patterns? [5]

OR

- Q6)** a) Explain gas turbine cogeneration system with neat schematic sketch. [8]
b) Explain Tri-generation with suitable Diagram. [5]
c) Explain Grid Dependent System Versus Independent System. [5]

- Q7)** a) Explain the role of economizer in steam generation. [7]
b) What are the direct and indirect benefits of waste heat recovery. [5]
c) Explain the operating principle of a regenerator. [5]

OR

- Q8)** a) Explain the significance of LMTD in the performance analysis of heat exchangers. [7]
b) What is a “heat pipe”? How does it work? [5]
c) What are the major points to be considered for development of WHRS? [5]



Total No. of Questions : 8]

SEAT No. :

P1030

[Total No. of Pages : 2

[5870]-1225

**T.E. (Mechanical/Automobile)
HONORS - ELECTRIC VEHICLES
e-Vehicle System Design
(2019 Pattern) (Semester - II) (302033MJ)**

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) *Figures to the right indicate full marks.*
- 3) *Draw the neat sketch wherever necessary.*

- Q1)** a) Explain electronic breaking system with its features and benefits in electric vehicles. [4]
- b) Explain in short steal wheel and alloy wheels and Differentiate between steal wheel and alloy wheels on basis of , [8]
- i) Cost and durability.
 - ii) Environmental working conditions
 - iii) Area of applications
 - iv) Effect on suspension system
- c) Explain The Need for Capacitor Banks or Ultra Capacitors in regenerative breaking on electric vehicles. [8]

OR

- Q2)** a) List out various defects in tires? [4]
- b) Elaborate the factors affecting on following while design the vehicles. [8]
- i) Driver
 - ii) Environment
 - iii) Load
 - iv) Type of Vehicle
- c) What do you mean by traction motor? Explain its significance with neat sketch in electric vehicles. [8]

P.T.O.

- Q3)** a) Explain the following terms (any two) [8]
- i) The open differential
 - ii) Torsen Differential
 - iii) Active differential
 - iv) Welded/Spool Differential
- b) Explain the significance of transmission component system design in detail? Explain the role of case, a drive part and a shift control device in transmission system? [8]

OR

- Q4)** a) Classify different types of transmission system used in automobiles? Explain hybrid electric vehicle transmission in detail? [8]
- b) Explain the Influence of effective case depth on bending fatigue strength and Shot peening strengthening and residual compressive stress on tooth surface? [8]

- Q5)** a) What do you mean by battery layout? Explain lead acid battery layout with neat sketch? [8]
- b) Explain Constructional details of cell design related to Batteries? [8]

OR

- Q6)** a) Explain the process of degradation modeling and analysis. [8]
- b) Explain Battery Compartment Design for Crashworthiness and Cooling. [8]

- Q7)** a) Explain Ergonomics based Roll-cage/Frame design with neat sketches? [10]

- b) Explain structural Design aspect of Roll-cage/Body-Frame? [8]

OR

- Q8)** a) Explain the importance and process involved in Impact/Crash Analysis. [8]
- b) What do you mean by vehicle dynamics? Explain the components of vehicle dynamics with? [10]



Total No. of Questions : 8]

SEAT No. :

P1031

[Total No. of Pages : 2

[5870]-1226

T.E. (Mechanical Engineering)

3D PRINTING

Design for Additive Manufacturing (Honors)

(2019 Pattern) (Semester - II) (302013MJ)

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) What are limitations of Additive Manufacturing? How the defects in the Additive manufacturing can be rectified? [7]
- b) What kind of role is thermodynamics of materials plays a role in additive manufacturing? What are Stresses, Thermal strains & Warpages during Printing? [10]

OR

- Q2)** a) Explain function trade-off and time Vs Cost for Additive Manufacturing? How Additive manufacturing technologies are selected using decision methods? [8]
- b) Explain distortion control methods in AM? Write a short note on Composition and phase transformation in process monitoring and control of Additive Manufacturing. [9]
- Q3)** a) What is Pre-processing, In-Situ Processing and Post-processing for Additive Manufacturing? [8]
- b) Write Classification and Types of 2D and 3D path Planning. Explain Path sequencing strategy. [10]

OR

- Q4)** a) Write Classification and types of Slicing. Explain any one Slicing strategy in detail. [9]
- b) Write a short note on
- i) Support Material
 - ii) Sanding
 - iii) Hot isostatic Processing

P.T.O.

Q5) a) What are various Infill Structure techniques? How selection of Infill Structure technique affects Printed components? [8]

b) Write a short note on [9]

- i) Use of FEA
- ii) Topology Optimization

iii) Continuum and Discrete Element Methods

OR

Q6) a) What are various AM CAD Data/file formats for Engineering and Non-Engineering Applications? What are the issues faced during 3D model creation. [8]

b) What is significance of CAD specific and Material specific ISO and ASTM Standards? What is support structure integration? [9]

Q7) a) What is Conventional use of reverse engineering procedure? What are various types of Measuring device? Explain any one device in short. [9]

b) What are applications of reverse engineering in Product Development and Manufacturing, Entertainment, Biomedical Engineering? [9]

OR

Q8) a) How scanning is done in Reverse Engineering? What are 3D scanners? Write classification of Scanners. [9]

b) Write a short note on Scanned Geometry Refinement. How repairing is done of scanned geometry? [9]



Total No. of Questions : 8]

SEAT No. :

P4561

[Total No. of Pages : 2

[5870]-1227

T.E. (E & TC) (2019 Pattern)
HONORS (ROBOTICS)
Robot Programming & Simulation
(Semester - II) (304183HR)

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 indicates full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1)** a) Classify different languages/methods used for robotic programming.
Explain the structure of VAL language command along with example. [6]
- b) Explain any three basic commands in VAL-II with example. [6]
- c) Explain motion control, hand control, program control commands used in robotic programming with example. [6]

OR

- Q2)** a) Explain anyone of the following robotic application using VAL program. [6]
- i) pick and place applications
 - ii) palletizing applications using VAL
- b) Explain WAIT, SIGNAL and DELAY commands used in robotics for communications using simple application. [6]
- c) W. r. t. VAL-II programming language explain simple pick and place application. [6]

- Q3)** a) Explain pick and place operation of industrial robot using rapid robot language. [6]
- b) List and explain Program control statements in AML. [6]
- c) Explain manual and automatic mode of operation of industrial robot. [6]

P.T.O.

OR

- Q4)** a) Which syntax move master command language uses? List and explain different types of commands. [6]
b) Describe the elements and functions used in AML robotic language. [6]
c) List and explain Motion and Sensor commands in AML. [6]

- Q5)** a) Compare AR and VR in robotics. [5]
b) Discuss how Collision detection works in robotics? [6]
c) Discuss in detail about Robot studio online software. [6]

OR

- Q6)** a) What is soft robotics? Discuss robotic process automation in detail.[6]
b) Describe following terms : [5]
i) Repeatability measurement
ii) Robot economics
c) Explain how multiple robot systems are handled? [6]

- Q7)** a) Discuss different steps involved in the simulation. [5]
b) Describe Analog and Hybrid simulation. [6]
c) Describe Monte Carlo simulation method. [6]

OR

- Q8)** a) Classify simulation software and Describe a general purpose simulation package. [6]
b) Compare simulation packages with programming languages. [5]
c) Discuss advantages and disadvantages of simulation. [6]



Total No. of Questions : 8]

SEAT No. :

P1032

[Total No. of Pages : 2

[5870]-1228

T.E. (Electronics & Telecommunication)

BLOCK CHAIN TECHNOLOGY

Decentralize & Blockchain Technologies (Honors)

(2019 Pattern) (Semester - II) (304183 HBCT)

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 indicate full marks.

Q1) a) What is consensus algorithm? Explain any one type of consensus algorithm in detail. [6]

b) With the help of a neat sketch, define the Proof of Elapsed Time (PoET). [6]

c) Explain terms [6]

i) Proof of Activity

ii) Proof of Burn

OR

Q2) a) What is Proof of stake? Narrate with example. [6]

b) What are hash functions and Hash puzzles? [6]

c) What are Blocks in a Blockchain? Enlist the disadvantages of Proof of work. [6]

Q3) a) Describe scaling process in Ethereum. [6]

b) Explain the terms [6]

i) Ethereum Clients

ii) Ethereum Wallets

c) What is the Difference Between Bitcoin and Ethereum Blockchain? [6]

OR

Q4) a) What are the Real-World use cases of Ethereum? [6]

b) Write short note on Smart Contract. [6]

c) How are Ethereum keys generated? [6]

P.T.O.

- Q5)** a) Express the selection process of Block-chain technology in detail. [8]
b) What are the most important opportunities for deployin blockchain technology in business? Explain one in detail. [9]

OR

- Q6)** a) What are the factors to consider when choosing Blockchains? Explain two factors in detail. [8]
b) What is the goal of blockchain? How does blockchain help in decision making? [9]
- Q7)** a) Explain how blockchain used in Medical record management system. [8]
b) Why do we need Block-chain? Explain private Block-chain Network in detail. [9]

OR

- Q8)** a) How does IoT work with block-chain? Enlist Benefits of IoT and block-chain. [8]
b) Write short note on future of Block-chain, along with one applications. [9]



Total No. of Questions : 8]

SEAT No. :

P1033

[Total No. of Pages : 2

[5870]-1229

T.E. (Civil)

METRO CONSTRUCTION

Planning & Quantity Estimation for Metro Construction (Honors)

(2019 Pattern) (Semester - II) (301303)

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 and Q.7 or Q.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary and clearly state.
- 5) Use of cell phone is prohibited in the examination hall.
- 6) Use of electronic pocket calculator is allowed.

- Q1)** a) Explain the purpose of land acquisition under the Right to fair compensation Act 2013. [4]
b) Explain the important features of the new Land Acquisition Act 2013? [5]
c) Define how to calculate compensation under Land Acquisition Act 2013? [4]
d) Explain are merits and demerits of Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (New Act)? [5]

OR

- Q2)** a) Explain the rules for land acquisition? [5]
b) Explain the benefits of land acquisition? [5]
c) Explain 3G and 3H in land acquisition? [4]
d) Explain the types of land acquisition? [4]

- Q3)** a) Prepare detailed estimate of Elevated section (viaduct). [10]
b) Explain steps involved in construction of Underground section by Cut and Cover. [7]

OR

P.T.O.

- Q4)** a) Prepare detailed estimate of Underground station (Civil work). [10]
b) Explain steps involved in construction of Elevated station (E&M work including lift and escalator). [7]

- Q5)** a) Which factors are influencing the investment decision? [6]
b) Enlist capital budgeting techniques and explain any 2 in brief. [6]
c) Explain cost of capital and its implications in budgeting decisions. [6]

OR

- Q6)** a) Define the concept of cost of capital. State how you would determine the weighted average cost of capital of firm. [6]
b) Explain Risk identification techniques. [6]
c) Distinguish between Internal Rate of Return and Net Present Value techniques. Which method would you recommend for evaluating investment? Explain. [6]

- Q7)** a) Define Financial Support for PPPs in Infrastructure. [7]
b) Explain types of contract documents used for construction. [5]
c) Explain Construction Contract Specifications? [5]

OR

- Q8)** a) Describe types of Construction Contract Specifications. [7]
b) Explain on any two : [10]
i) BOT
ii) BOOT
iii) EPC contracts
iv) Factors that influence procurement strategy selection



Total No. of Questions : 8]

SEAT No. : _____

P1034

[Total No. of Pages : 2

[5870]-1230

T. E. (Civil Engineering)

ARCHITECTURE AND TOWN PLANNING

Sustainable Architecture And Landscape Design (Honors)

(2019 Pattern) (Semester - II) (301403) (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 required.
- 5) Use of non programmable scientific calculator is allowed.

Q1) a) Why provision of green belt is made in Eco city? Explain in detail. [5]

b) Which are the different activities to be taken up for restoration and rejuvenation of water bodies? What are the benefits of this development? [6]

c) Write down a detailed note on Smart City concept. [6]

OR

Q2) a) Write a note on Eco City with its features and benefits. [6]

b) What are the roles of an architect and an urban planner in sustainable planning? [6]

c) Write down in detail different factors considered for design of green building. [5]

Q3) a) Explain the following principles of landscaping: [6]

- i) Color
- ii) Unity
- iii) Line

b) Write a note on [6]

- i) Surface drainage system and
- ii) Subsurface drainage system, in landscape planning.

c) What is the necessity of proper drainage system in landscape planning? [5]

OR

1

P.T.O.

Q4) a) Explain [6]

- i) Elements of geomorphology and
- ii) Elements of hydrology, that are considered for landscape design.

b) Write a note on Landscape Suitability Analysis. [5]

c) Explain different types of landscaping in detail. [6]

Q5) a) Explain in detail any four factors affecting on landscape design. [8]

b) Write down in detail any six purpose of landscaping. [6]

c) What are the benefits of green roof? [4]

OR

Q6) a) Write a note on “Impact of landscaping on environment”. [6]

b) Enlist the different factors considered for designing a green roof. Explain any 2 in detail. [4]

c) Explain in detail the process of landscape planning. [8]

Q7) a) Explain in detail any three factors affecting landscaping development in rural areas. [6]

b) Write a note on following: [6]

- i) Landscape treatment for highly industrialized areas.

- ii) Landscape treatment for water logged areas.

c) Explain various measures taken to improve landscape of existing road. [6]

OR

Q8) a) Explain the following factors that affects the landscape development in urban areas: [6]

- i) Road land width,

- ii) Highway cross section

b) Write a note on “Landscape treatment for desert areas”. [6]

c) Write a note on “Landscape treatment for costal highway”. [6]



Total No. of Questions : 8]

SEAT No. :

P1035

[Total No. of Pages : 2

[5870]-1231

T.E. (Mechanical-Sandwich)

PROCESS PLANNING & TOOL SELECTION

(2019 Pattern) (Semester - II) (302066) (Self-Study-I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory i.e. solve 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) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data if necessary and mention it clearly.

Q1) a) What are the advantages and disadvantages of combining operations? [5]

b) For a cube of 20 cm size, sketch six locators needed for equilibrium, and Explain why the locators are generally arranged in 3-2-1 pattern. [6]

c) What do you mean by qualifying and re-qualifying operations and how to identify them? [6]

OR

Q2) a) How to identify critical operations from part drawing? [5]

b) Explain mechanical control in relation to work-piece control. [6]

c) What are the rules for combating tool forces and holding forces? [6]

Q3) a) Explain briefly the relation between process selection and machine selection. [6]

b) What are types of drill bushes? Explain any two with neat sketch. [6]

c) What are the principles of location? [6]

OR

P.T.O.

- Q4)** a) What is a tool inserts and how it is used? What are the benefits of using Inserts over solid tools? [6]
- b) What are the design considerations of jigs and fixtures? [6]
- c) What do you mean by ‘Commercial tooling’, ‘Regular tooling’ and Special tooling? [6]

- Q5)** a) What are the three classifications that are used in a make or buy scenario? [5]
- b) Describe the main costs associated with manufacturing. [6]
- c) How does surface finish and material relates of manufacturing cost? [6]

OR

- Q6)** a) Write a note on ‘Break-even analysis’. [5]
- b) Write a note on ‘Economics of Process Planning’. [6]
- c) What are the factors involved in calculation of machining time. How to calculate cycle time? [6]

- Q7)** a) What is an operation routing? Which departments in the plants make use of routing? [6]
- b) What information is provided on process picture sheet? [6]
- c) Explain Retrieval Computer Aided Process Planning approach and Draw general procedure chart of retrieval CAPP. [6]

OR

- Q8)** a) Which process symbols used while making process pictures? [6]
- b) Discuss various steps involved in manual process planning. [6]
- c) Explain the need of CAPP. Also discuss the role of expert system in Generative Computer Aided Process Planning (CAPP) system. [6]



Total No. of Questions : 8]

SEAT No. :

P1036

[Total No. of Pages : 2

[5870]-1232

T.E. (Mechanical Sandwich)

**ADVANCED MATERIALS AND MANUFACTURING
(Self-Study-II)**

(2019 Pattern) (Semester - II) (302067)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Discuss in detail the characteristics and types of MMC with examples. [10]
b) Write a short note on Rule of mixtures in regards with composites. [8]
Elaborate with suitable examples.

OR

- Q2)** a) Explain the process of stir casting of MMC. State it's applications, advantages & limitations. [9]
b) With neat sketch explain squeeze casting of MMC along with advantages & disadvantages. [9]

- Q3)** a) With neat sketch explain high energy rate forming process along with its advantages and limitations. [9]
b) Briefly explain the principle and working of hydroforming process. State it's applications. [8]

OR

- Q4)** a) Explain the process of isostatic pressing. Discriminate between hot and cold isostatic pressing. [9]
b) Elaborate with the applications, advantages and limitations laser beam forming process. [8]

P.T.O.

- Q5)** a) With neat sketch explain working of atomic hydrogen welding process, advantages and limitations. [10]
b) Differentiate between electron beam and laser beam welding. [8]

- Q6)** a) State the principle of friction stir welding process and explain the construction and working. [10]
b) Write a short note on welding automation in aerospace, nuclear and transport vehicle area with examples. [8]

- Q7)** a) State the principle of Electric discharge machining process and explain the process parameters involved in it. [9]
b) State and explain the advantages of non-conventional machining processes over conventional machining processes. [8]

OR

- Q8)** a) Comment on Material removal rate of various non-conventional machining processes. Explain the influence of tool material, geometry, di-electric fluid and process parameters on machining characteristics. [9]
b) Explain the construction and working of Electrochemical machining process. [8]



Total No. of Questions : 10]

SEAT No. :

P2338

[Total No. of Pages : 2

[5870]-1501

T.E. (Automobile Engineering)

AUTOMOTIVE AERODYNAMICS AND BODY ENGINEERING

(2015 Pattern) (Semester - II) (316486)

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.

Q1) a) Explain brief about Aerodynamic drag with its different types. [4]

b) Write a short note on Impact of angle of attack on Development of lift on Aero foil. [6]

OR

Q2) a) Calculate the aerodynamic drag running at 75 km/hr and having a frontal projected area 4.2 m² Dimensionless coefficient is 0.28, Pressure 1.03 bar, temperature is 30°C and gas constant for air 287 KJ/Kg. [6]

b) Write the aerodynamic drag coefficient value for. [4]

- i) Sphere
- ii) Cube
- iii) Long Cylinder
- iv) Streamlined body.

Q3) a) Explain various techniques of shape optimization of car in detail. [4]

b) Explain role of Aerodynamics in Automobile. [6]

OR

Q4) a) With help of neat sketch explain flow around circular Cylinder and Aero foil. [4]

b) Explain dirt accumulation on the vehicle. [6]

P.T.O.

Q5) a) What is meant by Lift and pitching? [8]

b) What is meant by Aerodynamic Stability? [8]

OR

Q6) a) What is the design Factors to remove water and dirt accumulation on body? [8]

b) Draw a Neat Sketch of a car showing air flow pattern on it. [8]

Q7) a) What is meant by Wind-Rush Noise? [8]

b) What is meant by Blind Spot? Give two Examples. [8]

OR

Q8) a) Explain the term “Pressure Drag” on vehicle. [8]

b) What are the methods of improving space in cars? Discuss. [8]

Q9) a) Explain Full scale Open type Wind Tunnel with neat sketch. [10]

b) Differentiate between conventional and integral type construction of bus body. [8]

OR

Q10)a) Explain different types of Bus Body Layouts with sketch. [10]

b) Explain dimensions of driver seat in relation to control. [8]

X X X

Total No. of Questions : 10]

SEAT No. :

P2339

[Total No. of Pages : 5

[5870]-1504

T.E. (Automobile)

DESIGN OF ENGINE COMPONENTS

(2015 Pattern) (Semester - II) (316484)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any five questions from the following.
- 2) Figures to the right indicate full marks.
- 3) Neat diagram must be drawn wherever necessary.
- 4) Use of non-programmable calculator is allowed.
- 5) Assume suitable data, if necessary.

Q1) a) Explain Whipping stresses in detail. [4]

b) The following data is given for a four stroke diesel engine
Cylinder bore 250mm, maximum gas pressure 4MPa, bearing pressure
at small end of connecting rod 15MPa, length of piston pin in bush of
small end 0.45D, ratio of inner to outer diameter of piston pin 0.6, mean
diameter of piston boss = 1.4 x outer diameter of piston pin. Allowable
bending stress for piston pin 84 N/mm². [6]

Calculate :

- i) Outer diameter of the piston pin
- ii) Inner diameter of the piston pin,
- iii) Mean diameter of the piston boss.
- iv) Check the design for bending stress. [4]

OR

Q2) a) The following data is given for the connecting rod:

Engine speed=1800rpm

Length of connecting rod =350mm

Length of stroke =175mm,

Density of' material = 7800kg/m³

Thickness of web or flange 8mm.

Assume I section as cross section. $A = 11t^2$, $I_{xx} = (419/12)t^4$ $Y = (5t/2)$

Calculate whipping stress in connecting rod.

b) Enlist an three engine components with its function and material. [6]

P.T.O.

- Q3)** a) Explain why I section is used for connecting rod? [2]
 b) Design an exhaust valve for a horizontal diesel engine using following data. [8]

Cylinder bore 150 mm, length of stroke 275mm, engine speed 500rpm, maximum gas pressure 3.5MPa, allowable mean velocity of gas = 50 m/s, seat angle 45°, take allowable bending stress and 'k' value for steel valve as 50 N/mm² and 0.42 respectively.

Calculate :

- i) diameter of valve port
- ii) diameter of valve head
- iii) thickness of valve head
- iv) diameter of valve stem and
- v) maximum lift of valve

OR

- Q4)** a) What are the types of crankshaft? [2]
 b) What are the types of Engine cooling systems? Explain any one in detail. [8]

- Q5)** a) Derive an expression for principal stresses in rotating disc. [4]
 b) A rimmed fly wheel made of gray cast iron FG 200 ($\rho = 7100 \text{Kg/m}^3$) is required to keep down fluctuations in speed from 200 to 220 rpm. The cyclic fluctuations in energy are 30000 N-m, while the maximum torque during the cycle is 75000 N-m. The outside diameter of flywheel should not exceed 2m. It can be assumed that there are 6 spokes and the rim contributes 90% of the required inertia. The cross section of the rim is rectangular and the ratio of width to thickness is 2. Determine the dimensions of the rim. Assuming suitable cross section for spokes, calculate the stresses in the rim and the spokes using Timoshenko's Expression. [12]

OR

- Q6)** a) The Torque developed by an engine is given by following equation:

$$T = 14250 + 2200 \sin 2\theta - 1800 \cos 2\theta$$
 [8]

Where T is the torque in N-m and θ is the crank angle from the inner dead center position. The resisting torque of machine is constant throughout the work cycle. The coefficient of speed fluctuations is 0.01. The engine speed is 150rpm. A solid circular steel disk. 50mm thick, is used as fly wheel. The mass density of the steel is 7822kg/m³.

Calculate the radius of the flywheel.

- b) The following data is given for a rimmed flywheel made of grey cast iron FG 200, [8]

Mean radius of rim = 1.5 m,

Thickness of rim = 200mm,

Width of rim = 300mm,

Number of spokes = 6,

Cross sectional area of each spoke = 10000 mm²

Speed of rotation = 720 rpm.

Calculate :

- i) The tensile stress in rim at $\phi = 30^\circ$ and $\phi = 0^\circ$ and
- ii) The axial stress in each spoke.
- iii) The mass density of the cast iron FG200 is 7100kg/m³.

- Q7) a) The following data is given for a hydrostatic thrust bearing : [8]

Thrust load = 500 kN,

Shaft speed = 720 rpm,

Shaft diameter = 500mm,

Recess diameter = 300mm,

Film thickness = 0.15mm,

Viscosity of lubricant = 160 SUS,

Specific gravity = 0.86

Calculate :

- i) Supply pressure
- ii) Flow requirement in liters/min
- iii) Power loss in pumping
- iv) Frictional power loss.

- b) Explain the Hydrodynamic theory of lubrication. [8]

OR

- Q8)** a) A single row deep groove ball bearing is subjected to radial force of 8 kN and a thrust force of 3 kN. The shaft rotates at 1200rpm. The expected life $L_{10\text{th}}$ of the bearing is 20000h. The minimum acceptable diameter of the shaft is 75mm. select the suitable bearing for this application. [8]
- b) Differentiate between sliding contact bearing and rolling contact bearings. [8]

- Q9)** a) Explain selection of engine type on the basis of Stroke and Bore and Number of cylinders. [9]
- b) Select an IC engine for a car which can carry 4 people with maximum speed of 120Km/h producing minimum emission. [9]

OR

- Q10)** Write short notes on : [18]

- a) Mechanical fuel pump testing
- b) Cylinder power balance
- c) Oscilloscope engine analyzers

$\left(\frac{F_a}{C_0}\right)$	$\left(\frac{F_a}{F_r}\right) \leq e$		$\left(\frac{F_a}{F_r}\right) > e$		e
	X	Y	X	Y	
0.025	1	0	0.56	2.0	0.22
0.040	1	0	0.56	1.8	0.24
0.070	1	0	0.56	1.6	0.27
0.130	1	0	0.56	1.4	0.31
0.250	1	0	0.56	1.2	0.37
0.500	1	0	0.56	1.0	0.44

Table 1- X and Y factors of single row deep groove ball bearings

Principal dimensions (mm)	Basic load ratings (N)				Designation	
	d	D	B	C	C_0	
70	90	10	12100	9150	61814	
	110	13	28100	19000	16014	
	110	20	37700	24500	6014	
	125	24	61800	37500	6214	
	150	35	104000	63000	6314	
	180	42	143000	104000	6414	
	95	10	12500	9800	61815	
	115	13	28600	20000	10615	
	115	20	39700	26000	6015	
	130	25	66300	40500	6215	
75	160	37	112000	72000	6315	
	190	45	153000	114000	6415	

Table2 -Dimensions and static and dynamic load capacity of single row deep groove ball bearings



Total No. of Questions : 10]

SEAT No. :

P2340

[Total No. of Pages : 2

[5870] - 1505

T.E. (Automobile Engineering)
AUTOMOTIVE TRANSMISSION
(2015 Pattern) (Semester - II) (316485)

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 Rear Engine Rear Wheel Drive layout. [5]
b) Write a short note on Conventional and Fully forward Chassis. [5]

OR

- Q2)** a) What are the general requirements of clutch? What if there wasn't a clutch in a geared vehicle? Justify. [5]
b) Write a short note on Electromagnetic Clutch. [5]

- Q3)** a) What are the different resistances offered to the motion of vehicle? How gearbox helps to overcome these resistances? Justify. [5]
b) Write a short note on Double Declutching. [5]

OR

- Q4)** a) Explain Universal joint. Why two universal joints are used on a propeller shaft. Justify. [5]
b) Write a short note on two wheeler gearbox. [5]

- Q5)** a) Explain various forces and loads acting on the rear axle in detail with neat figures. [10]
b) Explain different types of final drives with figures. [8]

OR

- Q6)** a) Differentiate between Open Differential and Limited Slip Differential. [8]
b) Explain working of limited slip differential (LSD) with neat figures. [10]

P.T.O.

- Q7)** a) Explain Fluid flywheel with neat figures and its performance characteristics. [8]
b) Compare Fluid Flywheel with Torque Converter on the basis of performance characteristics. [8]

OR

- Q8)** a) Explain construction and working of Wilson epicyclic gearbox. [8]
b) Compare Conventional Gearbox with Torque Converter on the basis of performance characteristics. [8]

- Q9)** a) Write a short note on Hydramatic transmission. [8]
b) Explain Fully automatic transmission. [8]

OR

- Q10)**a) Write a short note on semi-automatic transmission. [8]
b) Explain Continuous Variable Transmission. [8]

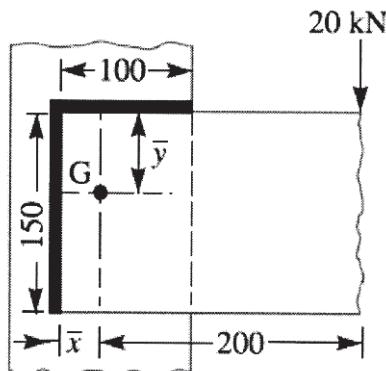


[5870]-1506**T.E. (Automobile Engineering)****DESIGN OF MACHINE ELEMENTS****(2015 Pattern) (Semester - I) (316481)****Time : 3 Hours]****[Max. Marks : 70****Instructions to the candidates:**

- 1) Answers Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10 from the following.
- 2) Draw neat labeled diagrams wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of non programmable electronic calculator is permitted.
- 5) Assume Suitable/Standard data if necessary.

Q1) a) State the theory of elastic failure on which ASME code is based. [4]

b) A bracket, as shown in Fig., carries a load of 10 kN. Find the size of the weld if the allowable shear stress is not to exceed 80 MPa. [6]

**OR**

Q2) a) Explain the factors to be considered while selecting the factor of safety.[4]

b) Explain Wahl factor, Active and Inactive helical coils, Spring index and Spring rate. [6]

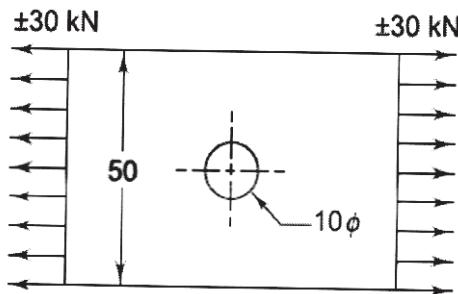
Q3) a) State the difference between rigid and flexible couplings. [4]

b) Draw a neat labeled sketch of cotter joint and write design steps. [6]

OR**P.T.O.**

- Q4)** a) Prove that square key is equally strong in crushing and shearing. State the assumption you made. [6]
 b) Write a short note on ‘bolts of uniform strength’. [4]

- Q5)** a) Define and explain Notch Sensitivity. [4]
 b) Write a short note on; Modified Goodman diagram. [6]
 c) A plate made of steel 20C8 ($S_{ut} = 440 \text{ N/mm}^2$) in hot rolled and normalized condition is shown in Figure. It is subjected to a completely reversed axial load of 30 kN. The notch sensitivity factor q can be taken as 0.8 surface finish factor 0.89, Theoretical stress concentration factor 2.51 and the expected reliability is 90%. The size factor is 0.85. The factor of safety is 2. Determine the plate thickness for infinite life. [6]



OR

- Q6)** a) Write a short note on Fatigue Failure. [4]
 b) What is modifying factor to account for stress concentration? [6]
 c) A cantilever of circular cross-section is fixed at one end and subjected to completely reversed force of 10 kN at free end. The force is perpendicular to axis of beam and at distance 100 mm from fixed end. For beam $S_{ut} = 540 \text{ N/mm}^2$, $S_{yt} = 320 \text{ N/mm}^2$. Take $K_a = 0.8$, $K_b = 0.85$, $K_c = 0.868$, temperature factor = 1.01 if diameter of beam is 35 mm. Find the life of beam. [6]

- Q7)** a) What is addendum modification in gears? How it is done? [4]
 b) Explain the effective load on helical gear tooth. How to estimate the effective load on helical gear tooth. [6]
 c) A pair of parallel helical gears consists of 24 teeth pinion rotation at 5000 rpm and supplying 2.5 KW to a gear. Take $i = 4 : 1$, $\alpha_n = 20^\circ$, $\phi = 23^\circ$, Both gear are made by steel with $S_{ut} = 750 \text{ N/mm}^2$. Take $C_s = 1.5$ and $FOS = 2$, $Y = 0.3626$, grade - 4 (i) Design gear if $V = 10 \text{ m/sec}$ (ii) Determine dynamic load by Buckingham equation also find effective load and correct FOS for bending (iii) Specify BHN for FOS = 2 pitting.[8]

OR

- Q8)** a) What is virtual number/formative number of teeth in helical gears? [4]
- b) State and explain the different type of gear tooth failure, their gear tooth failure, their causes and remedies. [6]
- c) It is required to design a pair of spur gear 20o full depth involute teeth having following design data, $Z_p = 18$, $N_p = 3000$ rpm, $N_g = 1500$ rpm, $KW = 5$, $m = 4$ mm, $b = 40$ mm, both gear are made by same material with ($S_{ut} = 630$ N/mm²). They are heat treated to surface hardness of 400 BHN. Assume $C_s = 1$, $C = 171$ N/mm. Determine FOS for bending and pitting failures. Take, $Y = 0.484 - (2.87/Z)$. [8]

- Q9)** a) Write down the advantages and disadvantages of worm gear drives? [4]
- b) Derive an expression for beam strength of straight bevel gears. [4]
- c) A pair of worm gear drive is designated as 1/30/10/10. Input speed, $N_1 = 1200$ rpm. Worm is made up by case hardened steel while worm wheel is made up by centrifugally Phosphor Bronze material. Find the rated power on the strength basis. [8]

OR

- Q10)** a) Define the following terms in Worm Gear: [4]
- | | |
|-----------------|--------------------|
| i) Axial Pitch | ii) Lead |
| iii) Lead angle | iv) Pressure angle |
- b) State and explain the following terms with suitable sketch: Pitch cone distance, Back cone, Pitch cone angle. [4]
- c) A pair of bevel gear consists of $Z_p = 30$, $Z_g = 45$, $a = 20^\circ$, $N_p = 600$ rpm, $C_s = 1.5$, BHN = 230, $m = 6$ mm, $b = 50$ mm. Both gears are made by cast Iron material with $S_{ut} = 600$ N/mm². The teeth are generated teeth and assume velocity factor is in account. Find Rated power at FOS = 2. [8]



Total No. of Questions : 10]

SEAT No. :

P2342

[Total No. of Pages : 2

[5870]-1509

T.E. (Automobile Engineering)

**AUTOMOTIVE ELECTRICAL AND ELECTRONICS
(2015 Pattern) (Semester - I) (316482)**

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 diagram must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

Q1) a) What are the different types of battery tests? Explain any one in brief. [4]

b) Compare Positive Earth and Negative Earth system. [6]

OR

Q2) a) What are the different types of spark plugs? Explain any one. [4]

b) Explain principle and construction of lead acid battery and also state the reaction for charging and discharging. [6]

Q3) a) What is use of Voltage regulator? [2]

b) Explain working of Fuel gauge. [8]

OR

Q4) a) Enlist the different types of battery ratings. [2]

b) Explain the working of Wind shield wiper with neat sketch. [8]

Q5) a) What are the different types of sensors? Explain any one. [8]

b) Explain with neat sketch Solenoid Actuators. [8]

OR

Q6) a) What are the different types of actuators? Explain any one. [8]

b) Explain with neat sketch MAP Sensor. [8]

P.T.O.

Q7) a) Write down the difference between Group and sequential injection system. [8]

b) Explain CRDI system with neat sketch. [8]

OR

Q8) a) Compare PFI and TBI system. [8]

b) Write down the difference between cold start and warm start system. [8]

Q9) a) Explain Radar warning system with layout. [10]

b) Write short note on Vehicle tracking system. [8]

OR

Q10) a) Explain Global Positioning Systems (GPS). [10]

b) What is Adaptive Cruise Control? Explain in brief. [8]



Total No. of Questions : 10]

SEAT No. :

P2343

[Total No. of Pages : 3

[5870]-1511

T.E. (Chemical)

CHEMICAL REACTION ENGINEERING - I

(2015 Pattern) (Semester - I) (New) (309348)

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, Q.9 or Q.10.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Explain four different ways of representing a reaction rate. [4]
b) The irreversible reaction $2A + B \rightarrow A_2B$ has been studied kinetically. The rate equation is given by $r_{A_2B} = 0.72 [A]^2[B]/(1 + 2[A])$. Propose a suitable mechanism consistent with above rate equation. [6]

OR

- Q2)** Aqueous A reacts to form R ($A \rightarrow R$) and in the first minute in a batch reactor its concentration drops from $C_{A0} = 2.03 \text{ ml/lit}$ to $C_{Af} = 1.97 \text{ mol/lit}$. Find rate equation for the kinetics are second order with respect to A. [10]
Q3) An aqueous feed containing A (1mol/lit) enters a 2-liter plug flow reactor and reacts away ($2A \rightarrow R$, $-r_A = 0.05 C_A^2 \text{ mol/lit.s.}$) Find the outlet concentration of A for feed rate of 0.5 liter/min [10]

OR

- Q4)** a) At certain temperature, half-life period and initial concentration for a reaction are [6]

$$t_{1/2} = 420 \text{ sec}, C_{A0} = 0.405 \text{ mol/lit}$$

$$t_{1/2} = 275 \text{ sec}, C_{A0} = 0.64 \text{ mol/lit}$$

find the rate constant of reaction

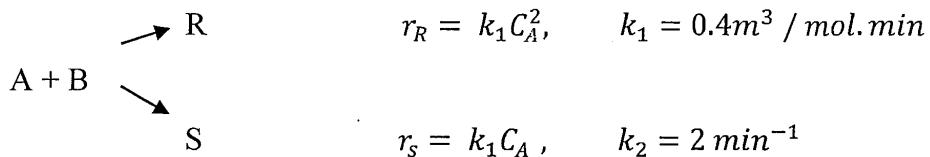
- b) Explain the differential analysis in detail with suitable example. [4]

P.T.O.

Q5) Give quantitative treatment of product distribution and of reactor size for parallel reaction. [16]

OR

Q6) a) Liquid reactant A decomposes as follows [12]



Feed of aqueous A ($C_{A0} = 40 \text{ mol/m}^3$) enters the reactor, decomposes a mixture of A, R and S leaves ,Find $C_R C_S$ and τ for $X_A = 0.9$ in:

- i) mixed flow reactor
- ii) Plug flow reactor
- b) Discuss the qualitative discussion about product distribution for parallel reactions. [4]

Q7) a) Explain effect of temperature, pressure and inert on equilibrium conversions (X_{AC}) for exothermic and endothermic reactions. [8]

- b) Define optimum temperature progression (OTP) needed for optimum reactor performance. [8]

OR

Q8) Calculate the heat of reaction at 600°C [16]



Heat capacities of reacting species may be expressed as

$$C_p = \alpha + \beta T + \gamma T^2 + \delta T^3$$

Component	α	$\beta \times 10^2$	$\gamma \times 10^5$	$\delta \times 10^0$
A	-0.24	8.65	-5.12	12.05
B	-1.30	8.40	-5.55	14.25
C	6.45	0.104	-0.008	0

The heat of reaction at the standard state (25 °C) of the reaction is 27.23 k cal/g mol.

Q9) A sample tracer was injected into the vessel and effluent concentration was measured as function of time. Construct C and E and Determine the fraction of material leaving the vessel that has spent 33 and 6 mill and fraction of material that has spent 7.75 and 8.2 mm in the vessel [18]

T (mm)	0	1	2	3	4	5	6	7	8	9	10	12	14	16
C (g/cm ³)	0	1	5	8	10	8	6	4	3	2.2	1.5	0.5	0	0

OR

Q10)a) Write an explanatory note on [10]

i) Compartment model

ii) Dispersion model

b) Explain E, F and C curve and find relationship between them [8]

X X X

Total No. of Questions : 8]

SEAT No. :

P2344

[Total No. of Pages : 2

[5870]-1512

T.E. (Chemical)

TRANSPORT PHENOMENA

(2015 Pattern) (Semester - II) (309349)

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 side indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain Ostwald de-wade model of Non-Newtonian fluid. [6]
b) State boundary conditions used in heat transfer problems. [6]
c) Explain and derive Fick's law of Diffusion. [8]

OR

- Q2)** a) Write a short note on Newtonian and Non-Newtonian fluids along with the examples. [6]
b) Explain procedure to solve thermal energy problems [6]
c) Derive the expression of molar flux and concentration profile for heterogeneous instantaneous chemical reaction. [8]

- Q3)** Derive Newton's second law of motion and extend it to derive Navier Stoke's equation of motion. [16]

OR

- Q4)** Derive Newton's second law of motion and extend it to derive Euler's equation of motion. [16]

- Q5)** a) Explain macroscopic mass balance equation. [5]
b) Derive expression for pressure rise for sudden expansion in pipeline.[12]

OR

P.T.O.

Q6) Derive Blake Kozeny and Burke Plummer equation for the flow of fluid in a packed column. [17]

Q7) Define the binary mass transfer coefficient in two phase. Derive the correlation for binary mass transfer coefficient in two phase at low mass transfer rates.[17]

OR

Q8) Explain in detail about Reynold's, Prandtl's, Martinelli's and Chilton-Colburn J-factor Analogy. [17]



Total No. of Questions : 10]

SEAT No. :

P2345

[Total No. of Pages : 4

[5870]-1513

T.E. (Chemical Engg.)

CHEMICAL ENGINEERING DESIGN - I

(2015 Pattern) (Semester - II) (309350)

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) *Use of logarithmic tables, steam table, slide rule, Mollier charts, Electronic Pocket calculator and Steam tables is allowed.*
- 4) *Your answer will be valued as a whole.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Write a brief of about various types of losses during storage of volatile fluids. [6]

b) A storage tank is to store 30,000 kg of benzene having density 800 kg/m³. Due to space limitations the maximum tank diameter can be 2.4 m. Estimate the height of the tank if the liquid is filled up 90% of the capacity of storage tank. [4]

OR

Q2) a) Skirt is to be designed for tall vertical vessel having diameter 2.5 m and height 37 m. Skirt diameter is equal to the diameter of vessel. Total weight of vessel is 222000 kg with pressure acting is 130 kg/cm². [6]

Seismic coefficient = 0.8, $k_1 = 0.7$, $k_2 = 1$,

Permissible stress = 800 kg/cm².

Calculate the skirt plate thickness and draw a skirt support for pressure vessel.

b) What are the various stresses in the cylindrical shell of the skirt support for tall vessel? [4]

P.T.O.

Q3) Write detailed procedure of design of shell and tube HE. [10]

OR

Q4) Write detailed procedure of design of double pipe HE. [10]

Q5) 0.8 Kg/s of furnace oil is to be heated from 10 C to 90 C in a shell and tube heat exchanger. Heating is done by steam available at 120 C and is to be maintained in a shell. Tube having outer diameter 19 mm and inside diameter 16 mm. Film coefficient of heat transfer of oil is 90 W/m²k while heat transfer coefficient of condensing film is 7400 W/m²k. Specific heat of furnace oil is 1970 KJ/Kg K and fouling resistance is 0.0009 m²/kW for furnace oil and 0.00005 m²/kW for condensing film. Tubes are arranged in 25 mm pitch, length is 3 m. [18]

Parameter	Shell side	Tube side
P, N/mm ²	0.5	21.3
Stress, N/mm ²	95	100.6
Joint Efficiency, %	85	65

Corrosion allowance - 6.3 mm

Ellipsoidal head - 2:1

Gasket seating stress - 53.5 N/mm²

Nozzle diameter - 75 mm

Gasket width - 24

Bolt circle diameter - 22 cm

Mean gasket diameter - 20 cm

Gasket factor - 3.75

Nozzle CA - 3 mm

Baffle thickness - 4 mm

Straight flange thickness - 4 cm

Height of nozzle - 3 cm

Design shell and tube HE

OR

Q6) a) Describe various types of evaporator. [8]

b) A single effect evaporator is to be operated at absolute pressure of 0.13 bar. Estimate the HT 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 HTC may be taken as 1.25 kW/m² °C. [10]

Data : Specific heat of feed = 4000 J/kg°C

Specific heat of product = 3260 J/kg°C

Feed temperature = 18°C

BPR of solution = 30°C

Density of boiling liquid = 1390 kg/m³

The liquid level in the evaporator is 1200 mm above the heating surface.

Q7) a) What is function of agitator? State different types of agitator. Explain any one agitator in detail with neat sketch. [8]

b) Explain selection criteria and various types of jacket. [8]

OR

Q8) a) Discuss the power requirement calculation for agitating system. [8]

b) Write a short note on reaction vessel. [8]

Q9) a) Write a short notes on : [8]

i) Gravity separator

ii) Liquid-liquid separator

b) Design steam water separator for the following conditions steam flow rate : 2000 kg/h; water flow rate : 1000 kg/h; Density of water 926.4 kg/m³; Density of vapour : 2.16 kg/m³; operating pressure : 4 bar [8]

OR

Q10)a Design a decanter to separate light oil from water. Oil is dispersed phase. Oil flow rate is 1000 kg/h, density of oil is 900 kg/m³, viscosity of oil is 3 mNs/m². Water flow rate is 5000 kg/h, density of water is 1000 kg/m³, viscosity of water is 1 mN s/m². [8]

b) Write a short notes on : [8]

- i) Knock out drum
- ii) Decanter



Total No. of Questions : 10]

SEAT No. :

P2346

[Total No. of Pages : 3

[5870]-1514

T.E. (Chemical Engg.)
MASS TRANSFER - II

(2015 Pattern) (Semester - II) (Elective - II) (309351)

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 diagram must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Define relative volatility, Derive equation for it in terms of vapour and liquid mole fraction. [4]

b) 100 kmol of mixture containing 45% mole of A (more volatile) and 55 % by mole of B is differentially distilled till the composition of the residue is 0.31. The average relative volatility is 2.2. Calculate the percentage of liquid distilled. [6]

OR

Q2) a) A mixture containing Benzene and Toluene with 40% Benzene and 60% Toluene is to be separated in a fractionating column to give product containing 96% Benzene and bottom product containing 95% Toluene. Feed is a mixture of 2/3 vapour and 1/3 liquid. The relative volatility is 2.5. Find the number of theoretical stages required if the reflux ratio of 1.5 times the minimum is used. [8]

b) Define Murphree Tray Efficiency of plate distillation column [2]

Q3) a) A solution containing 5% acetaldehyde and 95% Toluene is to be extracted with water in five stage crosscurrent extraction to extract Acetaldehyde. Toluene and water are essentially immiscible. 20 kg of water is used per 100 kg of feed each time. Calculate the amount of Acetaldehyde extracted and the final concentration of the exit solution. The equilibrium is $Y = 2.20 X$ [6]

Where $Y = \text{kg of Acetaldehyde} / \text{kg of water}$

$X = \text{kg of nicotine} / \text{kg of Toluene}$

b) Define the selectivity and Distribution coefficient and give their significance in solvent Extraction. [4]

OR

P.T.O.

- Q4)** a) Demonstrate the selection criteria for solvent used for Solvent Extraction. [5]
 b) Derive Fenske-Underwood equation for R_{\min} . [5]

- Q5)** a) Describe the construction, mechanism and application of Rotocel Extractor for leaching operation with neat sketch. [10]
 b) Write the material balance for the continuous crosscurrent leaching assuming variable underflow and no insolubles in the overflow. [6]

OR

- Q6)** a) Discuss on the graphical representation of equilibrium characteristics of Leaching operation with diagram and proper notations. [8]
 b) Oil is to be extracted from meal by means of benzene using continuous counter-current leaching unit. The unit treats 1000 kg of meal (on completely exhausted solids basis) per hour. The untreated meal contains 365 kg of oil and 30 kg of benzene. The solvent used contains 14 kg of oil and 590 kg of benzene. The exhausted solids contain 55 kg of oil and 451 kg of benzene. Find the number of stages required. The entrainment data is: [8]

Kg of oil/kg of Solution	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7
Kg of solution/kg of solid	0.5	0.505	0.515	0.53	0.55	0.517	0.595	0.62

- Q7)** a) Discuss on the principle, equilibria and rate of ion Exchange process in details. [10]
 b) Describe the adsorption Isotherms in adsorption operation. [6]

OR

- Q8)** a) A solution of washed raw cane sugar is coloured by the presence of small amounts of impurities. The solution is to be decolourised by treatment with an adsorptive carbon in contact filtration plant. The original solution has a colour concentration of 9.6 measured on an arbitrary scale

and it is desired to reduce the colour of 0.96. Calculate the necessary dosage of fresh carbon per 1000kg solution for single stage process. 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 Colour	9.6	8.6	6.3	4.3	1.7	0.7

- b) What are the desirable characteristics of an adsorbent. [6]

Q9) a) Define supersaturation. Enlist the methods of supersaturation and explain Mier's theory of supersaturation in crystallization. [10]

- b) What are different membrane modules? [4]
- c) Explain the principle and application of Ultrafiltration. [4]

OR

Q10) a) Give the classification of crystallizers. Explain the construction and working of Swenson Walker Crystallizer with diagram. [8]

- b) Calculate the yield of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ crystals when 1000 g saturated solution of MgSO_4 at 353 K is cooled to 303K assuming 10% of water is lost by evaporation during cooling. [10]

Data: Solubility of MgSO_4 at 353K = 64.2 kg/100kg water

Solubility of MgSO_4 at 303K = 40.8 kg/100kg water

Molecular weight of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ = 246



Total No. of Questions : 10]

SEAT No. :

P2347

[Total No. of Pages : 2

[5870]-1515

T.E. (Chemical)

PROCESS INSTRUMENTATION AND CONTROL

(2015 Pattern) (Semester - II) (309352)

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) *Neat diagram must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) What are transducers? Explain types of transducers. [5]

b) Distinguish between self operated and power operated instrument. [5]

OR

Q2) a) Explain Radiation pyrometer with neat diagram. [5]

b) Explain RTD with neat diagram. [5]

Q3) Explain following pressure sensors with neat diagram. [10]

- a) Bellows
- b) Helical Bourdon

OR

Q4) a) Explain Inclined leg manometer with neat sketch. [5]

b) Explain with diagram, construction, working and calibration of pressure sensor using dead weight tester. [5]

Q5) a) Explain with diagram, construction and working of Venturimeter with its industrial application. [8]

b) Explain classification of flow measuring instruments. [8]

P.T.O.

OR

- Q6)** a) Explain with diagram, construction and working of ultrasonic level measurement method. [8]
b) Explain with diagram, construction and working of sight glass level measurement method. [8]

Q7) Explain principle with diagram, construction, working of [16]

- a) Refractometry
b) Liquid chromatography

OR

Q8) Describe with neat diagram the following techniques of composition analysis. [16]

- a) Gas chromatography
b) Mass spectroscopy

Q9) a) Explain modes of control action. [9]
b) Describe the types of ideal forcing function. [9]

OR

Q10) a) Describe the heat exchanger automatic control system with block diagram. [9]
b) Derive the transfer function of mercury in glass thermometer and find the dynamic behavior for step change in input. [9]



Total No. of Questions : 10]

SEAT No. :

P2348

[Total No. of Pages : 2

[5870]-1516

T.E. (Chemical)

CHEMICAL ENGINEERING MATHEMATICS

(2015 Pattern) (Semester - I) (309341)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any five questions.
- 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 convergence and divergence in case of Newton-Raphson method using graphical representation. [6]

b) Solve the following system of equations using Relaxation methods. Perform 3 iterations. [4]

$$10x_1 - 2x_2 - 2x_3 = 6$$

$$-x_1 + 10x_2 - 2x_3 = 7$$

$$-x_1 - x_2 + 10x_3 = 8$$

OR

Q2) a) Using Newton-Raphson method and initial guess as zero, Find $x^3 - 5x + 3 = 0$. Do 3 iterations. [6]

b) State and explain drawbacks of Elimination method. [4]

Q3) a) Enlist the categories and various methods to solve linear algebraic equation. [4]

b) The equation of best fit curve is of the type $y = ab^x$. Find value of constants a and b. Fitting the curve through the points. [6]

x	2.1	2.5	3.1	3.5	4.1
y	5.14	6.78	10.29	13.58	20.57

OR

P.T.O.

Q4) a) Solve the following equations using Thomas Algorithm. [4]

$$x + 2y = 3$$

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

$$2y - z = 1$$

b) Discuss the importance of curve fitting and its applications in chemical engineering. [6]

Q5) a) State and explain graphical interpretation of Eulers method. [8]

b) Use Runge-Kutta method of Fourth order to obtain the numerical solution

$$\text{of } \frac{dy}{dx} = x^2 + y^2, y(0) = 0 \text{ Estimate } y(0.2) \text{ and } y(0.4). \quad [8]$$

OR

Q6) Use modified Euler's method to solve $\frac{dy}{dx} = x^2 + y$ with the condition

$y(0) = 1$. Find value of y at $x = 0.1$. Take accuracy upto four digits. [16]

Q7) A steel plate 750×750 mm has its two adjacent sides maintained at 100°C . While the two other sides are maintained at 0°C . What will be the steady state temperature at interior points assuming a grid size of 250mm? [16]

OR

Q8) Using the finite difference method solve the boundary value problem

$$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} = 1 \text{ with } y(1) = 0, y(1.4) = 0.0566. \text{ Find } y(1.1), y(1.2), y(1.3).$$

[16]

Q9) a) What is optimization and Discuss its application in detail. [9]

b) Explain Golden search method with its application. [9]

OR

Q10) A company is manufacturing two different types of products A and B. Each product has to be processed on two machines M1 and M2. Product A requires 2 hours on machine M1 and 1 hour on machine M2. Product B requires 1 hour on machine M1 and 2 hours on machine M2. The available capacity of machine M1 is 104. hours and that of machine M2 is 76 hours. Profit per unit for product A is Rs. 6 and that for product B is Rs. 11. [18]

i) Formulate the problem.

ii) Find the optimal solution by simplex method.



Total No. of Questions : 10]

SEAT No. :

P2349

[Total No. of Pages : 3

[5870]-1517

T.E. (Chemical Engg.)
MASS TRANSFER - I

(2015 Pattern) (Semester - I) (309342)

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) Calculate the rate of diffusion of acetic acid (A) in 2 hours across a film of nondiffusing water (B) solution 1 mm thick at 17°C when the concentrations on opposite sides of the film are 9 and 3 wt % acid respectively. The diffusivity of acetic acid in the solution is $0.95 \times 10^{-9} \text{ m}^2/\text{sec}$.

Data : At 17°C density of the 9 and 3 wt % solutions is 1012 and 1003.2 kg/m³, respectively. [6]

b) What are the General Principles of Mass Transfer? Explain importance of Mass Transfer operations. [4]

OR

Q2) a) Derive relation between overall and individual mass transfer resistance in term of mass transfer coefficients. [5]

b) Write short note on Heat, mass and momentum Transfer Analogies. [5]

Q3) 5000 kg/hr of a SO_2^- air mixture containing 5% by volume of SO_2 is to be scrubbed with 2,00,000 kg/hr of water in a packed tower. The exit concentration of SO_2 is reduced to 0.15%. The tower operates at 1 atm. The equilibrium relationship is given by $Y = 30X$.

Where,

$Y = \text{mole of } \text{SO}_2/\text{mole of air}$ $X = \text{mole of } \text{SO}_2/\text{mole of water}$

If the packed height of tower is 4.2 m, calculate the height of transfer unit (HTU). [10]

OR

P.T.O.

Q4) a) What are the factors to be considered for selecting solvent for Absorption.

[4]

b) What is minimum liquid-gas ratio for absorbers? How it is determined and Explain its significance during the design of absorption column. [6]

Q5) a) Write a short note on [6]

- i) Lewis relation and Psychrometric ratio
- ii) Adiabatic Saturation Temperature

b) What are the various type of cooling towers? Explain any one in brief.[12]

OR

Q6) a) Define wet bulb temperature and derive an expression relating wet bulb temperature with absolute humidity and psychrometric ratio. [10]

b) The DBT and WBT of air are found to be 30°C and 20°C respectively. By using humidity chart, Determine,

- i) Absolute humidity
- ii) % Relative Humidity
- iii) Humid Heat

[8]

Q7) a) Explain construction and working of any two of the following with neat sketch.

- i) Venturi scrubber
- ii) Mechanically agitated vessel
- iii) Wetted wall column.

[8]

b) Differentiate between tray columns and packed columns. [8]

OR

Q8) a) Discuss on Operating Characteristics of sieve Plate Column in details.[8]

b) Explain various types packing used in separation towers and their classification. [8]

Q9) a) Derive the equations for calculating constant rate of drying period and falling rate of drying period [8]

b) What are different types of dryers? Explain any one in detail. [8]

OR

- Q10)a** A wet solid is to be dried from 20% to 10% moisture (wet basis) under constant drying conditions in 2 hours. If the equilibrium moisture content is zero. How long will it take to dry solids to 4% moisture under the same conditions? Assume that no constant rate period is encountered and falling rate period is linear. [8]
- b) Define: [8]
- i) Moisture content in the solid on wet and dry basis
 - ii) Bound moisture content
 - iii) Critical moisture content
 - iv) Equilibrium Moisture content



Total No. of Questions : 10]

SEAT No. :

P2350

[Total No. of Pages : 2

[5870]-1518

T.E. (Chemical)

INDUSTRIAL ORGANISATION AND MANAGEMENT

(2015 Pattern) (Semester - I) (309343)

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, 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 FW Taylors principle of management. [6]

b) Write a note on Partnership Deed. [4]

OR

Q2) Explain with a neat sketch Line and Staff Organization along with Advantages. [10]

Q3) a) Explain different types of Wages. [4]

b) Explain in detail Recruitment. [6]

OR

Q4) Explain various functions of Purchase manager. [10]

Q5) a) What is market research? Explain with suitable example. [8]

b) Explain any two Pricing Strategies in detail. [8]

OR

P.T.O.

Q6) a) What is sales forecasting? Explain the two types of sales forecasting in detail. [8]

b) Write an explanatory note on Marketing Mix. [8]

Q7) a) Explain the role of Quality Circles for Quality Management of a process industry. [8]

b) Explain in detail various factors affecting international trade. [8]

OR

Q8) a) Explain Total Quality Management of a process industry. [8]

b) What is ISO? Explain any three ISO standards. [8]

Q9) a) Explain the term Agreement in Contract Act. Explain the various types of Contract according to enforceability, formation and performance. [12]

b) Write a note on FERA and FEMA. [6]

OR

Q10) Write short notes on: [18]

a) M RTP.

b) Monopolies Restrictive Trade Practices (M RTP).

c) Flow Chart and Flow Diagram.



Total No. of Questions : 10]

SEAT No. :

P2351

[Total No. of Pages : 2

[5870]-1519

T.E. (Chemical)

CHEMICAL PROCESS TECHNOLOGY

(2015 Pattern) (Semester - I) (309344)

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) Explain types of flow diagram in details. [10]

OR

Q2) Explain ammonium phosphate production with major engineering problems.[10]

Q3) Discuss Haber Bosch process for ammonia production. Also discuss major engineering issues associated with it. [10]

OR

Q4) List different methods fo sulfur production. Describe Frasch process in details.[10]

Q5) a) Explain destructive distillation of coal. [10]

b) Explain cleansing action of surfactant. Describe production process of detergent. [6]

OR

Q6) a) Describe the continuous hydrolysis and saponification process for Soap mfg. [8]

b) Explain solvent extraction process of oil from oilseeds. [8]

Q7) a) List different industrial gases. Explain water gas manufacturing process. [8]

b) Discuss in brief about fuel cell. [8]

OR

P.T.O.

- Q8)** a) Explain overview of petroleum refinery. Explain types of crude oil. [8]
b) Discuss catalytic reforming operation in petroleum refinery. [8]

- Q9)** a) Explain Phenol production by Rasching Process. [10]
b) Explain steam cracking of hydrocarbons. [8]

OR

- Q10)** a) Explain production of cumene by alkylation of benzene in details. [10]
b) Explain manufacturing of ethylene dichloride. [8]



Total No. of Questions : 10]

SEAT No. :

P2352

[Total No. of Pages : 3

[5870]-1520

T.E. (Chemical Engineering)

CHEMICAL ENGINEERING THERMODYNAMICS - II

(2015 Pattern) (Semester - I) (309345)

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) The azeotrope of ethanol(1)/benzene (2) system has a composition of 44.8% (mol) ethanol with a boiling point of 341.4 K at 101.3 KPa. At this temp the vapour pressure of benzene is 68.9 KPa and the vapour pressure of ethanol is 67.4 KPa. What are the activity coefficients in a solution containing 10% alcohol? [10]

OR

Q2) a) What is the physical significance of chemical potential? Explain the effects of temperature and pressure on chemical potential. [6]
b) Explain property changes of mixing and derive equation for ΔG & ΔH . [4]

Q3) Show that the fugacity of a gas obeying Van der waal's equation of state is

$$\text{given by } \ln f = \frac{b}{v-b} - \frac{2a}{RTV} + \ln\left(\frac{RT}{V-b}\right). \quad [10]$$

OR

Q4) Construct the p-x-y diagram for cyclohexane (1) - benzene (2) system at 313 K given that at 313 K the vapour pressures of cyclohexane and benzene are 24.62 KPa and 24.41 KPa respectively. The liquid phase activity coefficients are given by $\ln \gamma_1 = 0.458 x_2^2$, $\ln \gamma_2 = 0.458 x_1^2$. [10]

P.T.O.

Q5) a) Derive the following expression for SLE : [12]

$$\psi_i = \exp \int_{T_m}^T \frac{H_i^l - H_i^s}{RT^2} dT, \text{ where } \psi_i \equiv f_i^s / f_i^l$$

b) Explain liquid-liquid equilibrium diagram on triangular co-ordinates for a system in which two pairs are partially soluble. [6]

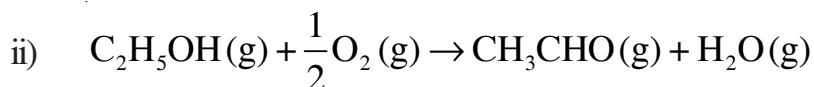
OR

Q6) a) Show that at constant T and P, the condition for stability for a single phase binary system is given as $\frac{d \ln \gamma_1}{dx_1} > -\frac{1}{x_1}$. [10]

b) Explain following two methods of consistency tests for VLE data: [8]

- i) Slope of $\ln \gamma$ curves
- ii) Redlich Kister method

Q7) a) Calculate the standard Gibbs free energy change and the equilibrium constant at 298.15 K for the following reactions: [8]



Free energies of formation at 298.15 K are given as follows:

$$\Delta G_f^\circ (NH_3) = -16.747 \text{ kJ/mol}, \Delta G_f^\circ (CH_3CHO) = -133.978 \text{ kJ/mol},$$

$$\Delta G_f^\circ (H_2O) = -228.600 \text{ kJ/mol}, \Delta G_f^\circ (C_2H_5OH) = -174.883 \text{ kJ/mol}.$$

b) Derive the expression : $\Delta G^\circ = -RT \ln K$. [8]

OR

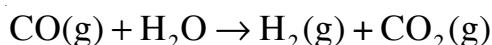
Q8) a) Derive an expression showing the effect of temperature on equilibrium constant. [8]

b) Develop expressions for the mole fractions of reacting species as functions of the reaction co-ordinate for [8]

i) A system initially containing 2 mol NH₃ and 5 mol O₂ and undergoing the reaction $4\text{NH}_3(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 4\text{NO}(\text{g}) + 6\text{H}_2\text{O}(\text{g})$

ii) A system initially containing 3 mol H₂S and 5 mol O₂ and undergoing the reaction $2\text{H}_2\text{S}(\text{g}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{g}) + 2\text{SO}_2(\text{g})$

Q9) a) Calculate values of k_p at 25°C and 800°C for the reaction [10]



Using the following data at 298K and 1 bar. Make suitable assumptions.

Component	H ₂	CO	H ₂ O	CO ₂
ΔG ⁰ _f , KJ/mole	0	-137.25	-228.59	-394.38
ΔH ⁰ _f , KJ/mole	0	-116.52	-241.88	-392.51

b) Write a note on multireaction equilibria. [6]

OR

Q10) a) Explain phase rule for reacting systems. [6]

b) A feed stock of pure n-butane is cracked at 750 K and 1.2 bar to produce olefins. Only two reactions have favourable equilibrium conversion at these condition: [10]



If these reactions reach equilibrium, what is the product composition?



Total No. of Questions : 10]

SEAT No. :

P2353

[Total No. of Pages : 4

[5870]-1521

T.E. (Civil)

ADVANCED SURVEYING

(2015 Pattern) (Semester - II) (301007)

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 whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Two triangulation stations A & B 100 Km apart have elevations of 125 m and 400 m respectively. The intervening peak C, 60 Km from A has an elevation of 131 m. Ascertain if point A is visible from B. If necessary, find the minimum height of scaffold at B so that the line of sight has a minimum clearance of 2.5 m anywhere. [6]
- b) Explain the measurement of sounding. [4]

OR

- Q2)** a) Explain the factors governing accuracy in SBPS positioning. [6]
- b) Define and explain the shore line survey. [4]

- Q3)** a) Define Remote Sensing. List out the applications of remote sensing & describe any one in detail. [6]
- b) What do you mean by sounding? Explain how soundings are reduced and plotted. [4]

OR

- Q4)** a) What is GIS? Explain the raster and vector data structure. [6]
- b) State different tide gauges used in hydrographic surveying. Explain any one in detail. [4]

P.T.O.

- Q5) a)** Find the most probable values of observed angles closing the horizon at station A using method of differences. [5]

A = $120^{\circ}5'58.9''$

B = $88^{\circ}45'16.1''$

C = $72^{\circ}55'30.7''$

D $78^{\circ}13'17.3''$

- b)** Define: [8]

- i) Spherical excess,
- ii) accidental errors and systematic errors,
- iii) independent and conditioned quantity and
- iv) weight

- c)** The angles of a spherical triangle PQR were observed as follows: [5]

P = $87^{\circ} 14' 39''$ weight = 4

Q = $39^{\circ} 40' 48''$ weight = 3

R = $53^{\circ}4'55''$ weight = 2

Find the values of the adjusted spherical angles, if the spherical excess is known to be $9''$.

OR

- Q6) a)** Explain the following in relation with triangulation survey: [5]

- i) Weight of an observation
- ii) Station adjustment

- b)** A surveyor carried out levelling operations of a closed traverse ABCDA starting from A and found that, [8]

B was 6.71 m above A

C was 5.59 m above B

D was 3.48 m above C

D was 13.72 m above A

The accuracy of all the four levelling operations is assumed to be equal. Determine the probable heights of B, C and D by the method of correlates.

- c)** Explain the principle of least squares method. [5]

- Q7)** a) Define relief displacement. Derive an expression for the same. [5]
- b) Define: [5]
- i) Isocentre,
 - ii) Exposure Station,
 - iii) Flying height and
 - iv) Tilt and tip
- c) The scale of an aerial photograph is $1 \text{ cm}=160 \text{ m}$ & the size of the photograph is $20 \text{ cm} \times 20 \text{ cm}$. If the longitudinal overlap is 65 % and side overlap is 35 %, determine the number of photographs required to cover an area of 232 sq. Km. [6]

OR

- Q8)** a) What are the applications of photogrammetry? Explain any one of them in detail. [5]
- b) The parallax difference between the top and bottom of a tree is measured as 1.32 mm on a stereo pair of photographs taken at 900 m above ground. Average photobase is 88 mm. How tall is the tree? [5]
- c) Determine the minimum number of aerial photographs required to cover an area of $40 \text{ km} \times 30 \text{ km}$, with the following details: [6]
- Size of an aerial photograph= $23 \text{ cm} \times 23 \text{ cm}$
- Scale of aerial photograph: $1 \text{ cm}= 150 \text{ m}$
- Longitudinal overlap= 60 %
- Side overlap= 30 %

- Q9)** a) Calculate the difference in level between two points M & N and the elevation of the point M from the following observation: [8]
- i) Horizontal distance MN =4100 m
 - ii) Angle of depression from M to N = $2^\circ 10' 10''$
 - iii) Height of instrument at M = 1.48 m
 - iv) Height of signal at N = 4.30 m
 - v) Coefficient of refraction = 0.07
 - vi) Radius of the earth = 6371 Km
 - vii) RL of N= 612.50 m
- b) Explain how centre line of tunnel is marked on the surface and how this centre line is transferred from surface to the underground. [8]

OR

- Q10)a** It is required to determine the elevation of a station O. Observations were made to three stations A, B and C already fixed and of known elevations. The following data was recorded. [8]

Inst. Stn	Stn ohs.	Ht. of inst.	Distance (m)	Ht. of signal	Vertical angle
O	A	1.50	3600	5.6	1° 1' 20"
	B		4700	4.1	-53' 00"
	C		5000	4.9	-34' 10"

- b) Describe the procedure for determining centre line length of bridge and procedure for location of bridge piers while setting out a bridge. [8]

x x x

Total No. of Questions : 10]

SEAT No. :

P2354

[Total No. of Pages : 2

[5870]-1522

T.E. (Civil)

PROJECT MANAGEMENT AND ENGINEERING ECONOMICS
(2015 Pattern) (Semester - II) (301008)

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 Project Management. Discuss the importance of Project Management in construction industry. [5]
- b) Explain Importance of Organizational Structure in Management. [5]

OR

- Q2)** a) Explain in detail the features of PMBOOK in point of view of construction industry. [5]
- b) Prepare the Work Breckdown Structure (WBS) for G+6 RCC Building. [5]

- Q3)** a) Define Material Management. What are the objectives of Materials Management? [2+3]
- b) Draw the network diagram and make out critical path, [5]

Activity	Duration
1-2	3
1-3	2
1-4	6
2-4	5
2-5	7
3-4	2
4-5	4

OR

P.T.O.

- Q4)** a) What do you mean by Inventory Control? How it can be achieve. [2+3]
b) Draw the Site Layout for Construction site. [5]

- Q5)** a) Explain the steps in project scheduling for a construction of road project. [6]
b) Enlist the Project Management Software use in Construction Industry, Explain any one software & its use. [6]
c) Define updating of network diagram when to update network diagram. [6]

OR

- Q6)** a) What do you known about earned value analysis? How economic health of any project analyzed by using it? [6]
b) Explain Resource Allocation, write steps in resource smoothening and leveling. [6]
c) What are the methods in Project Monitoring? Explain any one. [6]

- Q7)** a) Define Project Economics and Write down its importance in Construction Industry. [6]
b) Write down the difference between Cost, Value [6]
c) Explain the FDI in Infrastructure Project. [4]

OR

- Q8)** a) Explain the types of Capitals in detail. [6]
b) What are the factors affecting on Price Determination? [6]
c) Explain the Law of Demand and Elasticity of Demand. [4]

- Q9)** a) Explain in detail the role of Project management Consultants in Civil Engg. Field. [8]
b) What are the types of Project Appraisals? Explain with example. [8]

OR

- Q10)** a) Write a short note on any two: [8]
i) Break even analysis
ii) IRR and ARR method
iii) Role of project management consultant
b) Technical and economic appraisals are must to check project profitability, comment, [8]



Total No. of Questions : 12]

SEAT No. :

P2355

[Total No. of Pages : 3

[5870]-1523

T.E. (Civil)

FOUNDATION ENGINEERING

(2015 Pattern) (Semester - II) (301009)

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) Non programmable calculator is allowed.
- 5) Assume suitable data, if necessary and mention it clearly.

SECTION - I

Q1) What are the steps involved in soil exploration? Also explain factors influencing cost of subsurface investigation [6]

OR

Q2) Determine area ratios of samplers of the following description [6]

- a) Spilt spoon sampler, $D_o = 50$ mm and $D_i = 36$ mm
- b) Drive tube, $D_o = 100$ mm and $D_i = 90$ mm
- c) Shelby tube, $D_o = 60$ mm and $D_i = 55$ mm.

Q3) For a general $c - \phi$ soil cohesion, c is 50 kPa, the total unit weight γ_t is 20kN/ m^3 and the bearing capacity factors are $N_c = 8$, $N_q = 3$ and $N_\gamma = 2$. Using Terzaghi's formula, calculate the net ultimate bearing capacity for a strip footing of width $B = 2$ m at depth $z = 1$ m. Considering shear failure only, estimate the safe total load on a footing 15 m long by 2 m wide strip footing using a factor of safety of 3. [7]

OR

Q4) Explain with a sketch effect of water table on bearing capacity of soil by considering two conditions namely water table at ground level and below foundation. [7]

P.T.O.

Q5) Explain with sketch the determination of coefficient of consolidation by square root of time fitting method. [7]

OR

Q6) Explain with sketches spring analogy method of consolidation process. [7]

SECTION - II

Q7) a) Explain with sketches classification of piles on the basis of any three criteria. [6]

b) Draw a neat sketch of well foundation and explain the terms involved. [6]

c) A group of piles consists of 15 piles arranged in three rows and five columns. [6]

Compute efficiency of pile group by Feld rule. Assume diameter of piles = 300 mm and spacing 0.75m centre to centre.

OR

Q8) a) Explain with a neat sketch sand island method for well sinking. [6]

b) Explain how do you decide bearing capacity of single pile by a conventional pile load test. [6]

c) Discuss the concept of negative skin friction in piles with a sketch. How would you determine magnitude of the same in cohesive and cohesion less soils. [6]

Q9) a) Explain Engineering problems associated with black cotton soils. [6]

b) Explain with a neat sketch, procedure and interpretation for swelling pressure test. [6]

c) Explain the terms with sketches (1) free earth support (2) fixed earth support. [4]

OR

Q10)a) Explain the effects of swelling and shrinkage of expansive soils on wall and flooring of building constructed on it. Also enlist precautions to be taken with illustrative sketches. [6]

b) Draw a neat sketch of Double under-reamed pile foundation. Name the various component parts. [6]

c) Draw the sketches of structural arrangements involved in [4]

- i) Cantilever sheet pile
- ii) Anchored sheet pile

- Q11)a** What are the functional requirements of various types of geosynthetics? [6]
b) Explain the terms [6]
 i) Magnitude of an earthquake
 ii) Intensity of an Earthquake
c) Discuss effects of liquefaction. [4]

OR

- Q12)a** Write a short note on classification of geosynthetics with examples. [6]
b) Explain the use of geosynthetics in (i) Retaining waves (ii) Load bearing capacity improvement [6]
c) Differentiate between P - waves and S-waves. [4]



Total No. of Questions : 12]

SEAT No. :

P2356

[Total No. of Pages : 7

[5870]-1524

T.E. (Civil)

STRUCTURAL DESIGN - II

(2015 Pattern) (Semester - II) (301010)

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 and Q.11 or Q.12.
- 2) Figures to the right indicate full marks.
- 3) IS 456-2000 and non programmable calculator are allowed in the examination.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Mere reproduction from IS Code as answer, will not be given full credit.
- 6) If necessary assume suitable data and indicate clearly.

Q1) Draw stress strain curves for concrete in LSM and explain stress and strain values associated with the curves. [5]

OR

Q2) State and explain modes of failure (Balanced, Under reinforced and Over reinforced section) with diagrams [5]

Q3) A rectangular beam section, 230mm wide and 450mm effective depth is reinforced with 2 bars of 20mm diameter in the tensile zone and 2 bars of 12mm in the compression zone. The effective cover is 30mm for both the reinforcement. Determine moment of resistance of the section using WSM. Use M25 grade of concrete and Fe 415 grade of steel. [7]

OR

Q4) Calculate the moment of resistance by LSM for flanged beam section detailed as below : [7]

- a) Width of rib = 300mm
- b) Effective flange width = 1400mm
- c) Thickness of flange = 120mm
- d) Effective depth = 410mm
- e) Tension steel = 3- #16 through bars
- f) Use M25 grade of concrete and Fe 500 grade of steel.

P.T.O.

Q5) Design Cantilever slab at lintel level for a porch of span 2.2m perpendicular to supporting beam and width of 5.0m parallel to the beam. Size of supporting beam is 300×600 mm. Consider Live load = 1 kN/m^2 ; Floor Finish = 2kN/m^2 concrete grade: M20; steel grade : Fe415 and exposure condition: Moderate. Draw neat sketch showing details of Reinforcement. Use LSM. [8]

OR

Q6) Design intermediate flight (**only for flexure**) of a dog-legged staircase for the following data: [8]

- a) No of treads in flight = 8 Nos;
- b) Rise = 175 mm, Tread = 250 mm;
- c) Width of landing at each end = 1.2 m;
- d) Width of stair = 1.2 m;
- e) Live load = 3 kN/m^2 ;
- f) Floor finish = 1.0 kN/m^2 ;
- g) The staircase is supported by beams of width 230mm at the end of landings.
- h) Materials: M25 Concrete; Fe 500 Steel.

Show details of reinforcement. Use LSM.

Q7) Design a simply supported reinforced concrete floor beam with following data: [16]

- a) Clear Span of beam = 5.0 m
- b) Width of supporting columns = 300mm
- c) Beam width =230 mm
- d) Ultimate UDL on beam = 40kN/m , inclusive of self weight.
- e) The beam supports two way slab of thickness 120mm on both sides of beam
- f) Material- M25, Fe 415
- g) Show details of reinforcement. Use LSM

OR

Q8) Design a continuous beam ABCDE for **flexure** only using IS Code coefficients.

AB = BC = CD = DE = 4.0m. The beam supports 110mm slab on both sides. The beam carries dead load of 20 kN/m (including its self-weight) and live load of 12 kN/m. Consider material M25 and Fe 415. Show the reinforcement detail in longitudinal section and cross-section at continuous support and at mid span. [16]

Q9) Continuous RC beam ABC of rectangular section is simply supported at A and C and continuous over support B. Span AB = 6.0m, BC = 4.0m and CD = 5.5m. The beam carries dead load of 22 kN/m (including its self weight) and live load of 12 kN/m. The beam supports 120mm slab on both sides. Apply 20 % redistribution of moments. Calculate design moment for span BC and support C. Design span BC and support C only for flexure. Draw the reinforcement details. Material- Concrete of grade M30, Fe 500 reinforcement.

[16]

OR

Q10) Design a bi-axial short column by limit state method with material M25 and Fe 415 to carry Ultimate load of 1500 kN. Factored 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 is 4.2m. The column is fixed at one end and hinged at the other. Show details of reinforcement in plan and sectional elevation. [16]

Q11) a) State the functions of longitudinal and transverse reinforcement in columns. [4]

b) Design a short axially loaded column and its isolated footing for carrying a working axial load of 700 kN. The effective length of column is 2.8 m. Use M30 grade of concrete and Fe 500 grade of steel. SBC of soil is 200 kN/m². Show detailed design calculations and reinforcement details in plan and sectional elevation. [14]

OR

Q12) Design an uni-axial short column by limit state method with material M25 and Fe 415 to carry a working load of 600 kN and working moment of 70 kN-m about major axis bisecting the depth of column. The unsupported length of column is 4.5m. The column is fixed at both ends. Also design the footing for this column considering axial load and moment for **flexure** and **punching shear**. Take SBC = 250 kN/m². Show detailed design calculations and reinforcement details in plan and sectional elevation. [18]

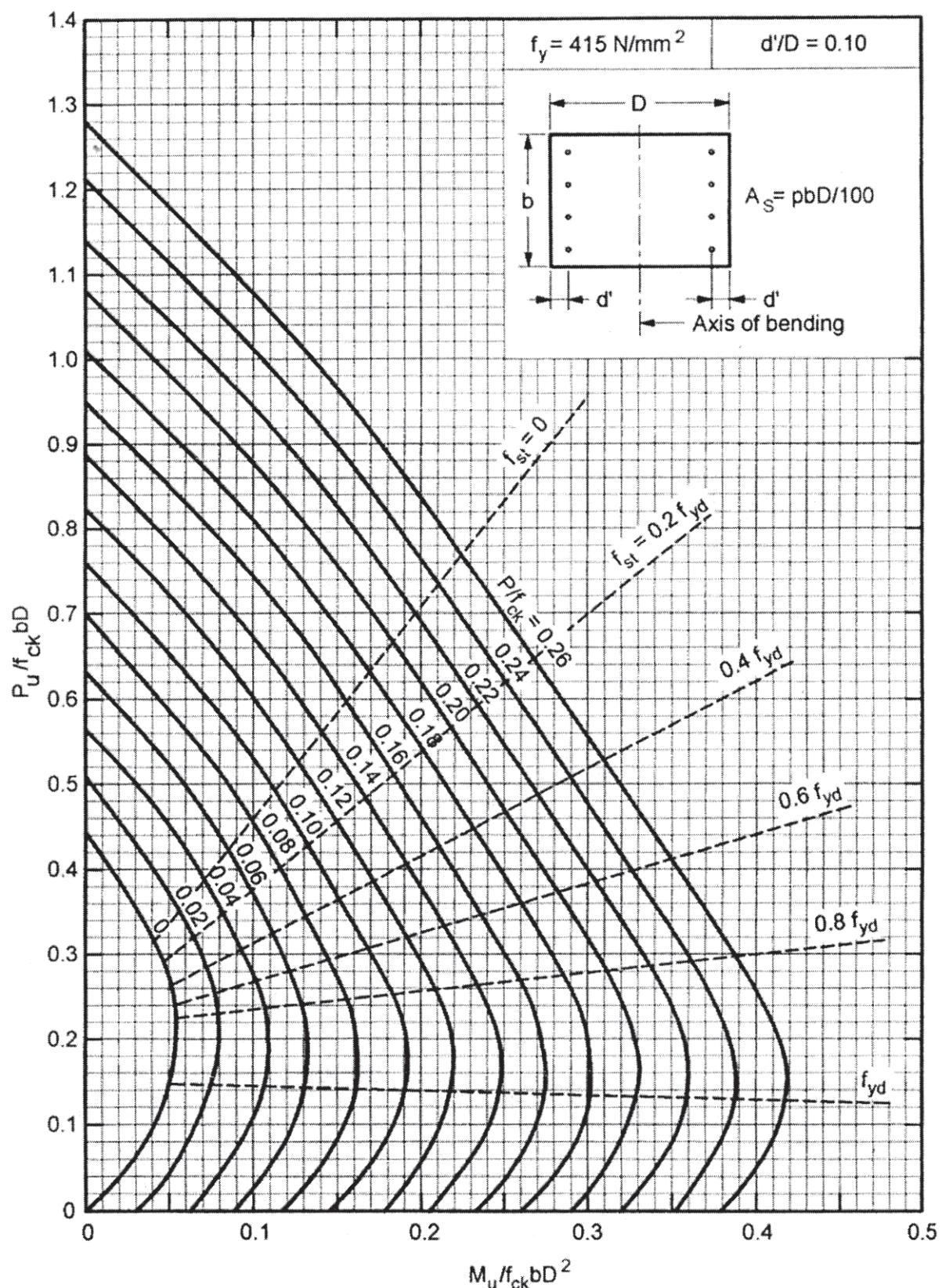


Chart No. 1 : Interaction chart for combined bending and compression on rectangular section with equal reinforcement on opposite sides.

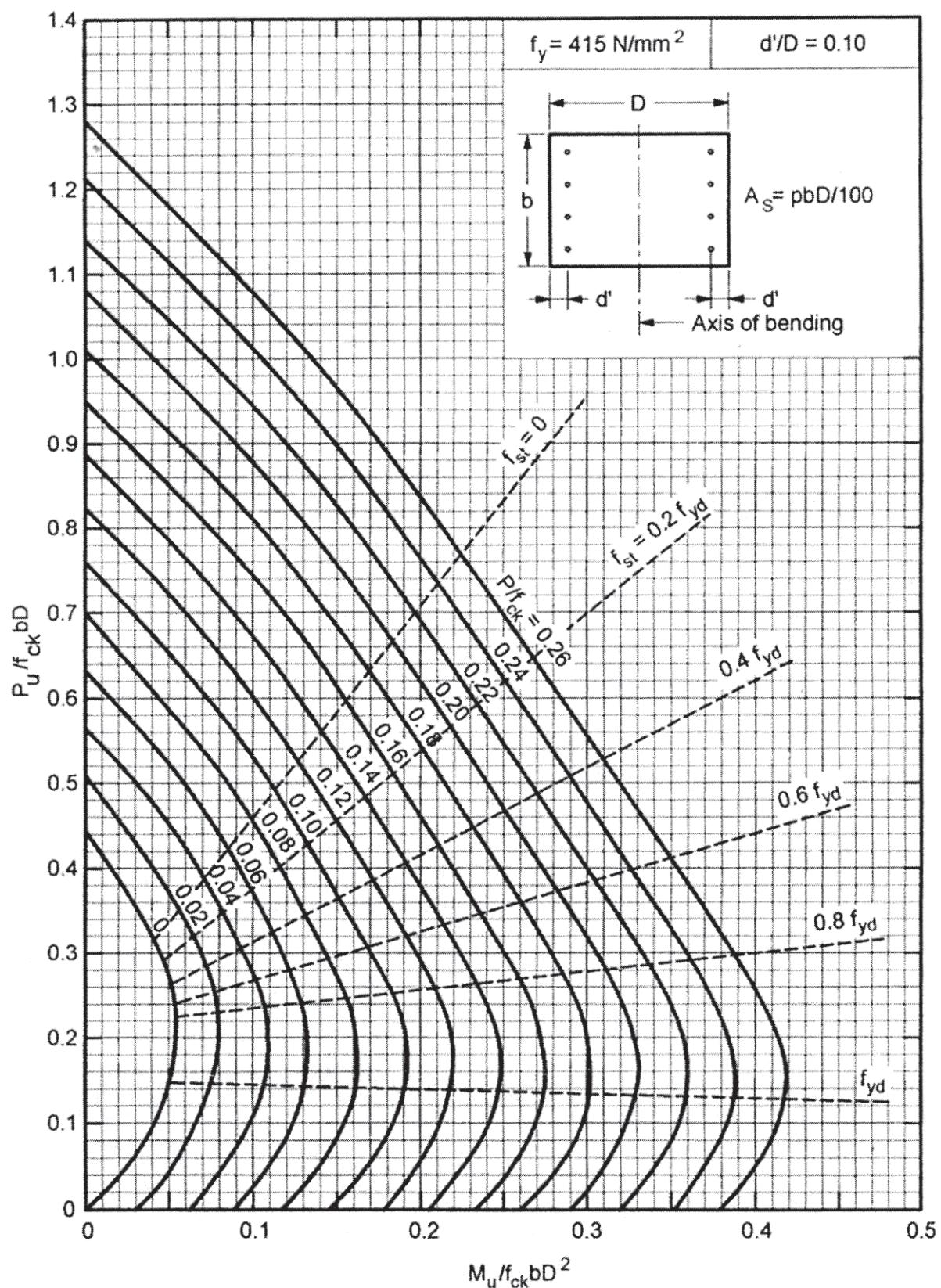


Chart No. 2 : Interaction chart for combined bending and compression on rectangular section with equal reinforcement on opposite sides.

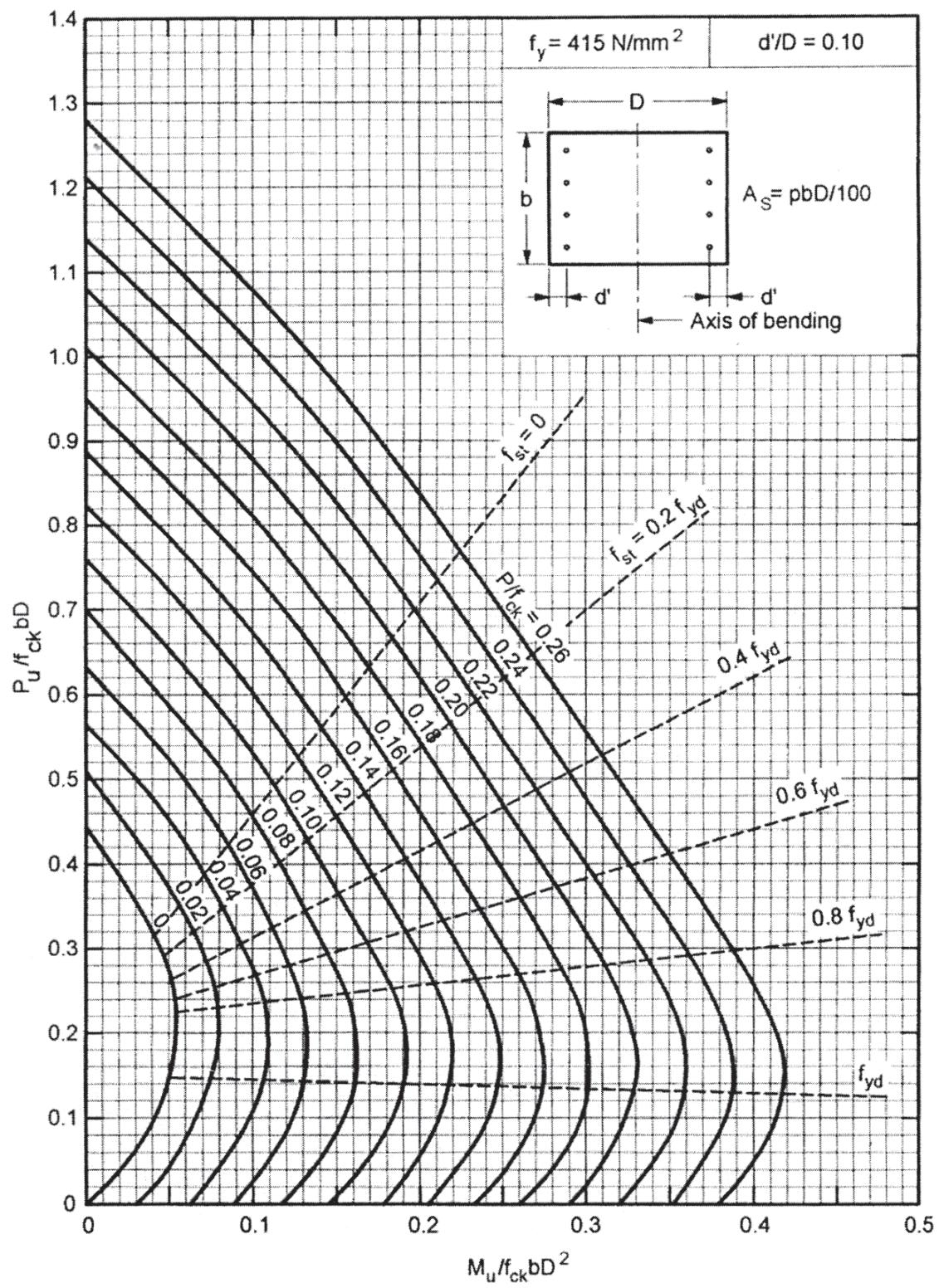


Chart No. 3 : Interaction chart for combined bending and compression on rectangular section with equal reinforcement on opposite sides.



Total No. of Questions : 10]

SEAT No. :

P2357

[Total No. of Pages : 2

[5870]-1525

T.E. (Civil)

ENVIRONMENTAL ENGINEERING - I

(2015 Pattern) (Semester - II) (301011)

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, Q.9 or Q.10.
- 2) Figures to the right indicate full marks.
- 3) Drawn neat figures wherever necessary.
- 4) Assume necessary data.
- 5) Use of scientific calculators is allowed.

- Q1)** a) State and explain the Plume behaviour. [6]
b) With sketch explain canal Intake structure. [4]

OR

- Q2)** a) Explain various factors which affect the rate of demand' ? [6]
b) What are the remedial measures to control the noise pollution? [4]

- Q3)** a) State factors affecting the efficiency of sedimentation. With the sketch describe fill and draw type sedimentation tank. [6]
b) Find the fire demand for a city having population of 25 lakh by various formulae. [4]

OR

- Q4)** a) With neat sketch explain back washing of rapid sand gravity filter. [6]
b) Explain various methods of aeration and its limitation. [4]

- Q5)** a) i) What is coagulation? Enlist the types of common coagulant? Why is it necessary? [6]
ii) Explain the various filter troubles? How are they rectified. [4]
b) What is flocculation? Write the design criteria for flocculation with rotating paddles. [6]

P.T.O.

OR

Q6) a) A water treatment plant treats $400 \text{ m}^3/\text{hr}$ of water. Design the circular clarriflocculator. [8]

- i) Dimension of flocculator unit.
- ii) Power input by paddles to water.
- iii) Size and number of paddles.
- iv) Opening below flocculator.

- b) i) Explain the theory of filtration. [4]
- ii) Differentiate between rapid and slow sand filter. [4]

Q7) a) Explain the zeolite process with neat sketch. [5]

b) Explain the chemical reactions of lime soda process. [5]

c) Write short note on post chlorination, super chlorination, and plain chlorination. [6]

OR

Q8) a) What is desalination what are the different methods, explain any one? [6]

- b) Explain defluoridation of water. [4]
- c) Explain the RO process with neat sketch. [6]

Q9) a) The designed demand is 5 MLD water is pumped into a elevated service reservoir from 6 am to 2 pm. The supply to the community is from 6 am to 10 am, and 6 pm to 10 pm at a uniform rate. Design the balancing capacity of the reservoir. [8]

b) Discuss the concept of packaged water treatment (WTP) in townships? [4]

c) Explain water harvesting technology? [6]

OR

Q10) a) State the various methods of distributing water. Explain any one. [4]

b) Differentiate between grid iron system and dead-end system? [4]

c) Differentiate between gravity and pumping system. And Explain radial system with sketch. [10]



Total No. of Questions : 10]

SEAT No. :

P2358

[Total No. of Pages : 2

[5870]-1526
T.E. (Civil)

HYDROLOGY AND WATER RESOURCES ENGINEERING
(2015 Pattern) (Semester - I) (301001)

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) Assume suitable data, if necessary.

- Q1)** a) Explain in brief various forms of precipitation. [5]
b) Write a note on drip irrigation with neat sketch state advantages and disadvantages of drip irrigation. [5]

OR

- Q2)** a) Explain Area Velocity method of discharge measurement. [5]
b) A catchment has six rain gauge stations. In a year the annual rainfall recorded by the gauges are as follows. [5]

Station	A	B	C	D	E	F
Rainfall (cm)	82.6	102.9	180.3	110.3	98.8	136.7

- i) Determine the standard error in the estimation of mean fall in the existing set of rain gauges.
- ii) For a 10% error in the estimation of the mean rainfall, calculate the optimum numbers of rain gauge stations in the catchment.

- Q3)** a) Derive the formula to calculate discharge of a well in a confined aquifer. [5]
b) What is Duty? State factors affecting & explain methods of improving duty. [5]

OR

- Q4)** a) What are the factors affecting water requirements of crops? [5]
b) Explain the following. [5]
- | | |
|-----------------------------------|----------------------|
| i) Aquifer | ii) Aquiclude |
| iii) Specific Yield of an Aquifer | iv) Porosity of soil |

P.T.O.

- Q5)** a) What is hydrograph? Explain all the parts of the typical hydrograph. Explain fern shaped catchment. [8]
b) Explain various climatic factors affecting runoff. [8]

OR

- Q6)** a) What is “S” curve hydrograph? Explain its component and construction with a sketch. [8]
b) What are different methods of estimation of flood. Explain any one. [8]

- Q7)** a) What is reservoir sedimentation? What is the significance of trap efficiency? Explain with sketch. [8]
b) What are various reservoir losses. What are various measures to control these losses. [8]

OR

- Q8)** a) Explain fixation of reservoir capacity using elevation capacity curve and dependable yield. [8]
b) Explain the mass curve and explain the step by step procedure to determine the reservoir capacity and surplus water. [8]

- Q9)** a) Compare Warabandi with cooperative water distribution system. [9]
b) Write a short note on ancient system of water distribution which still exist in north Maharashtra. [9]

OR

- Q10)** a) What is water logging? Explain tile drain formula and also state formula for spacing of tile drain. [9]
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. [9]



Total No. of Questions : 12]

SEAT No. :

P2359

[Total No. of Pages : 2

[5870]-1527

T.E. (Civil)

**INFRASTRUCTURE ENGINEERING & CONSTRUCTION
TECHNIQUES**

(2015 Pattern) (Semester - I) (301002)

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, Q.11 or Q.12.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicates full Marks.
- 4) Assume, suitable data, if necessary.

Q1) Write advantages and disadvantages of Bus Rapid Transit System (BRTS) also discuss the reasons of BRTS failure and comment to overcome it. [6]

OR

Q2) a) What are Similarities and Differences between Monorail and Metro Rail? [3]
b) Write short note on Rail Joints and Rail Fastenings. [3]

Q3) a) Write about Gradient, its types and Grade compensation on curves for different gauges. [4]
b) Define Degree of curve and find out radius of curve for one degree use chord length = 30.48 m. [4]

OR

Q4) a) Write the formulas of Safe speed on curves (Indian railways) for fully transition curves over different gauges in India. [4]
b) Write short note on ‘Regular and Periodic Track Maintenance’. [4]

Q5) Write about Diaphragm walls their purpose and construction methods. [6]

OR

Q6) a) Write about Prefabrication technique, its applications, advantages and disadvantages. [6]

P.T.O.

- Q7)** a) Write a short note on Pilot tunnel and shaft, [6]
b) Explain in detail the Pre-drainage and permanent drainage methods in Tunneling. [6]
c) Write a short note on trenchless tunneling. [4]

OR

- Q8)** a) Discuss the points to be considered when determining the shape and size of tunnel. [6]
b) Explain in detail the earth pressure balance method of tunneling in soft soil. [6]
c) Write a short note on addit and protal. [4]

- Q9)** a) Define following terms : [6]
i) Tri bar
ii) Hexapod
iii) Quay wall
b) Explain in brief with neat sketch : floating dike and jetties. [6]
c) Write a short note on Marin railway. [4]

OR

- Q10)** a) Draw the schematic diagram of artificial harbor layout showing all components and state their requirements. [6]
b) What is the difference between a port and a harbor? State various components of ports. [6]
c) Differentiate various Break waters in relations with design criteria and methods of construction. [4]

- Q11)** a) Discuss in detail factors affecting performance of equipments. [6]
b) Explain with labeled sketch “Dragline”. Discuss the application of it on construction site. [6]
c) Write short note on, Economic maintenance & repair of construction equipment. [6]

OR

- Q12)** a) Discuss various types of Excavators with their suitability. [6]
b) Write in detail on economic life of equipment. [6]
c) Enlist various types of hoists and cranes used on construction site and discuss about their selection criteria. [6]



Total No. of Questions : 10]

SEAT No. :

P2360

[Total No. of Pages : 3

[5870]-1528

T.E. (Civil)

STRUCTURAL DESIGN - I

(2015 Pattern) (Semester - I) (301003)

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) Determine design tensile strength due to yielding and block shear of an ISA 90 × 90 × 10 mm @ 13.4 kg/m which is used as a tie member for roof truss connected to back to back on either side of gusset plate by 3 bolts of 20 mm diameter. [6]

b) State & explain modes of failure of tension member with neat sketch. [4]

OR

Q2) a) Design bolted connection for single angle ISA 90 × 90 × 6 mm @ 8.2 kg/m carrying factored axial tension 115 kN with 8 mm thick gusset plate. Use M16 black bolt of 4.6 grade. [6]

b) Explain the terms gauge line, gauge distance, pitch and edge/end distance with sketch. [4]

Q3) a) Design a suitable single equal angle section to carry a factored tensile force of 250 kN. Use 5 mm size of fillet weld. [6]

b) Differentiate lacing and battening of built up column section. [4]

OR

P.T.O.

- Q4)** a) Design the slab base for a column ISMB 400 @ 61.6 kg/m carrying an axial factored load of 450 kN. Consider grade of concrete as M20. [7]
b) Why partial safety factors are used in LSM instead of factor of safety.[3]

- Q5)** A simply supported beam of effective span 6 m carries factored udl 40 kN/m. The section is laterally unsupported throughout the span. Design the beam using I-section and apply usual checks. [16]

OR

- Q6)** A simply supported beam of effective span 5 m carries a factored point load of 300 kN at mid span. If the compression flange is laterally supported throughout the span, design the section using I-section. Apply usual checks.[16]

- Q7)** Design a welded plate girder for an effective span 28 m and carrying a factored uniformly distributed load of 35 kN/m and factored concentrated loads of 140 kN acting 8 m from the both ends. Design flange and web section. Provide connection between webs and flange. [17]

OR

- Q8)** Design a welded seat connection for factored beam end reaction of 100 kN. The beam used is ISMB 250 @ 37.3 kg/m connected to the flange of column section ISHB 200 @ 37.3 kg/m. [17]

- Q9)** Design a gantry girder supporting an electronically operated crane to the following data: [17]

Capacity of crane = 120 kN

Span between crane rails = 20 m

Self-weight crane girder = 100 kN

Weight of crab, electronic motor, Hook etc. = 15 kN

Minimum hook approach = 1.2 m

Wheel base = 2 m

Span of Gantry = 5.5 m

OR

Q10) A truss shown in Fig. 10 is used for an industrial building situated at Allahabad covered with AC sheets. Determine panel point dead, live and wind load with following data: [17]

Spacing of truss = 8 m

Self weight of AC sheet = 171 N/m²

Self weight of purlin = 318 N/m

Height of column = 11 m

$K_1 = 1.0$, $k_2 = 0.89$, $k_3 = 1.0$, $C_{pe} = -0.8$ and $C_{pi} = -0.2$

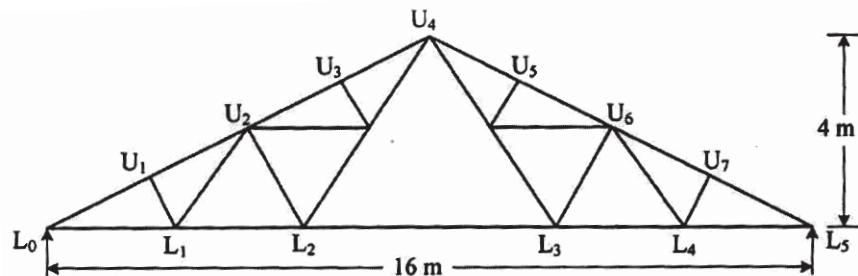


Fig. 10



Total No. of Questions : 8]

SEAT No. :

P2361

[Total No. of Pages : 3

[5870]-1529

T.E. (Civil)

STRUCTURAL ANALYSIS - II

(2015 Pattern) (Semester - I) (301004)

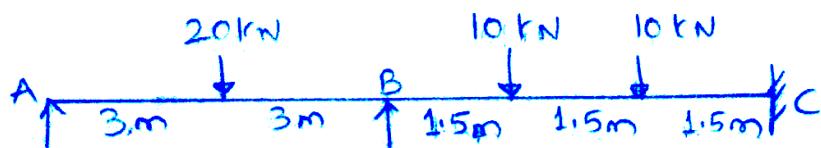
Time : 2½ Hours]

[Max. Marks : 70

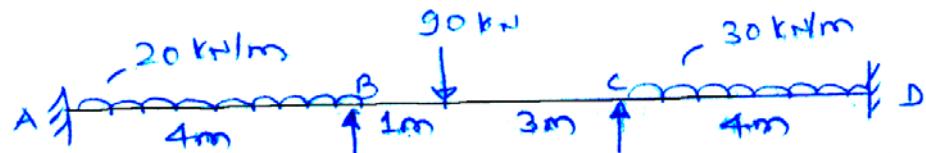
Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Use of non-programmable calculator is allowed.
- 4) Assume suitable data, if necessary.

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

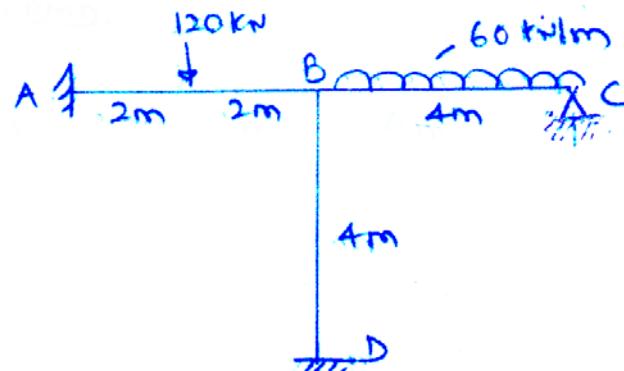


b) Analyze the continuous beam by moment distribution method. Draw BMD. [10]



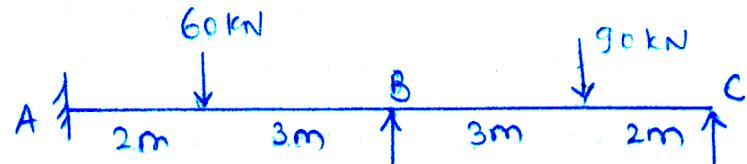
OR

Q2) a) Analyze the frame by slope deflection method. Draw BMD. [10]

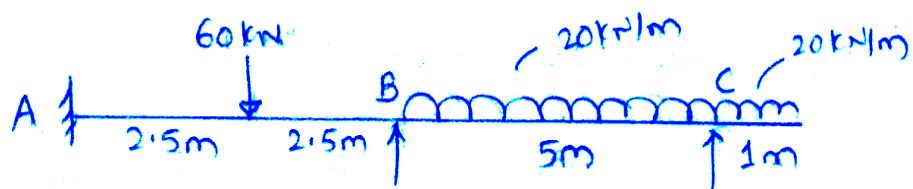


P.T.O.

b) Analyze the continuous beam by Flexibility Matrix method. [10]

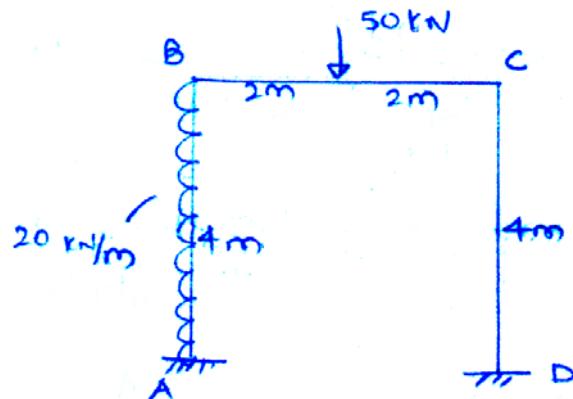


Q3) Analyze the continuous beam by stiffness matrix method. Draw BMD. [16]

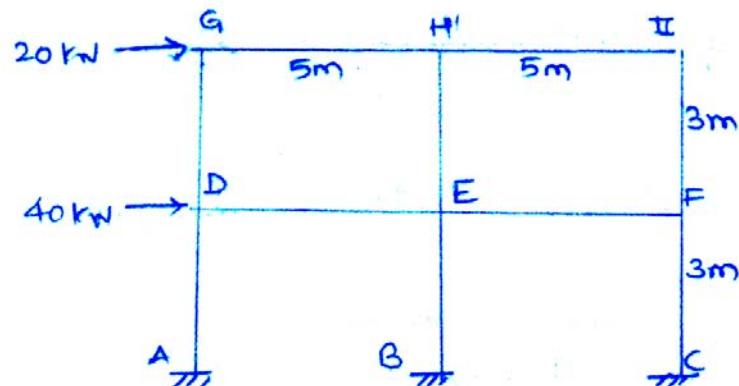


OR

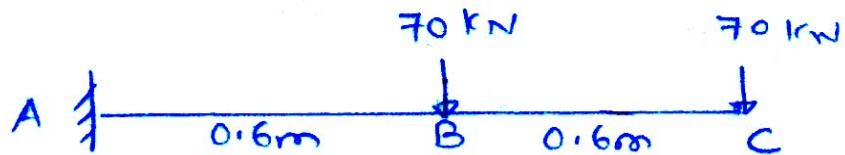
Q4) Analyze the frame by stiffness Matrix method. Draw BMD. [16]



Q5) a) Analyze the frame by portal method. [10]

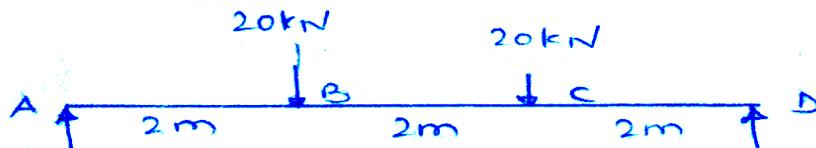


- b) A cantilever beam is loaded as shown. Find deflection under point loads. Take 5 nodes. [8]



OR

- Q6)* a) Analyze the frame given in *Q5a)* by cantilever method. [10]
 b) A simply supported beam is loaded as shown. Find deflection under point loads. Take 4 nodes. [8]



- Q7)* a) Explain the terms : [8]
 i) Plain stress problem
 ii) Plain strain problem
 iii) Superparametric elements
 iv) Co-ordinate systems.
 b) Differentiate between Axisymmetric and Isoparametric elements. [8]

OR

- Q8)* a) Explain constant strain triangle and linear strain triangle. [8]
 b) Explain Finite Element method and concept of discretization with example. [8]



Total No. of Questions : 8]

SEAT No. : _____

P2362

[Total No. of Pages : 2

[5870]-1530

T.E. (Civil)

FLUID MECHANICS - II

(2015 Pattern) (Semester - I) (301005)

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 side indicate full marks.
- 3) Assume suitable data if necessary.

Q1) a) Derive continuity equation as applicable to open channel flow. [6]

b) A spherical balloon 2m in diameter is filled with hydrogen and held stationary in air by anchoring it to the ground with the help of a string of negligible weight. The balloon is subjected to an upward force of 25 N. Determine the inclination of the string with the ground if the wind is flowing with a velocity of 18 km/hr. Also find the tension in the string. Take density of air = 1.2 kg/m^3 and $C_D = 0.5$. [6]

c) Derive the relation between sequent depths y_1 and y_2 of hydraulic jump. [6]
OR

Q2) a) Derive Chezy's formula. [6]

b) A 2.2m diameter, 2000m long steel penstock having a wall thickness 16 mm carries water at the rate of $6.1 \text{ m}^3/\text{s}$. Find the rise of pressure due to water hammer, if the valve at the end of penstock is closed in

- i) 3 seconds,
- ii) 10 seconds. Take the modulus of elasticity of steel as $2.06 \times 10^{11} \text{ N/m}^2$ and bulk modulus of elasticity of water as $2.01 \times 10^{11} \text{ N/m}^2$. Neglect loss of energy due to friction. [6]

c) A 9.5 m wide rectangular channel carries a discharge of $19 \text{ m}^3/\text{s}$ with a depth of 1.9 m. find the width to which the channel should be contracted to get critical flow at the contracted section. Neglect losses. [6]

Q3) a) For the case of 'jet striking on series of symmetrical moving curved vane at the centre', derive expressions for

 i) force exerted,
 ii) maximum efficiency. [10]

b) Draw a neat sketch of centrifugal pump and explain the component parts of it. [7]

OR

P.T.O.

- Q4)** a) Derive expression for force exerted by jet striking on [8]
 i) stationary flat plate held normal to jet,
 ii) stationary symmetric curved vane at centre.
- b) The inlet and outlet blade angles of the impeller of a centrifugal pump are 60° and 40° respectively. The width of the impeller is 30 mm. The inlet and outlet diameters of the impeller are 180 mm and 600 mm respectively. Find the speed of the pump to deliver $0.15\text{m}^3/\text{s}$ of water. Flow at inlet is entirely radial. Find also the head generated by the impeller and the manometric head and the impeller power. The manometric efficiency of the pump is 85 %. [9]

- Q5)** a) Draw a neat labelled sketch of Francis turbine. Explain working of each component [9]
 b) Define unit quantities. Derive expression for all unit quantities. [9]

OR

- Q6)** a) A Pelton wheel has mean bucket speed of 12 m/s with jet of water flowing at the rate of 750 lit/s under a head of 45 m. The bucket deflects the jet through an angle of 165° . calculate the power given by water to the runner and hydraulic efficiency of turbine. Assume coefficient of velocity as 0.98. [10]
 b) Define specific speed of turbine. Derive expression for specific speed of turbine. [8]

- Q7)** a) Explain S_1 , S_2 and S_3 profiles of GVF. [8]
 b) Explain graphical integration of GVF computation. [9]

OR

- Q8)** a) Derive differential equation for GVF. [7]
 b) A rectangular channel carries a discharge of $3.5 \text{ m}^3/\text{s}/\text{m}$. It is laid at a slope of 0.0001. If at a section in this channel the depth is 1.65 m. how far (upstream or downstream) of this section the depth will be 1.95 m. Take Manning's $n = 0.015$ and width of rectangular channel as 10 m. Use direct step method and take 2 steps only. [10]



Total No. of Questions : 8]

SEAT No. :

P2363

[Total No. of Pages : 2

[5870]-1531

T.E. (Computer Engg.)

DESIGN AND ANALYSIS OF ALGORITHM

(2015 Pattern) (Semester - II) (310250)

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) Figures to the right indicate full marks.
- 3) Draw neat diagram wherever necessary.
- 4) Make suitable assumptions wherever necessary.

Q1) a) Explain Time and Space complexity of an algorithm with example. [5]

b) What is the application of proof techniques? Explain any one technique with example. [7]

**c) Solve following multiplication using Divide and Conquer strategy.
12345678 * 21394276. [8]**

OR

Q2) a) Discuss the advantages & disadvantages of recursion. [6]

b) Prove by induction that $S_n = 1 + 2 + 3 + 4 + \dots + n = n*(n+1)/2$ [6]

c) For given two sequences, Find LCS,

String S = “ABACCD”, String T = “ACDF” [8]

Q3) a) What is Greedy algorithmic strategy? Explain Greedy approach for finding shortest path in weighted graph. [8]

b) Explain deterministic and non-deterministic algorithm with example. [8]

OR

P.T.O.

- Q4)** a) Explain asymptotic notations Big-O, Theta, Omega with example of each. [9]
b) Whether Travelling Salesman Problem is NP Hard problem or not? Justify. [7]

- Q5)** a) Explain amortized analysis of splay tree operations. [9]
b) Explain Randomized algorithm for Quick Sort. [8]

OR

- Q6)** a) Explain amortized analysis for Binary and Binomial Heap. [8]
b) Explain approximate algorithm for Vertex Cover. [9]

- Q7)** a) Explain Rabin- Karp string matching algorithm with example. [10]
b) Explain Distributed Breadth first search algorithm [7]

OR

- Q8)** a) Explain multithreaded Merge sort algorithm. [9]
b) Explain Naïve string matching algorithm with its best, average & worst case complexity. [8]

X X X

Total No. of Questions : 10]

SEAT No. :

P2364

[Total No. of Pages : 2

[5870]-1532

T.E. (Computer Engineering)

SYSTEM PROGRAMMING AND OPERATING SYSTEM

(2015 Pattern) (Semester - II) (310251)

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) Which data structures are used by two pass assembler? Explain with example. [6]
b) What is a macro? Compare macro with function. [4]

OR

- Q2)** a) What is the need of DLL? Explain with example. [4]
b) What is LEX? Explain its working. [6]

- Q3)** a) Which data structures are used by two pass macro preprocessor? explain with example. [5]
b) Show two variants of specifying an intermediate code in assembler. Compare them. [5]

OR

- Q4)** a) Explain compile and Go loader scheme with example. [5]
b) What is a compiler? Explain any two phases of compiler with suitable diagram. [5]

- Q5)** a) Draw and explain process state transition diagram. [6]
b) Differentiate between process and thread. [6]
c) Explain Bankers Algorithm with an example. [6]

OR

P.T.O.

- Q6)** a) What is process control block? Draw its structure and explain. [6]
b) Explain the concept of context switching with the help of neat diagram.[6]
c) What is a deadlock? State and explain the conditions for deadlock to occur. [6]

- Q7)** a) Explain segmentation with suitable example in brief. [8]
b) Explain contiguous memory allocation with suitable example. [8]

OR

- Q8)** a) Differentiate between internal and external fragmentation. [8]
b) Explain demand paging and swapping with suitable diagram. [8]

- Q9)** a) What is file system? Explain file system implementation in brief. [8]
b) Describe any two disk scheduling policy with an example. [8]

OR

- Q10)**a) What information is present in Directories? Explain the structure of Directory in detail. [8]
b) Explain RAID disk in brief. [8]



Total No. of Questions : 10]

SEAT No. :

P2365

[Total No. of Pages : 2

[5870] - 1533

T.E. (Computer Engineering)

EMBEDDED SYSTEMS & INTERNET OF THINGS (ES and IOT)

(2015 Pattern) (Semester - II) (310252)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer any five questions 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) *Assume Suitable data wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw neat & labelled diagram wherever necessary.*

Q1) a) What are the different features that an embedded system should possess? [5]

b) Compare REST-based communication and WebSocket communication API. [5]

OR

Q2) a) What is real time system? Explain the different real time scheduling algorithm. [6]

b) Explain Bluetooth, one of the pillar of IoT. [4]

Q3) a) What is SCADA? What are the different blocks of SCADA. [5]

b) Explain the steps for Purpose & Requirements specification in IoT design methodology. [5]

OR

Q4) a) With the help of appropriate diagram explain WebSocket-based communication APIs. [3]

b) Draw and Explain the Four pillars of IOT. [4]

c) What is Raspberry Pi? Explain the features of it. [3]

P.T.O.

- Q5)** a) What are the different topology of 802.15.4? Explain with suitable diagram. [6]
b) What is BACnet? Explain the different layers function. [6]
c) Explain the Sensor Standards for Interoperability. [4]

OR

- Q6)** a) Explain the Zigbee architecture with suitable diagram. [6]
b) Discuss the issues with IoT Standardization. [4]
c) What is KNX? Explain KNX-TP features, its Telegram. [6]

- Q7)** a) What is Web of Things (WOT)? What are the two pillars of the web? [6]
b) Explain unified multitier WOT Architecture in details. [6]
c) What is OSGi: The Universal Middleware? [5]

OR

- Q8)** a) Explain Cloud Middleware Architecture. [6]
b) Explain RFID middleware standards? [6]
c) What are the different attacks are possible in IoT? [5]

OR

- Q10)a)** Explain WAMP and its key concepts with diagram. [5]

b) Explain in brief Model, Template and View in Django architecture. [6]

c) Design Air Pollution Monitoring(APM) based on followings [6]

 - i) Define process specification for APM IoT system
 - ii) Domain model of APM IoT system
 - iii) Information model of APM IoT system
 - iv) Controller service of APM IoT system



Total No. of Questions : 10]

SEAT No. :

P2366

[Total No. of Pages : 2

[5870]-1534

T.E. (Computer Engineering)
Software Modeling and Design
(2015 Pattern) (Semester - II) (310253)

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) Assume suitable data, if necessary.
- 4) Figures to the right indicate full marks.

Q1) a) Define software design and give its importance. [5]

b) Define component. Compare component and deployment diagram. [5]

OR

Q2) a) Explain 4 + 1 View Architecture of UML. [5]

b) Draw Use Case diagram for ATM system by considering cash withdrawal scenario. [5]

Q3) a) Draw a sequence diagram for Online Shoppe. System. [5]

b) Define interface. Explain required and provided interface with example. [5]

OR

Q4) a) Explain with an example the difference between aggregation and composition. [5]

b) Draw Class Diagram for College Library Management System. [5]

Q5) a) Explain synchronous communication pattern in client server architecture. [8]

b) Explain the broker pattern for service oriented architecture. [8]

OR

Q6) a) Explain the component based software architecture in detail. [8]

b) Explain the real time software architecture. [8]

P.T.O.

- Q7)** a) Explain factory pattern with its intent, motivation and implementation. [8]
b) Explain observer pattern with suitable class diagram including subject and observer. [8]

OR

- Q8)** a) Explain proxy pattern with its intent, motivation and implementation. [8]
b) Explain Behavioral Design Pattern with example. [8]

- Q9)** a) Why testing is important? List different testing methods. [6]
b) What is integration testing? Explain its types in details. [6]
c) What is system testing? Explain with different types of testing. [6]

OR

- Q10)** a) Write a short note on (Any 3); [18]
i) Performance testing
ii) Scenario testing
iii) Unit testing
iv) Acceptance testing.



Total No. of Questions : 10]

SEAT No. :

P2367

[Total No. of Pages : 2

[5870]-1535

**T.E. (Computer Engineering)
WEB TECHNOLOGY**

(2015 Pattern) (Semester - II) (310254)

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 whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain different design issues in web development. [5]
b) Write at least any five Differences between HTML and HTML5. [5]

OR

- Q2)** a) List and brief the any four functions in JavaScript. [5]
b) Explain Document Object Model (DOM) with suitable example. [5]

- Q3)** a) Write a Java Servlet which will display “Welcome to Servlet” message. [5]
b) List and elaborate any five JSP implicit objects with examples. [5]

OR

- Q4)** a) What is JavaScript? How to validate any sample html login form using JavaScript. [5]
b) Write the different usage of JSP action tags and directives. [5]

- Q5)** a) Explain working of AJAX with neat labeled diagram. [8]
b) What is Multi dimensional arrays in PHP? Explain it with simple PHP code. [8]

OR

P.T.O.

- Q6)** a) What is Associate arrays in PHP? Explain it with simple PHP code. [8]
b) Explain WAP and WML with suitable applications. [8]

- Q7)** a) What is Dependency Injection mechanism in Angular JS? List components of this mechanism and explain any one with relevant example. [8]
b) Does Angular JS supports Single Page Application via multiple views on a single page? Justify your answer. [8]

OR

- Q8)** a) Draw and explain neat diagram which depicts MVC to the struts architecture. [8]
b) List and explain events supported by Angular JS to enrich form filling and validation. [8]

- Q9)** a) What are the different roles within web service architecture? Elaborate on each role. [6]
b) List and explain the main components of EJB architecture. [6]
c) What is JNDI lookup? How to acquire JNDI context? [6]

OR

- Q10)** a) Write differences between SOAP and REST. [6]
b) Write differences between session beans and entity beans. [6]
c) List and explain steps for developing EJB application. [6]



Total No. of Questions : 8]

SEAT No. :

P2368

[Total No. of Pages : 2

[5870]-1536

T.E. (Computer Engineering)
THEORY OF COMPUTATION
(2015 Pattern) (Semester - I) (310241)

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) Assume suitable data, if necessary.

Q1) a) Design DFA for a language of strings made up of 0 and 1 that. [6]

- i) Ends with 00
- ii) Either begin or end with 10

b) Define Pumping Lemma. Show that the language given is not regular

$$L = \left\{ w w^R \mid w \in \{a, b\}^* \right\}. \quad [6]$$

c) Design a Moore Machine that gives an output of 1 if the input strings ends in 'bab' over $\Sigma = \{a, b\}$. Convert the same Moore machine to Mealy Machine. [8]

OR

Q2) a) Eliminate the useless symbols in the grammar below - [6]

$$S \rightarrow aA|bB$$

$$A \rightarrow aA|a$$

$$B \rightarrow bB$$

$$D \rightarrow ab|Ea$$

$$E \rightarrow aC|d$$

b) Determine the regular expression over $\Sigma = \{a, b\}$ for the following. [6]

- i) All the strings containing exactly two a's.
- ii) All the strings containing ab.
- iii) All the strings starting with bb.

c) Construct NFA for the following Regular Expression. [8]

$$R.E. = 01 [(10^* + 111)^* + 0]^*1$$

PTO.

- Q3)** a) Define TM. Construct a TM for checking well formedness of parenthesis. [8]
 b) Construct a Turing Machine for $R = aba^*ba$. [6]
 c) Differentiate between FA and TM. [4]

OR

- Q4)** a) Write short note on: [12]
 i) Universal TM
 ii) Multi-tape TM
 iii) Halting problem of TM
 b) Design a Turing Machine to accept the language. [6]
 $L = \{0^n 1^n 2^n | n \geq 1\}$

- Q5)** a) Construct PDA that accepts following language $L = \{a^n b^n | n \geq 0\}$. Write simulation for string ‘aaabbb’. [6]
 b) Define PDA. What are different types of PDA? [6]
 c) Compare PDA with Finite Automata. [4]

OR

- Q6)** a) Construct a PDA that accepts all palindrome strings over $\Sigma = \{a, b\}$. Specify simulation for string ‘aba’. [6]
 b) Construct PDA that accepts a string of balanced parentheses. [6]
 c) Explain the working of bottom-up parser with example. [4]

- Q7)** a) Explain post correspondence problem. [6]
 b) Prove that the satisfiability problem is NP-complete. [6]
 c) Differentiate between P and NP classes. [4]

OR

- Q8)** a) What do you mean by Polynomial Time reduction? Explain with suitable example. [6]
 b) Explain Tractable and Intractable problem. [6]
 c) What is Node Cover Problem? Explain with an example. [4]



Total No. of Questions : 10]

SEAT No. :

P2369

[Total No. of Pages : 2

[5870] - 1537

T.E. (Computer Engineering)

DATABASE MANAGEMENT SYSTEM

(2015 Pattern) (Semester - I) (310242)

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) Construct an E-R diagram for a hospital with set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted. [5]
- b) What are triggers in SQL. What is the difference between statement level and row level trigger. Give example. [5]

OR

- Q2)** a) Explain the distinctions among the term primary key, candidate key and super key with example. [5]
- b) Write a PLSQL blocks to accept the attendance value from user and to display the message 'Term not granted' if the attendance is lesser than 75. [5]

- Q3)** a) Consider the following database schema [5]
- employee (employee_name, street, city)
works (employee_name, company_name, salary)
company (company_name, city)
manages (employee_name, manager_name)
- i) Find the company that has smallest payroll
 - ii) Give employees of First Bank Corporation 10-percent raise in salary
- b) Explain 2NF and 3NF with example. [5]

OR

P.T.O.

- Q4)** a) Explain the advantages of DBMS over File System. [5]
 b) Let R_1 and R_2 form a decomposition of R_1 . When we say that decomposition is a loseless decomposition. Give example. [5]

- Q5)** a) Explain the concept of conflict Serializability. Decide whether following schedule is conflict serializable. [8]

T_1	T_2
READ(A) WRITE(A)	READ(A) WRITE(A)
READ(B) WRITE(B)	READ(B) WRITE(B)

- b) Explain timestamp based concurrency control protocol. [9]

OR

- Q6)** a) What is log based recovery. Explain deferred database Modification and Immediate Database Modification. [9]
 b) Explain different states of transaction with a neat diagram. [8]

- Q7)** a) Explain Data Replication and Data Fragmentation in Distributed Data Storage. [8]

- b) What are different parallel database architecture? Explain with their advantages and disadvantages. [9]

OR

- Q8)** a) For concurrency control in distributed transaction distributed lock manager approach is used, explain in detail different approach for dealing with replication of data item in distributed lock manager approach. [9]

- b) Explain local and global transaction in a distributed system and also explain the basic system failure modes in an distributed environment. [8]

- Q9)** a) List and explain different NOSQL data models. [8]

- b) Explain CAP and BASE properties of NOSQL database. [8]

OR

- Q10)** a) What is unstructured data. Explain its use in social media. [4]

- b) Compare SQL and NOSQL database. [6]

- c) Write short note on Hadoop. [6]



Total No. of Questions : 10]

SEAT No. :

P2370

[Total No. of Pages : 2

[5870]-1538

T.E. (Computer Engineering)

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

(2015 Pattern) (Semester - I) (310243)

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) Assume suitable data, if necessary.

Q1) a) Define software process and software myths. Give an example of a software myths. [5]

b) What is agility? Explain it with respect to agile process. [5]

OR

Q2) a) Review Agile Software development tools like JIRA and Kanban. [5]

b) Elaborate functional and non-functional requirements and how they can be gathered? [5]

Q3) a) Explain the golden rules of user interface design. [5]

b) Define the terms “Software” and “Software Engineering”. “Software does not wear out”. State whether this statement is true or false. Justify your answer. [5]

OR

Q4) a) Select 3 components from “Information Systems”. Assess the types of cohesion and coupling that exhibits. Discuss the benefits of high cohesion and low coupling. [5]

b) Explain guidelines of component level design. [5]

Q5) a) Explain the role of people, project, process and product in project management. [8]

b) What is need of project estimation? Discuss the steps for estimation of software. [8]

OR

P.T.O.

- Q6)** a) Examine the project scheduling tool as PERT in detail. [8]
b) Based on project management concepts, make a list of 4-6 guidelines that will lead to software people who work to their full potential. That is, 4-6 commandments for empowering software engineers. [8]

- Q7)** a) You have been asked to develop a small application that analyzes each course offered by a university and reports the average grade obtained in the course. Discuss the scope that bounds this problem. [6]
b) State measurements, metrics and indicators with an example. Why they are important in software development. [6]
c) Examine the importance of LOC, FP in project estimation. [6]

OR

- Q8)** a) Discuss RMMM plan in detail with an example. [6]
b) Explain the elements that exist when an effective SCM system is implemented? Discuss each briefly. [6]
c) Explain the different types of risks involved in any software system. [6]

- Q9)** a) What is system testing? Explain any two system testing strategies. [8]
b) Discuss defect management plan in detail with an example. [8]

OR

- Q10)** a) Discuss the differences between verification and validation, and explain why validation is a particularly difficult process. [8]
b) Discuss various testing mechanisms to test non-functionality parameters using an example. [8]



Total No. of Questions : 10]

SEAT No. :

P2371

[Total No. of Pages : 2

[5870]-1539

T.E. (Computer Engineering)

**INFORMATION SYSTEMS AND ENGINEERING
ECONOMICS**

(2015 Pattern) (Semester - I) (310244)

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.
- 5) Use of calculator is allowed.

- Q1)** a) What are the different characteristics of a Transaction processing system? Explain them in brief. [5]
b) What is an Information System? What are its major components? [5]

OR

- Q2)** a) How is Information system(IS) different from Information Technology?[5]
b) With suitable example explain the concept of Information and Experience goods. [5]

- Q3)** a) Explain the characteristics of the Supply Chain Management System.[5]
b) What is the meaning of outsourcing and how is it different from off-shoring. [5]

OR

- Q4)** a) Explain in brief the Decision Support System. [5]
b) How are agile methods useful? Why they are preferred over waterfall model? [5]

P.T.O.

- Q5)** a) What are the different types of engineering economics decisions? Explain them in brief. [8]
b) Explain with suitable example nominal interest rate and effective annual interest rate. [8]

OR

- Q6)** a) What is rational decision making? Explain steps involved in it. [8]
b) Explain the following terms [8]
i) Annuities ii) Market Interest Rate

- Q7)** a) Explain with suitable example Consumer price index. [8]
b) What is annual- equivalence analysis? State its benefits. [8]

OR

- Q8)** a) Explain the following terms [8]
i) MARR ii) Accounting Rate of Return
b) What are different types of inflation? Explain them in brief. [8]

- Q9)** a) Explain various patterns of cash-flows with suitable examples. What are Positive and Negative cash flows? [10]
b) Write short note on: Cost Benefit Analysis [8]

OR

- Q10)** a) What are the different types of financial statements? Explain them in brief [10]
b) Explain Capital Expenses and Operating Expenses with proper examples. [8]



Total No. of Questions : 8]

SEAT No. :

P2372

[Total No. of Pages : 2

[5870]-1540

**T.E. (Computer Engineering)
COMPUTER NETWORKS**

(2015 Pattern) (Semester - I) (310245)

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) Figures to the right side indicates full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Explain LAN, MAN, WAN and PAN. [8]
b) Give brief about design issues in LLC. [6]
c) Differentiate between pure and slotted ALOHA. [6]

OR

- Q2)** a) Explain client server and peer to peer network. [8]
b) What is Hamming code? Explain with example. [6]
c) Explain IEEE 802.3 frame format. [6]

- Q3)** a) What are the functions of network Layer? Explain. [6]
b) Explain message switching in detail. [6]
c) Explain mobile IP. [5]

OR

- Q4)** a) Differentiate between circuit switching and packet switching techniques. [6]
b) What is IP addressing? How it is classified? [6]
c) What is DSR? Explain. [5]

- Q5)** a) What are the services of transport layer? [6]
b) How TCP will work for wireless? [6]
c) Explain connection establishment in transport layer? [5]

OR

P.T.O.

- Q6)** a) Explain differentiated services. [6]
b) Draw and explain TCP header. [6]
c) What is flow control and buffering in transport layer? [5]

- Q7)** a) What is HTTP? Explain HTTP request and reply messages. [8]
b) Write short notes on SMTP and MIME. [8]

OR

- Q8)** a) What is DHCP? Explain DHCP working. [8]
b) Write short notes on pop3 and webmail. [8]



Total No. of Questions : 10]

SEAT No. :

P2373

[Total No. of Pages : 3

[5870]-1541

T.E. (Electrical)

POWER SYSTEM - II

(2015 Pattern) (Semester - II) (303146)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Show that complex power is $S = \bar{V}\bar{I}^*$ [7]

b) What are the factors affecting corona? [3]

OR

Q2) a) Prove that per unit impedance of transformer on primary and secondary side is same. [5]

b) What the methods to improve surge impedance loading. [5]

Q3) a) What are the limitations of EHVAC transmission system. [5]

b) State the advantages of per unit system in power system analysis. [5]

OR

Q4) a) Show that receiving end complex power is a circle. Also derive radius and center formula. [7]

b) Justify that increase in the spacing between the conductor, decreases the corona loss in EHV AC transmission line. [3]

P.T.O.

- Q5) a)** A three phase 11kV, 5MVA, generator has a direct axis steady state reactance of 20%. It is connected to a 3MVA transformer having 5% leakage reactance and ratio of 11/33kV. The 33kV side is connected to a transmission line having 30 ohm reactance. A three phase fault occurs at other end of transmission line. Calculate steady state fault MVA and current supplied by generator assuming no load prior to the fault. Take base of 11kv, 5MVA on generator. [9]
- b)** Draw waveform of fault current when unloaded alternator is shorted at its terminal. Also draw circuit and write formula of subtransient, transient and steady state reactance. [8]

OR

- Q6) a)** Write short note on role of fault calculation on selection of breaker in power system. [9]
- b)** What are the different types of current limiting reactor? With circuit diagram, elaborate operation of each type. [8]

- Q7) a)** In three phase transmission line, show that positive, negative and zero sequence impedance $Z_1 = Z_2 = Z_s - Z_m$ and $Z_0 = Z_s + 2Z_m$ where Z_s is self impedance and Z_m is mutual impedance of lines. [9]
- b)** Draw zero sequence network for following types of transformer connection [8]
- Delta-star
 - Delta-star with neutral solidly grounded
 - Delta-star with neutral grounded through impedance Z_n

OR

- Q8) a)** Across a star connected symmetrical impedance load of 10Ω and a neutral impedance of $(10/3)\Omega$, an unbalanced three phase supply with $V_a = 220 \angle 0^\circ$ volts, $V_b = 200 \angle -110^\circ$ volts and $V_c = 180 \angle 110^\circ$ volts is applied. Determine the line currents using symmetrical components. [9]
- b)** Prove that apparent power in three phase circuit is given by [8]

$$S_{abc} = 3V_{a0}I_{a0}^* + 3V_{a1}I_{a1}^* + 3V_{a2}I_{a2}^*$$

Q9) a) Draw the complete single line diagram of HVDC system showing all components and elaborate any three components in detail. [8]

b) Write short note on [8]

i) Development of HVDC lines in India

ii) Homopolar HVDC link

OR

Q10)a) Explain constant current control in HVDC transmission system with characteristic and DC current equation. [8]

b) Compare HVDC and EHVAC transmission system. [8]

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Total No. of Questions : 8]

SEAT No. :

P2374

[Total No. of Pages : 3

[5870]-1542

T.E. (Electrical)

CONTROL SYSTEM-I

(2015 Pattern) (Semester - II) (303147)

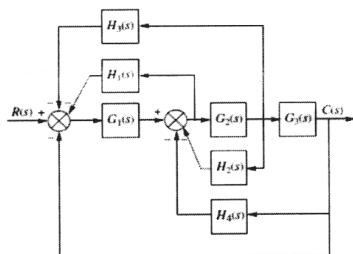
Time : 2½ Hours]

[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) Use of non programmable calculator is allowed.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Using Block diagram reduction technique find the transfer function of [7]

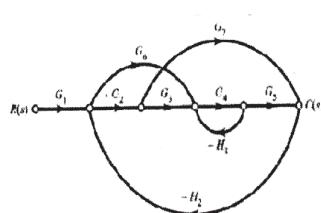


- b) For the unity feedback system with $G(s) = \frac{4900}{s(s+70)}$ find peak overshoot, settling time, for unit step input. What is steady state error for an input of 5tu(t) [6]
- c) Construct Root Locus for unity feedback system with open loop transfer function given as $G(s) = \frac{K(s+1.5)}{s(s+1)(s+2)}$.

[7]

OR

Q2) a) Find transfer function of given system using mason's gain formula. [6]



P.T.O.

- b) For the unity feedback system with $G(s) = 5000/(s+75)$ [7]
- What is the expected percent overshoot for a unit step input?
 - What is the settling time for a unit step input?
 - What is the steady-state error for an input of $5u(t)$?
 - What is the steady-state error for an input of $5tu(t)$?
 - What is the steady-state error for an input of $5t^2u(t)$?
- c) Using Routh Harvitz criterion determine range of values of K for system to be stable. Also determine the actual location of the closed loop poles

when the system is marginally stable. $G(s) = \frac{K}{s(s+1)(s+2)(s+5)}$ [7]

- Q3)** a) Explain correlation between frequency domain and time domain. [6]
 b) Sketch polar plot for system with open loop transfer function as [10]

$$G(S) = \frac{50}{s(s+3)(s+6)}$$

obtain gain margin and phase margin.

OR

- Q4)** a) Explain Nyquist stability criterion [6]
 b) For Unity feedback system $G(s) = \frac{K}{(s+2)(s+4)(s+6)}$ plot Nyquist diagram. Find range of K for stability. [10]

- Q5)** a) Explain terms gain cross over frequency, phase cross over frequency, gain margin and phase margin. [6]
 b) Sketch the bode plot for system with open loop transfer function as
 $G(s) = \frac{75(1+0.2s)}{s(s^2+16s+100)}$. Determine from that wgc, wpc, GM, PM and comment on stability. [12]

OR

Q6) a) State advantages of bode plot. [6]

b) Sketch bode plot for system with open loop transfer function as

$G(s) = \frac{K}{s(1+0.02s)(1+0.04s)}$ consider $K = 1$. Determine from that wgc, wpc, GM, PM. Find the value of K such that the system has a phase margin of 45° . [12]

Q7) a) Derive transfer function of armature controlled DC servo motor. [8]

b) Obtain the tuning of PID controller for a unity feedback system with open loop transfer function as using Ziegler Nichols method

$$G(s) = \frac{12}{s(s^2 + 4s + 13)} \quad [8]$$

OR

Q8) a) Explain PI controller design using root locus for given time domain specifications. [8]

b) Explain Lag and Lead compensator with their transfer function and pole zero plot. [8]



Total No. of Questions : 8]

SEAT No. :

P2375

[Total No. of Pages : 3

[5870]-1543

T.E. (Electrical)

UTILIZATION OF ELECTRICAL ENERGY

(2015 Pattern) (Semester - II) (303148)

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) *Use of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator is and steam table is allowed.*
- 4) *Figures to the right indicate full marks.*

Q1) a) Explain anodizing with applications and factors affecting the anodizing process. [6]

b) Explain flood lighting scheme design. [6]

c) The following data relate to 3 phase electric arc furnace, current drawn = 4000 A, arc voltage = 60 V. resistance of transformer referred to secondary = 0.0025 ohm, reactance of transformer referred to secondary = 0.0050 ohm, calculate

- i) Power factor and KW drawn from supply
- ii) If the overall efficiency of the furnace is 70 % find the time required to melt 2.5 tonne of steel if latent heat of steel = 37.2 KJ/Kg, specific heat of steel = 0.5 KJ/Kg K, melting point of steel = 1370°C and initial temperature of steel = 15°C [8]

OR

Q2) a) Explain modes of heat transfer with their mathematical expression. [6]

b) With neat diagram explain vapour compressor system used in refrigerator. [6]

c) Two similar lamps having uniform intensity 500 CP in all direction below the horizontal area mounted at a height of 4 mtr. What must be the maximum spacing between the lamps so that illumination on the ground midway between the lamps shall be at least one half the illumination directly under the lamp. [8]

P.T.O.

- Q3)** a) Compare pros and cons of diesel and electric engine locomotives. [8]
b) Explain function of following traction equipment [8]
i) Circuit Breaker
ii) Interrupter
iii) Pentograph

OR

- Q4)** a) Explain AC railway system substation with layout diagram. [8]
b) Explain with layout diagram, components of AC electric locomotive engine. [8]

- Q5)** a) Define : [8]
i) Average Speed
ii) Schedule Speed
iii) Crest Speed
iv) Coefficient of Adhesion
b) A train is required to run between two stations 3 km apart at an average speed of 50 kmph. The run is to be made to a simplified quadrilateral speed time curve. If the maximum speed is to be limited to 70 kmph, acceleration to 2 kmphps, coasting to 0.16 kmphps, breaking retardation to 3.2 kmphps respectively. Determine the duration of acceleration, coasting and breaking period. [8]

OR

- Q6)** a) Draw a quadrilateral speed time curve and derive the equation for total distance travelled. [8]
b) An electric train has quadrilateral speed time curve having uniform acceleration from rest at 2 kmphps for 25 sec, coasting for 60 sec, breaking period of 30 sec. The train is moving up gradient of 1 %, tractive resistance is 50 N/tonne, rotational inertia effect 10 % of dead weight, duration of station stop is 10 sec and overall efficiency of transmission gear and motor as 80%. Calculate schedule speed and specific energy consumption of run. [8]

- Q7)** a) Explain suitable characteristic of following motors for traction purpose [6]
- i) DC series motor
 - ii) Linear Induction Motor
- b) Explain Series parallel control method used in locomotive. [6]
- c) A 300 tonne train on a down gradient of 1 in 75 has its speed reduced from 60 kmph to 40 kmph. Calculate energy returned to the line in a distance of 1000 mtr by adopting regenerative breaking. Assume overall efficiency of 85 %, track resistance as 5 kg/tonne and allow 10 % for rotational inertia. [6]

OR

- Q8)** a) Write a note on Anti collision system. [6]
- b) A train weighing 500 tonne is going down a gradient of 20 in 1000. It is desired to maintain train speed at 40 kmph by regenerative breaking. Calculate the power fed into the line . tractive resistance is 40 N/tonne and allow 10 % for rotational inertia and efficiency of conversion as 75 %. [6]
- c) Explain following Transition method i) Open Transition ii) Shunt Transition [6]



Total No. of Questions : 8]

SEAT No. :

P2376

[Total No. of Pages : 2

[5870]-1544

T.E. (Electrical Engineering)

DESIGN OF ELECTRICAL MACHINES

(2015 Pattern) (Semester - II) (303149)

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) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable additional data if necessary.*
- 5) *Use of non-programmable calculator is allowed.*

Q1) a) Explain with justification, what happened if h.v. winding is placed near the core. **[6]**

- b)** Derive the equation for temperature rise-time for an electrical machines. From this curve plot temperature rise-time characteristics. **[7]**
- c)** Derive output equation for three-phase transformer. **[7]**

OR

Q2) a) Explain the procedure for the design of core for the core type transformers. **[6]**

- b)** Explain the procedure for the calculation of no-load current of single phase transformers. **[7]**
- c)** Derive the condition for the minimum loss in the transformers. **[7]**

Q3) a) Explain the factors to be considered while selecting the specific magnetic loading in three phase induction motors. **[8]**

- b)** Explain the guidelines that are to be considered while finalizing the stator slots. **[8]**

OR

P.T.O.

- Q4)** a) Derive the equation for the output of three phase induction motor. [8]
b) Explain the factors to be considered while selecting the specific electric Loading in three phase induction motors. [8]

- Q5)** a) Derive the equation for end-ring current of the squirrel cage induction motor. Clearly indicate the symbols used in the derivation. [8]
b) Find the main dimensions of 15 kW, 3-phase, 400 V, 50 Hz, 2810 rpm squirrel cage induction motor having an efficiency of 0.88 and a full load power factor of 0.9. Assume: $B_{av} = 0.5 \text{ wb/m}^2$, $a_c = 25000 \text{ A/m}$, Rotor peripheral speed = 20 m/sec at synchronous speed. $K_w = 0.955$ [8]

OR

- Q6)** a) Explain the significance of length of air-gap in three phase induction motor. ‘What are the various factors to be considered while estimating the length of air-gap? [8]
b) A 75 kW, 3300 V, 50 Hz, 8 pole, 3-phase star connected induction motor has a magnetizing current which is 35% of the full load current. Calculate the value of stator turns per phase if the mmf required for flux density at 30 degree from the pole axis is 500 A. Assuming winding factor = 0.95 and full load efficiency and power factor 0.94 and 0.86 respectively. [8]

- Q7)** a) Explain the procedure for the calculations of no-load current in three phase induction motor. [8]
b) Explain the different types of leakage flux in an three phase induction motor. [10]

OR

- Q8)** a) Explain the effect of dispersion coefficient on maximum power factor in a three phase induction motor design. [8]
b) Explain the procedure of calculation of total mmf of the magnetic circuit of three phase induction motor. [10]



Total No. of Questions : 12]

SEAT No. :

P2377

[Total No. of Pages : 3

[5870]-1545

T.E. (Electrical)

ENERGY AUDIT & MANAGEMENT

(2015 Pattern) (Semester - II (303150))

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) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam table is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) Discuss impact of energy use on environment. [6]

OR

Q2) Discuss important provisions under Energy Conservation Building Codes.[6]

Q3) Explain energy management strategy. [7]

OR

Q4) With suitable example explain force field analysis. [7]

Q5) Discuss constraints on supply side management. [7]

OR

Q6) Explain different tariff structures which help in energy management. [7]

P.T.O.

Q7) a) Explain post audit phase and bench marking. [8]

b) Following data is collected related to production & energy consumption. By using least square method obtain straight line fit for all data points:[8]

Data points (20, 250), (30, 350), (40, 450), (50, 550) and (60, 650).

OR

Q8) a) In a process plant certain encon options are implemented by using Cusum technique calculate energy savings from following data SEC 1000 kwh/unit & fixed consumption 500 kwh. [8]

Month	Production (units)	Energy consumed (kwh)
1	250	78,000
2	278	80,000
3	285	81,000
4	297	83,000
5	305	85,000
6	315	87,000

b) Explain in detail data collection and data analysis steps in detailed energy audit. [8]

Q9) a) Discuss energy conservation opportunities in Boiler and auxillary systems. Discuss different losses in boiler. [9]

b) Identify energy saving options in commercial establishment like malls.[9]

OR

Q10) a) Energy conservation measures in motive power. How energy can be saved in selection of motor and energy savings in variable speed applications? [9]

b) How energy savings can be achieved at design stage in illumination systems? Also state energy savings in normal case in lighting system. [9]

Q11) a) Calculate economic feasibility by calculating payback for replacement of 50HP standard motor with some capacity energy efficient motor from following data. [8]

Description	Std. Motor	Energy Efficient Motor
Rating	50 HP	50 HP
Efficiency at full load	0.85	0.94
PF at full load	0.82 lag	0.89 lag
Hours of operation	6500 Hrs.	6500 Hrs.
Capital cost	-	3.5 lacks
Scrap value	75000	

The cost of electricity is Rs. 8.5/unit and demand charges Rs. 350/kVA/month.

b) What is net present value? How it is calculated? State advantages and disadvantages. [8]

OR

Q12) a) Discuss break even analysis for financial appraisal. [8]

b) Calculate net present value for financial appraisal for following investment of Rs. 7,50,000 and cash flows for five years are Rs. 1,50,000, Rs. 2,00,000, Rs. 2,25,000, Rs. 2,75,000 and Rs. 3,00,000. Take discounting factor as 9% state economic feasibility. [8]



Total No. of Questions : 10]

SEAT No. :

P2378

[Total No. of Pages : 2

[5870]-1546

T.E. (Electrical)

**INDUSTRIAL AND TECHNOLOGY MANAGEMENT
(2015 Pattern) (Semester - I) (311121)**

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) Differentiate between administration and management. [5]
b) What is technology? Explain its classification. [5]

OR

- Q2)** a) Explain line and staff organization and functional organization. [5]
b) Write a short note on :
i) Limited Liability partnership (Act 2008)
ii) Partnership (Act 1934)

- Q3)** a) Explain ISO 9001 : 2000 and ISO14001 : 2004. [5]
b) Discuss the critical factors in technology management. [5]

OR

- Q4)** a) What is pareto Analysis and when it is used? [5]
b) Write a short note on Ishikawa Diagram and its use. [5]

- Q5)** a) What are the types of taxes? Explain in brief. [6]
b) What is Price, Capital, Debit and Credit? [6]
c) Write a short note on methods of costing. [4]

P.T.O.

OR

- Q6)** a) Explain monopoly, monopolistic completion and oligopoly. [4]
b) What are the methods of calculation of depreciation? [6]
c) What are the types of costs? Explain in details. [6]

- Q7)** a) Explain the different styles of leadership. [6]
b) Discuss the difference between recruitment and selection. [6]
c) Explain the different stages of Group dynamics. [4]

OR

- Q8)** a) Explain Importance and scope of HR Planning. [6]
b) Explain :
i) Training & Development
ii) Recruitment.
c) Explain Herzberg's two factor theory. [4]

- Q9)** a) What is the meaning of IPR and what are the different forms of IPR? [6]
b) What is copy right law? [6]
c) Describe the format and structure of patents. [6]

OR

- Q10)** a) Write a short note on trade mark laws. [6]
b) What are the qualities an entrepreneur should have? [6]
c) Explain government policies and incentives. [6]



Total No. of Questions : 10]

SEAT No. :

P2379

[Total No. of Pages : 2

[5870]-1547

T.E. (Electrical)

**ADVANCED MICROCONTROLLER AND ITS
APPLICATIONS**

(2015 Pattern) (Semester - I) (303141)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Figure to the right indicate full marks.*
- 2) *Neat diagrams must be drawn wherever necessary.*

Q1) a) Compare RISC and CISC architecture. [6]

b) Write program to make RC2 as input and RD4 as output, Also transfer the data from RC2 to RD4. [4]

OR

Q2) a) Explain BSR mode of RAM Organization and its relation with Bank Select Register. [6]

b) Explain following instruction with suitable example. [4]
i) BTFSC f, b, a
ii) COMF f, d, a

Q3) a) Explain the role of following SFR's [6]

TRISB, PORTC, LATA

b) Write Assemble language program generate 2's compliment of 30H and store the result at 55H. [4]

OR

Q4) a) Explain unsigned char, signed int, float data types in detail. [6]

b) Write C program to generate 200 hz square wave on pin RB2 using Timer0. Assume crystal frequency of 10MHz. [4]

P.T.O.

- Q5)** a) Discuss role of various SFR's related with PWM module of CCP1. [8]
b) Write a C program to count 10pulses and toggle the status of LED connected to CCP1 pin using compare mode of CCP. Use timer 3. [8]

OR

- Q6)** a) Write a C program to generate 2.5 Khz PWM frequency at 50% duty cycle on CCP1 pin. [8]
b) Explain programming steps of compare mode in CCP1 module. [8]

- Q7)** a) Discuss steps for receiving data serially and storing it at PORTD. [8]
b) Draw and Explain 16×2 LCD interfacing with pic 18f458. [9]

OR

- Q8)** a) Explain the steps of interrupt programming. [8]
b) Write C program to transmit character “B” continuously at a baud rate of 9600 and crystal frequency of 10MHz. [9]

- Q9)** a) Discuss steps of programming ADC with interrupts in pic 18f458. [8]
b) Draw the interfacing diagram of Electro-mechanical relay and also explain its interfacing procedure. [9]

OR

- Q10)**a) Explain voltage measurement give the algorithm to transfer the result to PORT C and PORT D, lower byte to PORTC and higher byte to PORTD. [8]
b) Write C program to generate sawtooth wave using DAC. [9]



Total No. of Questions : 8]

SEAT No. :

P2380

[Total No. of Pages : 2

[5870]-1548

T.E. (Electrical Engineering)
ELECTRICAL MACHINES - II
(2015 Pattern) (Semester - I) (303142)

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) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable additional data, if necessary.*
- 5) *Use of non-programmable calculator is allowed.*

Q1) a) Obtain the EMF Equation of alternator. [6]

b) State the various voltage drops takes place in alternator, when it is loaded.
Draw the phasor diagram at unity, lagging & unity power factor. [7]

c) Sketch & explain 'V' and 'Inverted V' curves of synchronous motor.[7]

OR

Q2) a) Compare salient pole type construction with non-salient pole type for three phase alternator. [6]

b) Draw the connection diagram & Explain one dark and two equally bright lamp method of synchronizing of alternators. [7]

c) Compare three phase synchronous motor with three phase induction motor. [7]

Q3) a) State the various methods of speed control of 3-ph induction motor & elaborate the V/f method for speed control of induction motor. [8]

b) Explain construction and working of permanent magnet DC motor. Also state its merits and demerits. [8]

OR

Q4) a) Draw the construction diagram and explain the working of permanent magnet stepper motor. Also state its merits and demerits. [8]

b) Elaborate the operation of induction motor as an induction generator. Also state its advantages, disadvantages and applications. [8]

P.T.O.

Q5) a) Enlist the problems associated with dc series motor on ac supply. Explain remedies for ac operation. [8]

b) Draw the neat diagram & compare the conductively compensated and inductively compensated series motor. [8]

OR

Q6) a) What is universal motor? How will you reverse the direction of rotation? State its applications. [8]

b) Plot a circle diagram of ac series motor & write down its procedure. [8]

Q7) a) Draw the connection diagram and write the procedure to conduct; no load and blocked rotor test on single phase induction motor? [8]

b) Draw the equivalent circuit of single phase induction motor explain the all terminology used. [10]

OR

Q8) a) Explain double field revolving theory for single phase induction motor. Also draw its torque-speed characteristics. [8]

b) Draw the connection diagram and explain working of capacitor start induction motor. Also sketch its torque characteristics & state its 03 applications. [10]



Total No. of Questions : 3]

SEAT No. :

P2381

[Total No. of Pages : 2

[5870]-1549

T.E. (Electrical)

POWER ELECTRONICS

(2015 Pattern) (Semester - I) (303143)

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, Q.9 or Q.10.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.

Q1) a) With neat constructional diagram explain working of GTO. [4]

b) What is the duty cycle of choppers? Explain PWM and FM techniques for controlling the output voltage. [6]

OR

Q2) a) Explain R-C triggering circuit of SCR. [4]

b) Draw and explain output and transfer characteristics of MOSFET. [6]

Q3) a) Explain the following ratings of the SCR. [4]

- i) Latching current
- ii) Holding current

b) A single phase full converter connected to 230V, 50 Hz source is feeding a load $R=10\Omega$ in series with a large inductance that make the load current ripple free. For firing angle of 45° , calculate rectification efficiency, FF and RF. [6]

OR

Q4) a) Draw and explain turn off characteristic of SCR. [4]

b) A single phase full converter with large inductance is fed by 230 V supply. Find average output voltage and reduction in output voltage due to overlap if $\alpha = 30^\circ$ and $\mu = 2^\circ$.

Q5) a) Explain single phase AC voltage regulator feeding RL load. Draw output voltage waveform and derive equation for average output voltage. [8]

b) Explain working of three phase fully controlled converter feeding RL load. Obtain expression for RMS voltage. [8]

OR

P.T.O.

- Q6)** a) With neat diagram explain triggering of TRIAC using DIAC. [8]
b) Explain working of three phase half controlled converter feeding RL load. Obtain expression for average voltage. [8]

- Q7)** a) Explain with circuit diagram and waveforms, operation of single phase current source inverter. [8]
b) Explain sinusoidal pulse width modulation used in inverters. How sinusoidal PWM is used for harmonic elimination. [8]

OR

- Q8)** a) Explain with neat circuit diagram working of single phase full bridge voltage source inverter. Draw all waveforms. [8]
b) Derive expression for output voltage in single pulse modulation by fourier analysis. [8]

- Q9)** 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) List different harmonic elimination techniques used in inverter. Explain any two methods in detail. [8]

OR

- Q10)** a) Explain working of three phase six step voltage source inverter in 120° mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in each step. [10]
b) Draw neat diagram and explain flying capacitor multilevel inverter. [8]



Total No. of Questions : 8]

SEAT No. :

P2382

[Total No. of Pages : 2

[5870]-1550

T.E. (Electrical Engg.)

**ELECTRICAL INSTALLATION, MAINTENANCE AND TESTING
(2015 Pattern) (Semester - I) (303144)**

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) 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 5 MVA, 33 kV H. V, 3-phase transmission line supplies a load of 5000 kW at 0.8 p.f. throughout the year. Per km cost of the line is Rs. (25,000 a + 2500) where 'a' is C. S. area in cm². The other details are as follows: [8]

- i) Interest and depreciation total 10 % per annum.
 - ii) Energy loss cost Rs. 0.05 per kWh
 - iii) Resistivity of conductor material is $10^{-6} \Omega\text{m}$
- Find the most economical C. S. area of conductor in cm².

b) Explain the terms with suitable diagrams [6]

- i) Touch Voltage
- ii) Step Voltage

c) Explain [6]

- i) Preventive maintenance of transformer
- ii) Use of Thermography in power systems.

OR

Q2) a) Explain with the help of diagram Pipe earthing. [6]

b) Define and explain : [6]

- i) Polarization index
- ii) Dielectric Absorption ratio

c) A Single-phase distributor 1 km long having sending end A and far end B has total (to and return) conductor resistance and reactance conductor 0.2 Ω and 0.3Ω respectively. At the far end, the voltage V_B is 200 V and current is 100 A at 0.75 pf lagging with reference to the voltage V_B . At the mid-point M of the distributor, a current of 100 A is tapped at a p.f. of 0.6 lagging with reference to the voltage V_M at mid -point. Calculate: [8]

- i) Voltage at Mid-Point. (V_M)
- ii) Sending end voltage

P.T.O.

- Q3)** a) What is Dissolved gas analysis (DGA)? List out gases generally found in transformer oil. [6]
b) Explain motor current signature analysis for Induction motor. [6]
c) List out fault location methods for locating the cable fault and explain any one with diagram. [6]

OR

- Q4)** a) Write a short note on following : [9]
i) Degree of polymerization
ii) Failure modes of transformer
iii) Causes of cable failure
b) What are the causes of failure of On line tap changer? [4]
c) Explain condition monitoring of transformer bushings. [5]

- Q5)** Write a short note on following: [16]

- i) Cable sizing
- ii) Price catalogue
- iii) Labour rate
- iv) Schedule rate

OR

- Q6)** a) Explain the procedure of installation of underground LT service lines.[6]
b) Write down various steps in estimation of 11kV pole mounted substation. [6]
c) Explain the different types of wires generally used for residential wiring.[4]

- Q7)** a) Classify the different hazard areas and its effect on human body [6]
b) Write any objectives of electrical safety [6]
c) Write a short note on contents of first aid box. [4]

OR

- Q8)** a) State Indian Electricity rules of central Electricity Authority (CEA) [8]
b) Describe how electric accidents can be prevented. [8]



Total No. of Questions : 10]

SEAT No. :

P2383

[Total No. of Pages : 3

[5870]-1551

T.E. (Electronics Engineering)

DSP & APPLICATIONS

(2015 Pattern) (Semester - II) (304206)

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, Q.9 or Q.10.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of electronic pocket calculator is allowed.

Q1) a) An analog signal is represented as $x(t) = 2 \cos 150\pi t + \sin 300\pi t - 2\cos 600\pi t$. [6]

- i) What should be sampling frequency to avoid aliasing?
- ii) Obtain DT signal if this sequence is sampled at 400 Hz.
- iii) Does aliasing occurs in above sequence after sampling? If yes calculate aliased frequency from original frequency

b) State & explain following properties associated with DFT. [4]

- i) Linearity ii) Time shifting

OR

Q2) a) Determine all possible sequence $x(n)$ associated with z transform [6]

$$X(z) = \frac{z^2 - z}{(z^2 - 3z + 2)(z - \frac{1}{2})}$$

b) Obtain IDFT of following sequence. [4]

$$X(K) = [4 \ 1-j \ -2 \ 1+j]$$

Q3) a) With help of neat diagram & waveform explain sampling rate conversion by non integer factor. [4]

b) Obtain DFT of [1 2 2 1] using radix 2 DIF FFT algorithm. [6]

P.T.O.

OR

- Q4)** a) Obtain circular convolution of $x(n) = [2 \ 4 \ 1 \ 2]$ & $h(n) = [1 \ 2 \ 3 \ 4]$ using graphical method. [6]
b) What are causality & stability considerations for LTI system in terms of z transform? [4]

- Q5)** a) Derive an expression for transformation of analog system function $H_a(s)$ to digital system function $H(z)$ using Bilinear Transformation method. Also illustrate with neat sketch relationship of s plane to z plane. Comment on advantage of BLT method over impulse invariance method. [10]
b) Determine parallel realization of IIR digital filter transfer function given by [7]

$$H(z) = \frac{z(5z-2)}{\left(z + \frac{1}{2}\right)\left(z - \frac{1}{3}\right)}$$

OR

- Q6)** a) Describe in brief characteristics of butterworth, chebyshev & elliptic filters. [9]
b) Find out $H(z)$ using impulse invariance method at 10 Hz sampling frequency from $H(s)$ as given below : [8]

$$H(s) = \frac{2}{(s+2)(s+3)}$$

- Q7)** a) Determine the impulse response $h(n)$ of a filter having desired frequency response

$$\begin{aligned} H_d(e^{jw}) &= e^{-j(M-1)w} \quad \dots \text{for } 0 \leq |w| \leq \pi/2 \\ &= 0 \quad \dots \text{for } \pi/2 < |w| \leq \pi \end{aligned}$$

M = 7. Use hamming window technique [9]

- b) Describe in brief frequency sampling method of FIR Filter Design. [8]

OR

- Q8)** a) If Transfer function of FIR LPF is $H(z) = 1 + 3z^{-1} + 4z^{-2} + 3z^{-3} + z^{-4}$. Show that impulse response is symmetric. [6]
- b) What is Gibb's phenomenon? How it is reduced? [5]
- c) Compare IIR & FIR filters. [6]

- Q9)** a) Describe in brief application of DSP in implementation of triggering for converter. [8]
- b) Illustrate your answer with neat sketch & also describe in brief architecture of general DSP processor. [8]

OR

- Q10)** a) Comment on following issues involved in DSP processor design. [8]
- i) Speed
 - ii) Accuracy
 - iii) Pipelining
 - iv) Quantization Error
- b) Describe in brief application of DSP in DC motor control. [8]



Total No. of Questions : 10]

SEAT No. :

P2384

[Total No. of Pages : 2

[5870]-1552

T.E. (Electronics Engg.)

EMBEDDED PROCESSORS

(2015 Pattern) (Semester - II) (304207)

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) Assume suitable data if necessary.
- 3) Figures to the right side indicate full marks.

Q1) a) List the features of MSP430 microcontroller. [4]

b) State the function of different GPIO port registers of MSP430. [6]

OR

**Q2) a) List features and applications of variants of the MSP430 family
MSP430x2x,MSP430x4xMSP430x5x. [6]**

b) Explain in brief system clocks of MSP430 microcontroller. [4]

Q3) a) Draw and Explain Data flow model of ARM7. [6]

b) Explain difference between ARM7, ARM9 and ARM11. [4]

OR

Q4) a) Explain Program Flow Model in ARM7 with its operating modes. [6]

b) Compare SPI and 12C Communication protocol. [4]

Q5) a) Explain Pin connect block and GPIO registers in LPC2148. [8]

**b) Draw and explain interfacing of 8 LEDs with port pin P1.24 to P1.31 of
LPC2148 and also write the embedded C program to blink the LEDs.
Also draw flowchart and Algoritm. [8]**

OR

P.T.O.

Q6) a) Explain the PLL and VPB divider of LPC2148. Explain the PLL Programming. Explain the calculation of values of ‘M’ multiplier and ‘P’ divider in PLL. [8]

b) Draw interfacing diagram of LCD to LPC2148. Also write a Embedded C program to display ‘INDIA’ on LCD. Also draw flowchart or Algorithm. [8]

Q7) a) Draw and explain interfacing diagram of GPS to LPC2148. Also write a Embedded C program with its flowchart or Algorithm. [8]
b) Write a C program for generation of triangular waveform using on chip DAC of LPC 2148 along with its interfacing diagram, flowchart or algorithm. [9]

OR

Q8) a) List features of UART0 to LPC2148. Give the difference between UART0 and UART1. [8]
b) Write a C program for generation of square waveform using on chip DAC of LPC2148 along with its interfacing diagram, flowchart or algorithm. [9]

Q9) a) Draw and explain CMSIS structure of cortex series. [9]
b) Compare ARM7 with CORTEX M Series. [8]

OR

Q10)a) Draw and explain block diagram of ARM CORTEX M3. [9]
b) Compare CORTEX A, CORTEX M, CORTEX R processor series.[8]



Total No. of Questions : 8]

SEAT No. :

P2385

[Total No. of Pages : 2

[5870]-1553

T.E. (Electronics Engineering)

**BUSINESS MANAGEMENT AND ORGANISATION
(2015 Pattern) (Semester - II) (304208)**

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 wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) a) Explain various factors to be considered while setting up an enterprise. [8]

b) Explain the pros and cons of globalization. [6]

c) Write a short note on public sector. [6]

OR

Q2) a) List various government policies and explain the SEZ policy. [8]

b) List features, relative merits and demerits of Sole Proprietorship. [6]

c) Distinguish between Traditional commerce and E-commerce. [6]

Q3) a) Explain the various social auditing standards. [8]

b) Explain the importance of professionalization in business. [8]

OR

Q4) a) Explain various social responsibilities of a business enterprise. [8]

b) Explain Technological Development and Social Change in Business. [8]

Q5) a) Define management and explain the functions of management. [8]

b) What are the principles of management proposed by Henri Fayol. [8]

OR

Q6) a) Explain management as Art, Science and Profession. [8]

b) Explain F. W. Taylor's principles of scientific management. [8]

P.T.O.

- Q7)** a) Write a short note on : [10]
i) Total Quality Management
ii) Strategic Management
b) Write a short note on importance of decision making in Business Organization. [8]

OR

- Q8)** a) Write a short note on : [10]
i) Change Management
ii) Management of crisis
b) Write a short note on Environment friendly management. [8]



Total No. of Questions : 10]

SEAT No. :

P2386

[Total No. of Pages : 2

[5870]-1554

T.E. (Electronics)

FUNDAMENTALS OF HDL

(2015 Pattern) (Semester - II) (304209)

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 is process statement in VHDL? Write a VHDL code by using process for a sequential statement. [6]

b) Write a VHDL code for a 4:1 MUX by using case statement. [4]

OR

Q2) a) Draw Logic block, truth table and logic gate circuit of full adder. [4]

b) Write a VHDL code using structural modeling style for a 4-bit ripple adder by using full adder. [6]

Q3) a) Distinguish between asynchronous and synchronous finite state machines. [6]

b) Describe in brief assert and report statement. [4]

OR

Q4) a) State the features of CPLD and FPGA. [6]

b) Classify programmable logic devices. [4]

Q5) a) Describe in detail the data types of Verilog HDL. [8]

b) With an example write a Verilog HDL code by using always statement. [5]

c) How many abstraction levels are there in Verilog HDL. [4]

OR

P.T.O.

- Q6)** a) Write a Verilog HDL Code for 4-bit full adder by using case statement. [8]
b) With an example explain blocking and non blocking statements in Verilog HDL. [9]

- Q7)** a) Write a Verilog HDL Code for a 4-bit comparator. [8]
b) What are the reduction operators and represent them by their logic symbol. [4]
c) Find the value of following expressions if the two unsigned variables are
 $A = 4'B\ 1111$ and $B=4'B1011$
i) $\{A\&\&B\}$
ii) $(A\ ||\ B)$
iii) $\{4\{A\},2\{B\}\}$ [4]

OR

- Q8)** a) Sketch the logic block, truth table and Write a Verilog HDL code for a 3-bit serial in serial out register. [8]
b) Explain in detail a task and a function with an example. [8]

- Q9)** a) Explain relative and logical operators with examples of Verilog HDL. [8]
b) What are the sequential statements in Verilog HDL. Write a verilog code for a 3:8 decoder using assign statement. [9]

OR

- Q10)** a) What are the data types available in nets for Verilog HDL. [8]
b) List down the features, compare and contrast of Verilog HDL and VHDL. [9]



Total No. of Questions : 8]

SEAT No. :

P2387

[Total No. of Pages : 2

[5870]-1555

T.E. (Electronics)
PLC & APPLICATIONS
(2015 Pattern) (Semester - II) (304210)

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) Figures to the right indicate full marks.

Q1) a) Define PLC? Explain relay and ladder logic in detail. [8]

b) What is processor memory organization? How PLC memory structured? [6]

c) List data handling functions used in PLC? Explain matrix function used in ladder logic? [6]

OR

Q2) a) Write in your own words about Hardwired logic and programmed logic? [8]

b) Write a ladder logic for XOR and NOR gate? [6]

c) Design ladder logic for a system using comparision instruction. [6]

Motor 1 starts as soon as the PLC starts. After 10 seconds, Motor 1 goes OFF & Motor 2 starts. After 5 seconds Motor 2 goes OFF and Motor 3 starts. After another 10 seconds Motor 2 restarts and after 5 seconds it stops and motor 1 starts and cycle is repeated?

Q3) a) Describe for PLC installation which consideration to be taken care about operating environment? [8]

b) How to identify error in [8]

i) Processor module

ii) Input & output malfunctions

OR

P.T.O.

- Q4)** a) Explain how leakey input & output and voltage surges will affect on PLC performance? [8]
- b) List general stops followed commissioning of a PLC system and explain them in brief. [8]

- Q5)** a) List types of processes? Explain a motion control system in detail? [8]
- b) Draw a detail block diagram of SCADA & describe operation of RTO.[8]
- c) List advantages of HMI? [2]

OR

- Q6)** a) What is HMI? Explain interface technique of PLC with HMI. [8]
- b) Illustrate MTU operating interfaces & its applications? [6]
- c) Explain on/off control system. [4]

- Q7)** a) What is fieldbus? Explain the working of it? List the industrial application of field bus. [8]
- b) Explain (i) CAN (ii) Profibus-DP. [8]

OR

- Q8)** a) With the help of neat diagram explain Two & three axis robot control with PLC. [8]
- b) List types of communication interface? Explain serial communication protocol in details. [8]



Total No. of Questions : 8]

SEAT No. :

P2388

[Total No. of Pages : 2

[5870]-1556

T.E. (Electronics Engineering)
POWER ELECTRONICS AND APPLICATIONS
(2015 Pattern) (Semester - I) (304201)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Figure to the right indicate full marks.*
- 2) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) What are heat sinks? Explain any one method of cooling technique with its need in high power industries. [7]
b) Explain Voltage protection by Selenium diodes and MOVs. [7]
c) Explain Microprocessor based control circuit for power electronics applications. [6]

OR

- Q2)** a) Define triggering circuits. What are the different types triggering methods? Explain any one in details. [7]
b) Draw and explain three phase semi converter for RL Load with waveforms. [7]
c) Compare MOSFET and IGBT. [6]

- Q3)** a) Explain single phase full bridge inverter for R Load. Derive the expression for RMS output voltage. [8]
b) Explain voltage control of inverters using PWM. [8]

OR

- Q4)** a) Draw and explain three phase inverter with the help of waveform for 120° conduction mode for R load. [8]
b) Explain Single phse AC voltage controller with R load. [8]

P.T.O.

- Q5)** a) A simple d.c. chopper is operating at frequency f_0 2KHz from a 96V d.c. source to supply a load resistance of 8Ω . The load time constant is 6ms. If average load voltage is 57.6 V, find i) T_{on} period of the chopper ii) The RMS value of the load voltage iii) The average load current iv) The magnitude of the ripple current and its RMS value. [10]
- b) Explain Class C chopper with its wave forms. [8]

OR

- Q6)** a) Explain fly-back converter (SMPS) with circuit diagram and its appropriate waveforms. [10]
- b) Explain Buck-Boost converter in detail. [8]

- Q7)** a) 18 lead - acid cells, each having a discharge capacity of 90A-H at 10 hours rate are being charged at constant current continuously for 8 hours. The A-H efficiency is 85% and terminal voltage per cell at the beginning of charging is 2.4 volts. Determine the dc supply voltage required to charge the battery and charging current if the internal resistance of the battery is 0.1Ω . [8]
- b) Explain application of power electronic in inducting heating. [8]

OR

- Q8)** a) Draw and explain monopolar HVDC transmission system. Also state its advantages. [8]
- b) Explain Classification of electric drives with selection of power converters for different drive applications. [8]



Total No. of Questions : 8]

SEAT No. :

P2389

[Total No. of Pages : 2

[5870]-1557

T.E. (Electronics)
INSTRUMENTATION SYSTEMS
(2015 Pattern) (Semester - I) (304202)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right side indicate full marks.

- Q1)** a) Define sensor & transducer? Give classification of transducer based on their electrical parameters. [6]
b) Draw block diagram of LMTS & Explain in detail. [6]
c) Which are the types of level measurement sensor? Explain DP cell in detail with diagram. [8]

OR

- Q2)** a) Define : [6]
i) Accuracy
ii) Non-linearity
iii) Sensitivity
iv) Response time
b) Draw and explain working to thermocoupic? [6]
c) List variable area type flow meters. Draw & explain in brief rotameter and vortex shedding? [8]

- Q3)** a) Draw a neat diagram of rotary detector? How angular displacement is measured? [8]
b) Explain construction and working of LVDT. How LVDT can be used as pressure sensor? [8]

OR

- Q4)** a) Explain in brief. [8]
i) CMOS image sensor
ii) Gas Home detector.
b) List the types of motion detectors? Explain optoelectronics motion sensor? [8]

P.T.O.

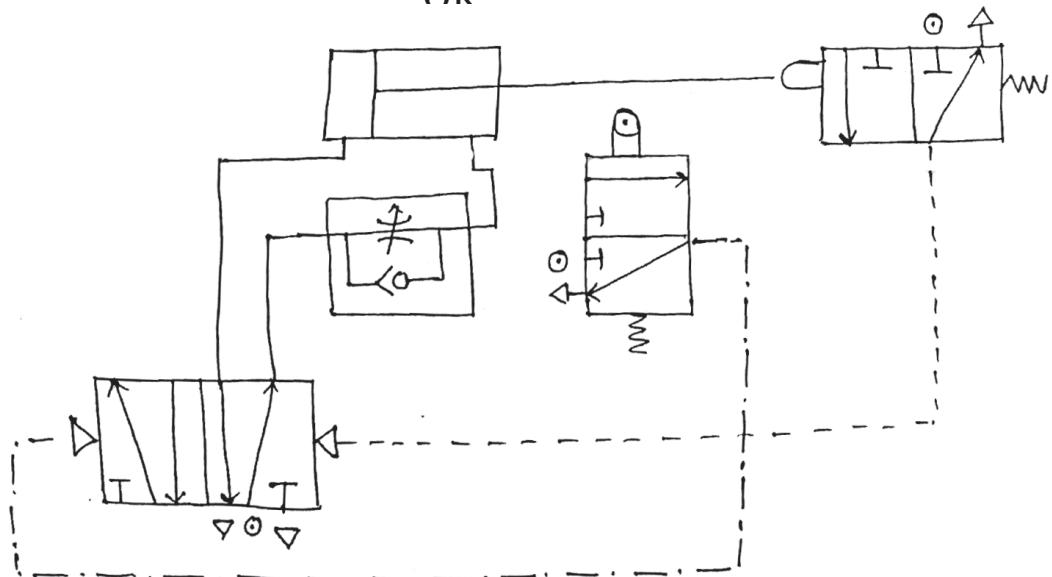
- Q5)** a) What is MRE? Explain its working & Applications. [6]
 b) With neat diagram explain working of hot wire anemometer? [6]
 c) Explain micromachined absolute pressure sensor. [6]

OR

- Q6)** a) Extend your view on application of SMART sensors in todays engineering aspect? [6]
 b) Draw and explain working and construction of surface micro machined accelerometer? [6]
 c) What is MEMS? Explain piezoelectric sensor (PTZ) with neat diagram. [6]

- Q7)** a) What is final control element? Draw and explain any one pneumatic system in details? [8]
 b) With reference to the diagram explain process in detail (assume suitable initial condition). [8]

OR



- Q8)** a) What is actuator? With neat diagram explain rotary spool valve & solenoid valve. [8]
 b) Draw a neat diagram of
 i) Double acting cylinder with double rod
 ii) Rolling diaphram cylinder



[5870]-1558**T.E. (Electronics Engineering)****ELECTROMAGNETICS AND WAVE PROPAGATION****(2015 Pattern) (Semester - I) (304203)****Time : 2½ Hours]****[Max. Marks : 70****Instructions to the candidates:**

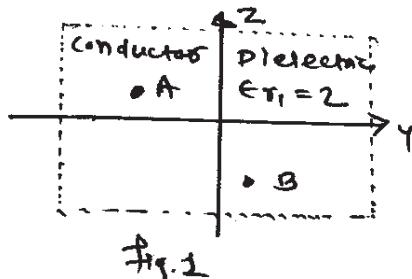
- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of electronic pocket calculator and smith chart is allowed.

Q1) a) State and explain Coulomb's law of force. [4]**b) For a parallel plate capacitor, area of plate A = 120 cm², spacing between plates d = 5mm, separated by dielectric of $\epsilon_r = 12$, connected to 40V battery. Find [6]**

- | | |
|----------------|--------------------------------|
| i) Capacitance | ii) \bar{E} |
| iii) \bar{D} | iv) Energy stored in capacitor |

OR**Q2) a) State and explain Divergence theorem. [4]****b) Using Ampere's circuital law find magnetic field intensity (\bar{H}) due to an infinite long straight current carrying conductor. [6]****Q3) a) Region y < 0 consists of a perfect conductor while region y > 0 is a dielectric medium ($\epsilon_r = 2$) as shown in fig.1. If there is a surface charge of 2 nc/m² on the conductor, determine \bar{E} and \bar{D} at [4]**

- | | |
|-----------------|------------------|
| i) A (3, -2, 2) | ii) B (-4, 1, 5) |
|-----------------|------------------|

**b) Derive an expression for Electric field intensity (\bar{E}) due to infinite line of charge. [6]****OR****P.T.O.**

- Q4)** a) An infinite long straight filament carrying a current of 3 amp is placed along z-axis. calculate the magnetic field intensity at point P (1, 2, 1). [4]
 b) Derive the expression for the capacitance of spherical plate capacitor. [6]

- Q5)** a) Give the relationship between \bar{E} and potential for time varying field. [4]
 b) State and explain Faraday's law. [4]
 c) The electric field propagating in a free space has $\bar{E} = E_m \sin(\omega t - \beta z) \hat{a}_y$
 Find displacement current density (\bar{J}_d), Magnetic flux density (\bar{B}) and
 magnetic field intensity (\bar{H}) Also sketch \bar{E} and \bar{H} at $t = 0$. [10]

OR

- Q6)** a) Explain displacement current density and also find the displacement current for parallel-plate capacitor with area of 5 cm^2 and plate separation of 3mm has a voltage $50 \sin 10^3 t \text{ V}$ applied to its plates by assuming $\epsilon = 2\epsilon_0$. [10]
 b) Write the Maxwell's equations for static and time varying fields in point form and integral form. [8]

- Q7)** a) Derive expression for wave equation in perfect conducting medium. [8]
 b) State and prove poynting theorem. Interpret each term. [8]

OR

- Q8)** a) Define polarization of uniform plane waves and also explain different types of polarization in detail. [8]
 b) A uniform plane wave of 200MHz travelling in free space is incident normally on large block of material having $\epsilon_r = 4, \mu_r = 9, \sigma = 0$. Calculate reflection and transmission coefficients. [8]

- Q9)** a) Explain the fundamental equation for the free space propagation. [8]
b) Explain the following. [8]
- i) Virtual Height
 - ii) MUF
 - iii) Skip distance
 - iv) Multi-hop propagation

OR

- Q10)** a) Explain modes of propagation : Ground, sky and space wave propagation. [8]
b) Explain characteristics of wireless channel. [8]
- i) Fading
 - ii) Multipath delay spread
 - iii) Coherence Bandwidth
 - iv) Coherence Time



Total No. of Questions : 8]

SEAT No. :

P2391

[Total No. of Pages : 2

[5870]-1559

T.E. (Electronics)

MICROCONTROLLERS AND APPLICATIONS

(2015 Pattern) (Semester - I) (304204)

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 side indicate full marks.
- 3) Assume suitable data, if necessary.

Q1) a) Explain the functions of following registers of 8051 microcontroller [4]

- i) Accumulator
- ii) Program Counter
- iii) DPTR
- iv) Stack Pointer

b) Draw and explain the block diagram of Logic analyzer. How it is different from CRO? [8]

c) Draw interfacing of 8 bit DAC with 8051 microcontroller. Write an assembly language program to generate Ramp and Triangular waveforms. [8]

OR

Q2) a) Interface relay with 8051 microcontroller. Write an assembly language program to ON and OFF relay with a delay of 1 second. [4]

b) Explain different timer modes of 8051 microcontroller. [8]

c) Explain the following development tools [8]

- i) Assembler
- ii) Compiler
- iii) IDE
- iv) Emulators

Q3) a) Explain the following with respect to PIC18FXXX microcontroller [8]

- i) Watch dog timer
- ii) Power down mode

b) Explain various oscillator options in PIC18FXXX microcontroller. Explain how to select the oscillator options. [8]

OR

P.T.O.

- Q4)** a) Draw the structure of Status register and RCON register of PIC18FXXX microcontroller. Explain the function of each bit in above registers microcontroller [8]
- b) Explain the following instructions of PIC18FXXX microcontroller. [8]
- ANDLW 0 ×11
 - MULW 0 × 22
 - ADDLW 0 × 01
 - RETFIE

- Q5)** a) Interface 16 × 2 LCD in 8 bit mode with PIC18FXXX. Write an embedded C program to display message “SPPU” on LCD. [8]
- b) Calculate timer count and write an embedded C program to generate square wave of frequency 1 kHz using timer 0 on PORTA.3 pin of PIC18FXXX microcontroller. Assume crystal frequency of 10 MHz.[8]

OR

- Q6)** a) With the help of neat diagram explain how speed of dc motor can be controlled by using CCP of PIC18FXXX microcontroller. [8]
- b) Interface LED 0 and LED 1 to PORTC.0 and PORTC.1 pin of PIC18FXXX microcontroller. Write an embedded C program to turn ON and OFF alternate LED. [8]

- Q7)** a) Explain MSSP structure with I2C mode in PIC18FXXX microcontroller [8]
- b) Explain designing of home protection system. Draw and explain home protection system. [10]

OR

- Q8)** a) List the features of ADC of 18FXXX microcontroller. Write an embedded C program to convert analog input signal into digital. [8]
- b) Write short note on : [10]
- I2C
 - SPI



Total No. of Questions : 10]

SEAT No. :

P2392

[Total No. of Pages : 2

[5870] - 1560

T.E. (Electronics Engineering)

DATA COMMUNICATION

(2015 Pattern) (Semester - I) (304205)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer the 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) Use of logarithmic tables slide rule, Electronic pocket calculator is allowed.
- 5) Assume Suitable data, if necessary.

- Q1)** a) Compare coaxial cable, Fiber optic cable, Twisted pair cable. [6]
b) Explain ARQ stop and Go back N error control systems in Detail. [4]

OR

- Q2)** a) The parity check matrix of a particular (7, 4) linear block code given by

$$[H] = \begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix} [6]$$

- i) Find Generator Matrix.
ii) List all code vectors.
b) A continuous signal is band limited to 5kHz. The signal is quantized to 8 level of PCM system with the probabilities 0.25, 0.2, 0.2, 0.1, 0.1, 0.05, 0.05, and 0.05. Calculate the rate of information. [4]

- Q3)** a) Explain in detail [6]
i) Information rate
ii) Mutual Information
iii) Entropy
b) Explain various data transmission modes with suitable example. [4]

P.T.O.

OR

- Q4)** a) An information source produces a sequence of independent symbols having the following probabilities. $S_1 = 1/3$, $S_2 = 1/27$, $S_3 = 1/3$, $S_4 = 1/9$, $S_5 = 1/9$, $S_6 = 1/27$, $S_7 = 1/27$. Construct Ternary code using Huffman encoding procedure and find its efficiency. [6]

b) Compare linear block code and convolution code. [4]

- Q5) a)** Draw the waveforms for the bit sequence 10111001 [8]
i) Unipolar RZ ii) Polar NRZ
iii) AMI iv) Split phase Manchester

b) Draw and Explain DPCM transmitter and receiver. [8]

OR

- Q7)** a) Explain the ASK receiver with the help of Wave form. [8]
b) Explain the QPSK receiver with the help of Wave form. [8]

OR

- Q8)** a) Draw and Explain the generation and detection of BPSK signal. [8]
b) Compare ASK, BFSK, BPSK, MSK. [8]

- Q9)** a) Draw and explain the DSSS BPSK Transmitter and Receiver. [8]
b) Explain the PN sequence generator with diagram and truth table. Also write down the properties of PN sequence. [10]

OR

- Q10)**a) Explain the operation of FHSS with the help of block diagram and waveforms. [8]
b) Explain working principle of Slotted ALOHA, ALOHA, CSMA/CD and CSMA/CA. [10]



Total No. of Questions : 8]

SEAT No. :

P3805

[Total No. of Pages : 2

[5870]-1561

T.E. (E & TC)

POWER ELECTRONICS

(2015 Pattern) (Semester - II) (304186)

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 side indicate full marks.
- 4) Assume suitable data wherever necessary.
- 5) Use of calculator is allowed.

- Q1)** a) Explain Construction & VI characteristics of SCR of using suitable waveform. [7]
b) Compare MOSFET & IGBT in detail, Draw & Explain VI characteristics of IGBT. [7]
c) Draw and explain the single phase bridge Inverter for R-L load using IGBT with the help of suitable waveforms. [6]

OR

- Q2)** a) The trigger circuit of a thyristor has a source voltage of 15v and the load line has slope of –120v per ampere. The min. gate current to turn on the SCR is 25 mA, Compute: Source resistance required in the gate current circuit, The trigger voltage and trigger current for an average gate power dissipation of 0.4 watts. [7]
b) Explain about the various ratings & Gate characteristics of SCR. [6]
c) Draw & explain about Single phase Semi converter with RL load with waveform. [7]

- Q3)** a) Draw & explain about DC Chopper, Explain step up chopper. [8]
b) A dc chopper has a resistive load of 20W and input voltage $V_S = 220V$. When chopper is ON, its voltage drop is 1.5 volts and chopping frequency is 10 kHz. If the duty cycle is 80%, determine the average output voltage and the chopper on time. [8]

P.T.O.

OR

Q4) a) Explain the working single phase full wave AC voltage controller with R load, derive RMS output voltage equation. [8]

b) A chopper circuit is operating on TRC at frequency of 2 kHz on 440 volt DC supply, if the load voltage is 350 volts; calculate the conduction period of thyristor in each cycle. [8]

Q5) a) What is SLR half bridged DC-DC converter, explain through circuit, its uses & application? [6]

b) Explain working of ONINE Ups & OFF line UPS. [6]

c) Full-bridge series resonant inverter with bidirectional switches has $C_r = 6 \text{ m F}$, $L_r = 50 \text{ mH}$, $R = 2 \text{ W}$, $f_0 = 3.5 \text{ kHz}$ and $E_{dc} = 220 \text{ V}$. Calculate the average supply current. [6]

OR

Q6) a) Explain Voltage & frequency control methods for 3 Phase induction motor drive. [6]

b) A 3-pulse cycloconverter feeding a single-phase load of 200 V, 50 A at a power factor of 0.8 lagging. Calculate the Power factor of the supply current. [6]

c) How EMI will define? State various sources & minimizing techniques of EMI. [6]

Q7) a) What are speed control techniques of DC Motor? Explain single phase separately exited DC motor power circuit. [8]

b) Explain the operation of step down SMPS, Draw the diagram using PWM IC LM 3524. [8]

OR

Q8) a) Explain & draw about the snubber circuit, explain through application to power circuit. [8]

b) Explain the working of LED lamp driver circuit used for house hold application explain through block diagram. [8]



Total No. of Questions : 8]

SEAT No. :

P2393

[Total No. of Pages : 2

[5870] - 1562

T.E. (Electronics & Telecommunication)
INFORMATION THEORY, CODING AND
COMMUNICATION NETWORKS
(2015 Pattern) (Semester - II) (304187)

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) Define Entropy and explain Shannon's source coding theorem. [6]

b) Consider a (6, 3) LBC whose generator matrix is

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

find all possible codewords. If the received codeword is $r = [0\ 0\ 1\ 1\ 1\ 0]$, obtain the corrected codeword. [6]

c) Draw the hardware circuit for cyclic encoder with generator polynomial $g(x) = 1 + x^2 + x^3$. Obtain the codeword for the message word [1 0 1 1] using polynomial division method. [8]

OR

Q2) a) State the objectives of source coding & channel coding. State & explain Shannon's channel coding theorem. [6]

b) State information capacity theorem. If a binary signal is sent over 3KHz channel with SNR 20dB, what is maximum achievable rate? [6]

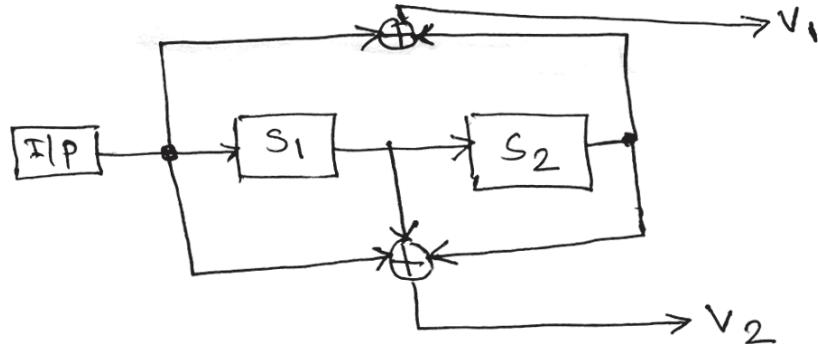
c) For the (7, 4) cyclic code, generator polynomial is $g(x) = x^3 + x^2 + 1$. Find the syndrome for received codeword [1 1 0 1 1 0 1], If the parity check matrix is given as below.

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

Draw the syndrome decoder circuit. [8]

P.T.O.

- Q3)** a) Find the generator polynomial for BCH code with block length $n = 15$ and error correcting capacity $t_c = 1, 2$. Assume primitive polynomial $p(x) = x^4 + x + 1$. [9]
 b) For the convolutional encoder shown in figure, draw state diagram and trellies diagram. What is constraint length of given encoder? Encode the sequence [1 0 1 1] [9]



OR

- Q4)** a) The received code polynomial for (7, 4) BCH code is $r(x) = x^6 + x^4 + x^3 + x^2$. Find the corrected codeword if $t_c = 1$ $p(x) = x^3 + x + 1$. [9]
 b) Find the generator polynomial for (7, 3) RS code. Also find the codeword for $m = [011, 001, 110]$. [9]

- Q5)** a) Draw and explain the TCP/IP reference model. [8]
 b) Define Network. Explain different network topologies. [8]

OR

- Q6)** a) Define transmission media. Explain guided and unguided transmission media. [8]
 b) Draw OSI model. Compare OSI & TCP model. [8]

- Q7)** a) State & explain in brief the functions associated with Data Link Layer in OSI model. [8]
 b) What is ARQ? Explain ARQ protocols types. [8]

OR

- Q8)** a) Draw and explain HDLC protocol and frame structure. [8]
 b) What is framing? Explain character count and bit stuffing methods of framing. [8]



Total No. of Questions : 8]

SEAT No. :

P2394

[Total No. of Pages : 2

[5870]-1563

T.E. (Electronics & Telecommunication)
BUSINESS MANAGEMENT
(2015 Pattern) (Semester - II) (304188)

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 side indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) Enlist the forms of organization and compare traditional organization with modern organization. [6]

b) Describe break even analysis with graphical representation. [6]

c) A company producing a single product at Rs. 5 each. The marginal cost of production is Rs. 3 and fixed cost is Rs. 200 P.A. Calculate (i) P/V ratio (ii) Break Even Point (iii) The sales to earn a profit of Rs. 250. [8]

OR

Q2) a) Elaborate the concept of globalization. [6]

b) Define Kaizen system and write a short note on 5S quality management standards. [6]

c) State the attributes of a project and Justify - fixed and working capitals are important for setting up the business. [8]

Q3) a) State the objectives of HRM and explain the challenges to HR professionals. [8]

b) Describe the human resource planning with neat schematic and list out the objectives of it. [8]

OR

P.T.O.

- Q4)** a) Define recruitment in HRD and explain the sources of recruitment. [8]
b) Enlist the steps in talent acquisition process and justify-recruitment strategies are well designed to build the right team. [8]

- Q5)** a) Identify and describe the role of an entrepreneur in the economic development. [8]
b) Explain business plan and state the reasons for preparing business plan. [8]

OR

- Q6)** a) Discuss on “Women Entrepreneur” and describe policies with schemes for it in India. [8]
b) Compare :
i) MOA and AOA.
ii) Proprietorship and Partnership.

- Q7)** a) Explain marketing environment and state the macro environmental factors of marketing. [10]
b) Explain the need of market research and describe the salient features of it. [8]

OR

- Q8)** a) Write a short note on:
i) Supply Chain Management.
ii) Customer Relationship Management.
b) Enlist the types of branding and enumerate the activities of sales force management. [8]



Total No. of Questions : 8]

SEAT No. :

P2395

[Total No. of Pages : 2

[5870] - 1564
T.E. (E & TC)
ADVANCED PROCESSORS
(2015 Pattern) (Semester - II) (306189)

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) Assume Suitable data wherever necessary.

Q1) a) What is TDMI? Compare ARM instruction set and thumb instruction set. [6]

- b) Write an ALP to Add & Multiply two numbers. [7]
- c) Interface & LED's and write embedded C program to flash LED's alternately. [7]

OR

Q2) a) Draw and explain programmers model of ARM7. [6]

- b) Write an embedded C program to transmit & receive data using UARTO. [7]
- c) Explain the steps involved in PLL programming. [7]

Q3) a) Draw an interfacing diagram to display temperature on LCD. Write an embedded C program for initialization of ADC. [8]

- b) Draw interfacing diagram of SD card with LPC2148. Also write steps for switching SD bus mode to SPI bus mode. [8]

OR

Q4) a) Interface EEPROM with LPC2148 using I²C protocol. Also write steps for reading / writing from EEPROM. [8]

- b) Interface GSM module with LPC2148 and write embedded C program to send message "SPPU PUNE". [8]

P.T.O.

- Q5)** a) Explain the general purpose register files of TMS320C67X processor with the help of example. [8]
b) Draw and explain the computer hardware architecture for digital signal processing. [8]

OR

- Q6)** a) Explain the concept of Extended parallelism. Also explain SIMD. [8]
b) Draw and explain Data path of TMS320C67X. [8]

- Q7)** a) Enlist on chip peripherals of TMS320C67X. Also explain concept of timers. [10]
b) Explain functional units of TMS320C67X. With the help of instruction set. [8]

OR

- Q8)** a) Explain the concept of pipeline operation of TMS320C67X. [10]
b) Explain the functions of following instructions in detail. [8]
i) MPYU .M1 or .M2
ii) LDBU .D1 or .D2
iii) MVKLH .S1 or .S2
iv) SADD .M1 or .M2



Total No. of Questions : 8]

SEAT No. :

P2396

[Total No. of Pages : 3

[5870]-1565

T.E. (E & TC)

**SYSTEM PROGRAMMING AND OPERATING SYSTEM
(2015 Pattern) (Semester - II) (304190)**

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) Figures to the right indicate full marks.

- Q1)** a) Explain Lexical analysis, syntax analysis & semantic analysis with one example. [7]
b) What is function of loader? Explain different loading schemes with appropriate examples. [7]
c) Differentiate between pre-emptive & non-pre-emptive scheduling. [6]

OR

- Q2)** a) Consider the following process where the arrival and burst time as shown below calculate average waiting time + turnaround time using FCFS algorithm. [7]

	Burst Time	Arrival Time
--	------------	--------------

P ₁	06	0
P ₂	04	1
P ₃	07	3
P ₄	02	5

- b) Explain phases of compiler with one example. [7]
c) Explain the following terms: [6]
- i) Macro definition
 - ii) Macro cell
 - iii) Nested Macro Call

P.T.O.

- Q3)** a) What is dead lock in operating system? Explain in brief dead lock avoidance method. [6]
- b) Explain Dinning Philosophers problem with solution. [6]
- c) Find out the safe sequence for execution of 3 processes using bankers algorithm. [6]

Maximum resources are:

$$R_1 = 04$$

$$R_2 = 04$$

Allocation Matrix

	R ₁	R ₂
P ₁	1	0
P ₂	1	1
P ₃	1	2

Maximum Required Matrix

	R ₁	R ₂
P ₁	1	1
P ₂	2	3
P ₃	2	2

OR

- Q4)** a) Explain interprocess communication in detail. [6]
- b) Write a short note on semaphore with one example. [6]
- c) Find out the safe sequence for the execution of the following processes using bankers algorithm. [6]

Maximum resources:

$$R_1 = 15$$

$$R_2 = 08$$

Allocation Matrix

	R ₁	R ₂
P ₁	2	1
P ₂	3	2
P ₃	3	0

Maximum Required Matrix

	R ₁	R ₂
P ₁	5	6
P ₂	8	5
P ₃	4	8

- Q5)** a) Explain concept of paging & give significant advantages & disadvantages of the paging mechanism. [6]
- b) Write a note on virtual memory. [4]
- c) Mention different page replacement algorithms & explain any one of them. [6]

OR

- Q6)** a) Consider the following page reference string 1, 2, 3, 4, 2, 1, 5, 6, 1, 2, 3, 7, 6, 3, 2, 1, 3, 6. The number of pages frame = 3. Calculate page faults using LRU. [6]
- b) Differentiate between paging & segmentation. [4]
- c) Consider the following page reference string 8, 1, 3, 5, 3, 1, 4, 8, 5, 7, 1, 2. The number of page frames = 3, calculate the page faults & the hit ratio for first in first out page replacement algorithm. [6]

- Q7)** a) Write a note on: [6]
- i) Directory structure in OS.
 - ii) File management system in OR.
- b) Explain linux file system. [6]
- c) Explain DMA concept in detail. [4]

OR

- Q8)** a) Write a short note on RAID disc. [6]
- b) Explain I/O software layer. [6]
- c) Give difference between memory mapped I/O & I/O mapped I/O. [4]



Total No. of Questions : 8]

SEAT No. :

P2397

[Total No. of Pages : 3

[5870]-1566

T.E. (E & TC)

DIGITAL COMMUNICATION

(2015 Pattern) (Semester - I) (304181)

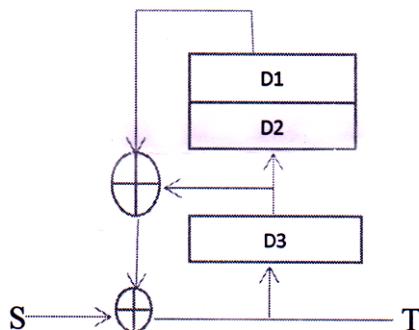
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) 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 the detailed block diagram of digital communication system and explain working of each block. [8]
- b) In digital communication scrambler is needed, why? The data stream $s = 1010000$ is the input to the scrambler shown in fig. Obtain scrambler output. Draw the descrambler also. [8]



- c) A WSS random process $X(t)$ is passed through LTI system with impulse response $h(t) = 9e^{-3t} u(t)$. Find mean value of output $Y(t)$ if $E[X(t)] = 3$. [4]

OR

P.T.O.

- Q2)** a) Draw the block diagram of Linear Predictive Coder (LPC) transmitter and receiver and explain it. [8]
- b) What is narrowband noise? Show the generation of narrowband noise from its in-phase and quadrature components. [8]
- c) What is ISI? Explain causes and remedies for it. [4]

- Q3)** a) Derive the expression of SNR for integrator and dump filter and explain the working of it. [8]
- b) A binary data is transmitted at a rate of 10 Mbps over a channel whose bandwidth is 8 MHz. [8]

Find signal energy per bit at receiver input for $P_e \leq 10^{-4}$. Assume $\frac{No}{2} = 10^{-10}$ watt/Hz. ($\text{erf}(2.6) = .9998$)

- c) What is correlator? [2]

OR

- Q4)** a) Explain Gram-Schmitt procedure for Orthogonalization. [6]
- b) A binary signal has amplitude $\pm 2V$ held for a time T. The signal is corrupted by white Gaussian noise having power spectral density 10^{-4} volt 2 /Hz. If the signal is processed by Integrator and dump filter, what should be minimum time T of the signal so that error probability is not above 10^{-4} ? ($Q(3.71) = 10^{-4}$). [8]
- c) State the properties of Matched filter. [4]

- Q5)** a) If a digital message input data rate is 8 kbps and average energy per bit is 0.001 unit. Find. [8]
- i) Bandwidth required for transmission of message through BPSK, QPSK, 16-PSK, orthogonal BFSK and 16-QAM
 - ii) Put these schemes in order of their susceptibility to noise after calculating minimum separation in signal space.
- b) Draw and explain QPSK receiver with required derivation of o/p. Also draw PSD curve and calculate bandwidth for the same. [8]

OR

Q6) a) A BPSK signal is received at the input of a coherent optimal receiver with amplitude 10mv and frequency 10 KHz. The signal is corrupted with white noise of PSD 10^{-9} W/Hz. If data rate is 10^4 bits/sec. Find the error probability and required average energy per bit. ($\text{erfc}(1.58)=0.0254$) [8]

b) Explain generation and reception of DPSK. Also draw the suitable transmitted and received signal waveforms. [8]

Q7) a) Explain spread spectrum technique with block diagram and draw waveforms at each step. [6]

b) PN sequence is generated using a feedback shift register of length $m=4$. Chip rate is 10^7 chips/sec. Find the following [4]

- i) PN sequence length
- ii) Chip duration of the PN sequence
- iii) PN sequence period

c) Explain slow and fast frequency hopping with the help of relevant diagram. [6]

OR

Q8) a) Explain DSSS in detail and state the applications of the same. [4]

b) The information bit duration in DSSS-PSK system is 10 msec. while the chipping rate is 1 MHz Assuming an average error probability is 10^{-6} for proper detection of message signal, calculate the jamming margin and processing gain. ($Q(4.7)=10^{-6}$) [6]

c) Design a 4 bit PN sequence generator and verify the properties of Maximum Length Sequence (MLS). Assume that initial condition is 1000. [6]



Total No. of Questions : 8]

SEAT No. :

P2398

[Total No. of Pages : 2

[5870]-1567

T.E. (Electronics & Telecommunication)

DIGITAL SIGNAL PROCESSING

(2015 Pattern) (Semester - I) (304182)

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) If $x(t) = \sin(70\pi)t + \cos(55\pi)t$ is sampled by $fs = 200$ Hz frequency. Then find out Nyquist rate, Nyquist interval and Nyquist frequency. [6]
- b) Compute the DFT for the sequence {1, 2, 0, 0, 0, 2, 1, 1} using radix-2 DIT-FFT algorithm. [7]
- c) State and prove the time shifting and time reversal properties of z-transform. [7]

OR

- Q2)** a) Determine the 4 point DFT of the sequence $x(n) = \{1, 1, 1, 1\}$ using DITFFT. [6]
- b) Derive and draw the radix-2 DIF algorithm for FFT of 8 points. [7]
- c) Find the inverse z-transform of $H(z) = z(z+2)/(z-0.2)(z+0.6)$. [7]

- Q3)** a) Explain the procedural steps in the design of low pass digital Butterworth filter and list its properties. [8]
- b) Convert the analog filter in to a digital filter whose system function is $H(s) = \frac{s+0.2}{(s+0.2)^2 + 9}$. Use Impulse Invariant Transformation. Assume $T = 1$ sec. [9]

OR

P.T.O.

Q4) a) For a given specifications of the desired low pass filter given below. [8]

$$0.707 \leq |H(\omega)| \leq 1.0, \quad 0 \leq \omega \leq 0.2\pi$$
$$|H(\omega)| \leq 0.08, \quad 0.4\pi \leq \omega \leq \pi$$

design a Butterworth filter using bilinear transformation.

b) Apply Bilinear Transformation to $H(s) = \frac{2}{(s+2)(s+3)}$ with $T = 0.1$ sec. [9]

Q5) a) Differentiate IIR filters and FIR filters. [8]

b) Design a linear phase FIR band filter using hamming window with cut off frequencies 0.2 rad/sec & 0.3 rad/sec, $M = 7$. [9]

OR

Q6) a) What is Gibb's phenomenon? How is it reduced? [8]

b) Show that the filter with symmetric impulse response has linear phase response. [9]

Q7) a) Draw a block diagram of Digital crossover audio systems. Explain in brief. [8]

b) Explain two band digital crossover in detail. [8]

OR

Q8) a) Discuss the interference cancellation in ECG using DSP. [8]

b) Explain Compact disc recording system in detail. [8]



Total No. of Questions : 10]

SEAT No. :

P2399

[Total No. of Pages : 3

[5870]-1568

T.E. (E & TC)

ELECTROMAGNETICS

(2015 Pattern) (Semester - I) (304183)

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, Q.9 or Q.10.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) Develop an expression for electric field intensity (\bar{E}) at general point 'P' due to infinite line charge distribution along Z axis. [5]
- b) For a line charge $\rho_1 = (10^{-9}/2)$ C/m on the z axis, Find V_{AB} , where A is (2m, $\pi/2, 0$) and B is (4m, $\pi, 5$ m). [5]

OR

- Q2)** a) State and prove Gauss's theorem for electrostatic field. [5]
- b) Derive the expression for parallel plate capacitance. [5]

- Q3)** a) State and explain Biot -Savart's law. [5]
- b) Derive boundary conditions for dielectric-conductor interface. [5]

OR

- Q4)** a) Derive the expression for magnetic field intensity \bar{H} due to infinite length conductor carrying current I. [5]
- b) A current sheet, $\bar{K} = 6.0 \hat{a}_x$ A/m, lies in the $z = 0$ plane and a current filament is located at $y = 0, z = 4$ m, Determine current I and its direction, if $\bar{H} = 0$ at (0,0,1.5)m. [5]

P.T.O.

Q5) a) Write Maxwell's equations in differential and integral form for time varying fields. [8]

b) If $\bar{E} = 125 e^{(3x-kt)} \hat{a}_y$ V/m in the free space, use Maxwell's equations to find magnetic field intensity and k. [8]

OR

Q6) a) State and prove Poynting theorem, interpret each term. [8]

b) What is Faraday's law? Derive expression for EMF induced in conductor in motion through time varying field. [8]

Q7) a) Define and explain primary and secondary parameters of transmission line. [8]

b) A telephone line has $R=6\Omega/\text{km}$, $L=2.2 \text{ mH/km}$, $C=0.005\mu\text{F/km}$, $G=0.05\mu\text{mho/km}$. Determine Z_o , α , β at 1 kHz. If the line length is 100km. determine the attenuation and phase shift of the signal. Also calculate the phase velocity of the signal. [10]

OR

Q8) a) Derive expression for characteristic impedance, propagation constant and velocity of propagation for distortion less line. [8]

b) A transmission line of length 100m and characteristics impedance 100Ω is terminated by load $Z_L = (100-j 200) \Omega$. Using Smith chart, determine line impedance and admittance at 0.25λ from the load end. [10]

Q9) a) Derive the reflection coefficient for uniform plane wave, when it is normally incident to the boundary. [8]

b) A plane wave travelling in air is normally incident on a block of paraffin with $\epsilon_r = 2.2$. Find the reflection and transmission coefficient. [8]

OR

- Q10)a**) What do you mean by uniform plane wave? Obtain wave equation travelling in free space in terms of \bar{E} . [8]
- b) A plane wave travelling in +Z direction in free space ($Z<0$) is normally incident at $Z = 0$ on a conductor ($Z>0$) for which $\sigma = 61.7 \text{ MS/m}$, $\mu_r = 1$. The free space \bar{E} wave has a frequency $f = 1.5 \text{ MHz}$ and an amplitude of 1.0 V/m ; at the interface it is given by $\bar{E}(0,t) = 1.0 \sin(2\pi ft) \hat{a}_y (\text{V/m})$. Find $\bar{H}(z,t)$ for $Z>0$. [8]



Total No. of Questions : 8]

SEAT No. :

P2400

[Total No. of Pages : 2

[5870]-1569

T.E. (E & TC)

MICROCONTROLLERS

(2015 Pattern) (Semester - I) (304184)

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) Neat diagrams 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) Explain Program Status Word (PSW) of 8051 with example. [6]

b) Interface 8 LEDs with port 1 of 8051 write assembly language program to flash alternate LEDs after every 1 sec. [8]

c) Explain Memory organization of 8051. [6]

OR

Q2) a) Explain instruction MUL, XOR and MOVx A, @ DPTR. [6]

b) Explain interface of ADC with 8051. Write a program to display hex value on LEDs connected to port 2. [8]

c) Explain modes of operation of Timers available in 8051. [6]

Q3) a) State silent features of PIC18F458. [8]

b) Draw and explain the program memory and Data memory map of PIC18. [8]

OR

Q4) a) Explain power down modes of PIC18F458 in detail. [8]

b) What are the various oscillator options? How can it be selected using Config register. [8]

P.T.O.

- Q5)** a) Explain the concept of CCP modes of PIC 18F458. [9]
b) Explain different ports of PIC18Fxx microcontroller along with SFR.[9]

OR

- Q6)** a) Interface LEDs to PIC 18Fxx controller. Write embedded C Program to flash LEDs after every 100 msec. [9]
b) State the programming steps for generation of time delay using Timer.[9]

- Q7)** a) Draw and explain MSSP structure of PIC18F458. [8]
b) Explain RS-232 and RS-485 Protocol in details. [8]

OR

- Q8)** a) Explain I₂C Protocol in details and compare I₂C, RS-232 and RS-485 protocols. [8]
b) Explain the step wise procedure and design methodology of PIC test board. [8]



Total No. of Questions : 8]

SEAT No. :

P2401

[Total No. of Pages : 2

[5870]-1570

T.E. (E & TC)

MECHATRONICS

(2015 Pattern) (Semester - I) (304185)

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

Q1) a) Mention the factors considered for the selection of transducers with example. [6]

- b) Compare positive displacement type and Non- Positive Displacement type pump with appropriate example. [8]
- c) Draw and explain a basic block diagram of Mechatronics system with suitable example. [6]

OR

Q2) a) Explain the construction & working principle of MEMS and Nano Sensors. [8]

- b) Draw and explain Washing Machine Mechatronics system used in daily life. [6]
- c) Explain block diagram of servomechanism and state its applications. [6]

Q3) a) Explain in detail the Fluid power system. [8]

- b) Draw a neat labeled diagram to explain the working of a lubricator in a Pneumatic System. [8]

OR

P.T.O.

- Q4)** a) Explain pneumatic lift system by pilot operated 2/2 valves. [6]
b) Classify the actuators based on their design and principle of working.[6]
c) Explain in details : [4]
i) Air filter & water trap
ii) Axial Piston pump

- Q5)** a) What are Electromechanical relays? State its use. [6]
b) What is a stepper motor? With the help of a diagram explain its working. [6]
c) Explain control of single-acting & double-acting cylinders. [6]

OR

- Q6)** a) Draw the symbol of [6]
i) 4/2 directional control valve
ii) 3/2 way spool valve
b) Explain the role of solenoids and relays as electrical actuators. [6]
c) Explain signal cables and Power cables. [6]

- Q7)** a) For a car parking system with appropriate inputs and outputs, explain the working using PLC ladder diagram. [8]
b) Explain the necessity of autopilot system for boat. Also explain its construction & working using diagram. [8]

OR

- Q8)** a) Write a short note on CNC machine. Compare the conventional NC with CNC machine. [8]
b) With the help of a block diagram explain the Anti Lock Braking system. State its significance in a vehicle. [8]



Total No. of Questions : 10]

SEAT No. :

P2402

[Total No. of Pages : 2

[5870]-1571

T.E. (Information Technology)

COMPUTER NETWORK TECHNOLOGY

(2015 Pattern) (Semester - II) (314450)

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

- Q1)** a) List and Explain four different timers in Transport Control Protocol (TCP). [6]
b) Explain in brief working of Simple Mail Transport Protocol (SMTP). [4]

OR

- Q2)** a) A service provider has given you the Class C network range 209.50.1.0. Your company must break the network into 20 separate subnets how many usable subnets are possible & usable hosts/subnet are possible? For the 15th usable sub network, give the IP address for : [6]
- i) Network ID
 - ii) 1st Usable Host
 - iii) Last Usable Host
 - iv) Broadcast IP
- b) Explain Domain Name System (DNS) resource records and its functions. [4]

- Q3)** a) Explain the Transport Control Protocol (TCP) header with diagram. [6]
b) Why File Transfer Protocol (FTP) requires two TCP ports? List and explain four FTP commands. [4]

OR

P.T.O.

- Q4)** a) How Nagle algorithm helps in TCP transmission policy? Explain the Clark's solution to overcome the silly window syndrome. [6]
b) Differentiate between File Transfer Protocol (FTP) and Trivial File Transfer Protocol (TFTP). [4]

- Q5)** a) Explain the basic architecture of WLAN and discuss various components in it. [8]
b) Explain with diagram the architecture of IEEE 802.15 (Bluetooth). [8]

OR

- Q6)** a) Compare IEEE 802.11 (WiFi) and IEEE 802.15 (Bluetooth). [8]
b) Explain 802.16 (WiMAX) protocol stack and its frame format. [8]

- Q7)** a) Explain design Goals of a transport Layer Protocol for Ad hoc Wireless Networks. [8]
b) Explain how hidden and exposed station problem is overcome in MACAW. [8]

OR

- Q8)** a) List routing protocols for Adhoc network and explain working of any one in detail. [8]
b) Compare Table driven and On -demand routing protocol. List their advantages and disadvantages. [8]

- Q9)** a) Write short note on following (any two) : [10]
i) Software Defined Networks (SDN).
ii) Internet of Things (IoT).
iii) LEACH
b) Define Internet of Things (IoT). What are the issues and challenges in Internet of Things (IoT). [8]

OR

- Q10)** a) Describe each component of sensor node architecture with diagram. [10]
b) Compare LEO, MEO and GEO. [8]



Total No. of Questions : 10]

SEAT No. :

P2403

[Total No. of Pages : 3

[5870]-1572

**T.E. (Information Technology)
SYSTEMS PROGRAMMING
(2015 Pattern) (Semester - II) (314451)**

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, 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) Enlist task of Pass-I and Pass-II of Two pass assembler. Also explain the data structure required for design of Two Pass Assembler. [5]
- b) How Literals are processed in Assembler. Explain with suitable examples. [5]

OR

- Q2)** a) Write a short note on Compile and Go loader. [5]
- b) What is Macro processor? With suitable example explain the working of MEC. [5]

- Q3)** a) What is Loader? Explain task performed by loader [5]
- b) Describe the data structures required in design of two pass Direct Linking Loader with suitable example. [5]

OR

- Q4)** a) Using the algorithm convert the following regular expressions to DFA:
 $(a,b)^* \cdot a \#$ [6]
- b) Describe single pass assembler. [4]

P.T.O.

- Q5)** a) Construct Predictive Parser for the following Grammar and show the working of parser for the input string id1 + id2 * id3. [8]

$$E \rightarrow E + T \mid T$$

$$T \rightarrow T * F \mid F$$

$$F \rightarrow (E) \mid id$$

- b) Write a note on Predictive Parser (LL1 Parser). [4]

- c) What is bottom-up parsing? Compare SLR and CLR parsers. [4]

OR

- Q6)** a) Explain Recursive Descent Parser by considering appropriate example of any CFG. [8]

- b) Write a short note on : [8]

i) Operator precedence parser.

ii) CLR

- Q7)** a) Define and give example the following. [8]

i) Syntax directed definition

ii) Syntax directed translation

iii) Synthesized attributes

iv) Inherited attributes

- b) Translate the following into postfix form. three address code. syntax tree and DAG. $(a^b)^*(c+d)+(a^b^c)$ [8]

OR

- Q8)** a) Construct quadruples, triples, for the expression [4]

- (a + b)*(c + d) - (a + b + c)

- b) Explain implicit and explicit type conversion. [4]

- c) Given the grammar below, write the syntax directed definition with the synthesized attribute val. Also draw the annotated parse tree for the expression $(3+4)^*(5+6)$. [8]

$$L \rightarrow E, E \rightarrow T$$

$$E \rightarrow E_1 + T, T \rightarrow F$$

$$T \rightarrow T_1 * F, F \rightarrow (E), F \rightarrow \text{digit}$$

- Q9)** a) With suitable example explain simple code generator. [6]
b) Compare Machine Dependent and Machine Independent Code optimization. [6]
c) Explain Common Sub-expression elimination with example. [6]

OR

- Q10)** a) Discuss the factors affecting target code generation. [9]
b) With examples explain at least four machine independent code optimization techniques. [9]



Total No. of Questions : 10]

SEAT No. :

P2404

[Total No. of Pages : 2

[5870]-1573

T.E. (Information Technology)

DESIGN & ANALYSIS OF ALGORITHMS

(2015 Pattern) (Semester - II) (314452)

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) Explain the proof by contradiction. Why do we need this proof technique? [5]
b) Solve the following instances of job sequencing with deadline problem using greedy approach. Let $n = 4$, $P[] = \{100, 10, 15, 17\}$, $D[] = \{2, 1, 2, 1\}$. [5]

OR

- Q2)** a) List the properties of various asymptotic notations. [5]
b) Find the optimal solution for the fractional knapsack problem making use of greedy approach. Consider $-n = 5$, $w = 60$ kg [5]
 $(w_1, w_2, w_3, w_4, w_5) = (5, 10, 15, 22, 25)$
 $(p_1, p_2, p_3, p_4, p_5) = (30, 40, 45, 77, 90)$

- Q3)** a) Explain Warshalls algorithm in detail? [5]
b) Write an algorithm for finding minimum cost binary search tree using dynamic programming strategy? [5]

OR

- Q4)** $N = 3$ and $\{a_1, a_2, a_3\} = \{\text{do, if, while}\}$ Let $P(1:3) = (0.5, 0.1, 0.05)$, $Q(0:3) = (0.15, 0.1, 0.05, 0.05)$. Compute and construct OBST for the above values using Dynamic Programming. [10]

- Q5)** a) Discuss Queen problem by giving algorithmic layout for the same. [8]
b) What is difference between recursive backtracking and iterative backtracking? What are implicit Rules for implementation of the same? Give outline of Backtracking Algorithm. [8]

OR

P.T.O.

- Q6)** a) Give algorithmic layout for sum-of-subset technique with worst case analysis. [8]
 b) What are the constraints for 0/1 knapsack problem? Discuss. [8]

- Q7)** a) Differentiate between backtracking & branch and bound. Illustrate with example of Knapsack problem. [8]
 b) Solve following Job sequencing with deadline problem using Branch and Bound. [8]

Job	P	d	t
1	5	1	1
2	10	3	2
3	6	2	1
4	3	1	1

OR

- Q8)** a) Solve the following instance of the knapsack problem by branch and bound algorithm for $W = 16$. [8]

Item	Weight	Value in Rs.
1	10	100
2	7	63
3	8	56
4	4	12

- b) Describe the following with respect to B & B: [8]
- The method
 - LC search
 - Control abstraction for LC search
 - Bounding function

- Q9)** a) When do you claim that algorithm is polynomial time algorithm? Explain with an example. [9]
 b) Explain (i) Complexity classes (ii) Deterministic Algorithms. [9]

OR

- Q10)** a) Explain Vertex cover problem is in detail. [9]
 b) What is deterministic algorithm? Write any one deterministic algorithm. [9]



Total No. of Questions : 10]

SEAT No. :

P2405

[Total No. of Pages : 2

[5870]-1574

T.E. (Information Technology)

CLOUD COMPUTING

(2015 Pattern) (Semester - II) (314453)

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) Assume suitable data if necessary.

Q1) a) Explain advantages and disadvantages of Cloud Computing. [5]

b) What are different Cloud Delivery Models? Compare it with diagrams.[5]

OR

Q2) a) Compare private cloud verses public cloud. [4]

b) Write Short Notes On : [6]

i) Multitenant Technology

ii) Web Technology

Q3) a) Define Hypervisor. Explain and Differentiate its Types. [5]

b) Draw and explain XEN architecture. [5]

OR

Q4) a) Write short note on: Open Cloud Consortium [OCC]. [4]

b) Explain three types of virtualization. [6]

Q5) a) Explain virtualization attack in detail with suitable examples. [8]

b) List and describe three different threat agents. [8]

P.T.O.

OR

- Q6)** a) How are security policies and mechanisms used to counter threats. [8]
b) Explain the concept and use of hardened virtual server image. [8]

- Q7)** a) Explain architecture of NASA's Nebula Cloud. [8]
b) Explain the concept of cloudlet. How is it different from cloud? [8]

OR

- Q8)** a) Explain the concept of cloud mashup with a suitable diagram. [8]
b) Explain architecture of Facebook platform. [8]

- Q9)** a) What is a Docker? Explain docker deployment workflow. [9]
b) Describe key issues related to energy efficiency in cloud computing. [9]

OR

Q10) Write short notes on :

- a) Jungle computing [6]
b) Autonomic cloud engine [6]
c) Multimedia Cloud [6]



Total No. of Questions : 10]

SEAT No. :

P2406

[Total No. of Pages : 3

[5870]-1575

T.E. (Information Technology)

DATA SCIENCE & BIG DATA ANALYTICS

(2015 Pattern) (Semester - II) (314454)

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 or Q.7 or Q.8, Q.9 or Q.10.
- 2) Figures to the right side indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Make suitable assumptions wherever necessary.

- Q1)** a) Explain data processing infrastructure challenges in Big data. [4]
b) Define random variable & give one example. [3]
c) Explain the process of reading a file in HDFS. [3]

OR

- Q2)** a) Discuss the processing complexities associated with big data. [3]
b) Determine the distinct element in the following stream using Flajolet Martin algorithm. [3]

Input stream - 4, 2, 5, 9, 1, 6, 3, 7

Hash function - $(x + 6) \bmod 32$

- c) Explain the role of following components in Hadoop system. [4]
i) Data node
ii) Secondary name node

- Q3)** a) How analyzing Big Data help the organizations prevent fraud? [3]
b) A company is considering using market theory to analyze brand switching between three different brands of floppy disks. Survey data has been gathered & has been used to estimate following transition matrix for the probability of moving between brands each month. [4]

P.T.O.

To Brand				
	1	0.80	0.10	0.10
From brand	2	0.03	0.95	0.02
	3	0.20	0.05	0.75

The current (month 1) market shares are 45%, 25%, 30% for brands 1, 2 & 3 respectively what will be the expected market shares after two months have elapsed (i.e. in month 3)?

- c) Write a short note on Hadoop ecosystem. [3]

OR

- Q4)** a) Write a note on Enterprise data warehouse platform. [4]
 b) Explain markor's inequality with appropriate formula. [3]
 c) Write a note on Google file system. [3]

- Q5)** a) Describe the data transformation process in brief. Enlist the challenges & advantages of data transformation. [6]
 b) Draw & explain architecture of HIVE. [6]
 c) What is R markdown? What is the use of it? [4]

OR

- Q6)** a) Explain different steps in data analytics. [6]
 b) How data can be ingested in Python. Write syntax in Python for the same. [6]
 c) Explain data cleaning in R or Python. [4]

- Q7)** a) Write a short note on :
 i) Data visualization with Tableau.
 ii) Analytical techniques (any 1) used in Big data visualization with example. [8]
 b) What are the different challenges for Big data visualization? Explain the mechanism to overcome these challenges. [8]

OR

- Q8)** a) What is the need of data visualization? Explain advantages of data visualization. [8]
- b) Explain analytical techniques used in big data visualization. [8]
- i) Classification
 - ii) Clustering
 - iii) Regression
 - iv) Association rule

- Q9)** a) Explain the process of social media analytics with example. [6]
- b) What is mobile analytics? What is importance of mobile analytics? [6]
- c) Explain data scientist role and responsibilities with suitable diagram. [6]

OR

- Q10)**a) Explain with suitable example the Big data user experience ramification. [6]
- b) Explain in brief the use cases of application of big data in telecommunication & marketing industry resp. [6]
- c) Explain Michael Porter's Value chain analysis with diagram. [6]



Total No. of Questions : 10]

SEAT No. :

P2407

[Total No. of Pages : 2

[5870] - 1576

T.E. (IT)

**THEORY OF COMPUTATION
(2015 Pattern) (Semester - I) (314441)**

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. or Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.

Q1) a) Define : [4]

- i) Symbol,
- ii) RE
- iii) Transitive Reflexive Closure with an example

b) Find CNF for the given grammar : [6]

$$S \rightarrow ABAB$$

$$A \rightarrow aA \mid \epsilon$$

$$B \rightarrow bA \mid \epsilon$$

OR

Q2) a) Write RE for the following : [6]

- i) $\Sigma = \{a, b\}$, Set of all string that have at least one a & any b's
- ii) $\Sigma = \{0, 1\}$, Set of all string in which every 1 followed by immediately 00
- iii) $\Sigma = \{0, 1\}$, Set of string begin or end with 01 or 10

b) Give the limitation of FA, FSM. [4]

Q3) a) Find DFA from given RE $(1. 1 + 0)^*.1^*$. [5]

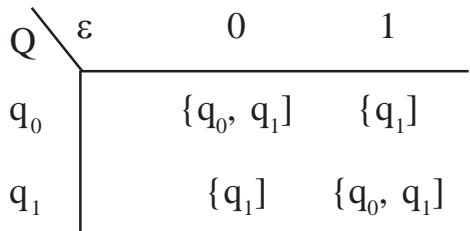
b) Test whether the following grammars are ambiguous or not, if it is ambiguous then remove it [5]

$$S \rightarrow Ab, A \rightarrow a, B \rightarrow C \mid b, C \rightarrow D, D \rightarrow E, E \rightarrow a$$

P.T.O.

OR

- Q4)** a) Design FA to accept 'L'. Where $L = \{ \text{"String in which a always appear tripled"} \}$ [4]
 b) Find DAF from given NFA (Table) [6]



- Q5)** a) Explain the Chomsky Hierarchy with help of an example of each. [9]
b) Show that the context free languages are closed under union, concatenation and kleen star. [8]

OR

- Q6)** a) Design a PDA accepting by empty store / stack of the following language:
 $a^n b^{2n} \mid n >= 1$. [9]
 b) Construct PDA for accepting following CFG :
 $S \rightarrow bA \mid aB, A \rightarrow bAA \mid aS \mid a, B \rightarrow aBB \mid bS \mid b$ [8]

- Q8)** a) Prove that the recursiveness problem of type 0 grammar is unsolvable. [8]
 b) Construct a TM that can accept language $\Sigma = \{0, 1\}$, [9]
 $L = W C W^R \mid (W \text{ is in } (0+1)^*)$

- Q9)** a) Prove that "It is undecidable whether CFG is ambiguous". [8]
 b) Prove that PCP with two list [8]
 $X = \{b, bab^3, ba\}$, $Y = \{b^3, ba, a\}$ have a solution?

- OR

Q10)a) Prove that following undividable [8]
 $= (M, W \mid \text{The TM } M \text{ accept } W\}$

b) Prove that "It is undividable whether CFG is unambiguous". [8]

△△△△

Total No. of Questions : 10]

SEAT No. :

P2408

[Total No. of Pages : 3

[5870]-1577

T.E. (Information Technology)

DATABASE MANAGEMENT SYSTEMS

(2015 Pattern) (Semester - I) (314442)

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.

Q1) a) Explain aggregation and specialization concept with the help of diagrams. [5]

b) Define Data independence and explain the concept of data independency with level of abstraction in DBMS. [5]

OR

Q2) a) Specify the Codd's norms to be satisfied by RDBMS. [5]

b) Draw ER diagram of college database application considering the following requirements: [5]

- A college has many departments.
- Each department has multiple teachers (one person is head of the department).
- A teacher belongs to only one department.
- Each department offers multiple courses, each subject is taught by a single teacher.
- A student may enroll for many courses offered by different departments.

P.T.O.

Q3) a) Consider the following employee database [5]

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 Gold Bank Corporation.

ii) Find the names and cities of residence of all employees who work for Gold Bank Corporation.

iii) Find all employees in the database who live in the same cities and on the same streets as do their managers.

b) Describe the concept of transitive dependency and explain how this concept is used to define 3NF. [5]

OR

Q4) a) What is cursor? Why is it needed? Explain different phases of cursors with suitable example. [5]

b) Differentiate between conflict and view serializability with suitable precedence graph example. [5]

Q5) a) What is recoverable schedule? Why is recoverability of schedules desirable to allow non recoverable schedule? [8]

b) Explain check point-based recovery mechanism with suitable example. [8]

OR

Q6) a) When do deadlock happen, how to prevent them and how to recover if deadlock takes place? [8]

b) Explain and state difference between centralized and client server architecture with suitable applications. [8]

Q7) a) What is mobile database? State the functionalities required for mobile databases. [8]

b) Explain XML data model. Explain advantages of XML. [8]

OR

Q8) a) Explain NoSQL concept with suitable MongoDB example. [8]

b) Write a short note on: [8]

i) SQLite Database

ii) Internet Database

iii) Cloud Database

iv) XML Database

Q9) a) Explain knowledge discovery phase in detail. [6]

b) Explain association rules with support and confidence measures. [6]

c) What is multi-dimensional data model? Explain with suitable example. [6]

OR

Q10) a) Draw and explain data mining architecture. [9]

b) Draw and explain key components of Data warehouse. [9]



Total No. of Questions : 10]

SEAT No. :

P2409

[Total No. of Pages : 2

[5870]-1578

T.E. (Information Technology)

**SOFTWARE ENGINEERING & PROJECT MANAGEMENT
(2015 Pattern) (Semester - I) (314443)**

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 diagram must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Contrast between Incremental Models & Evolutionary Models. [5]
b) Discuss the significance of Clean Room Software Engineering. [5]

OR

- Q2)** a) Discuss in brief Personal and Team Process Models. [5]
b) Illustrate the significance of Verification and Validation with an example. [5]

- Q3)** a) Discuss the need of prioritizing requirements and provide a brief discussion on ways of prioritizing requirements. [5]
b) Discuss the PERT chart and CPM in the context of software project management. [5]

OR

- Q4)** a) Illustrate with an example how Cost Estimation Tools and Techniques are used in IT industry. [5]
b) Demonstrate how use case diagram and class diagram are contributing to analyse the requirements. [5]

- Q5)** a) Discuss in brief agile manifesto & principles. [6]
b) How XP contributes to agile process model. [10]

OR

P.T.O.

- Q6)** a) Illustrate with example significance of XP and Scrum in agile development. [8]
b) Discuss role refactoring & pair programming in agile development. [8]

- Q7)** a) Explain use of Microsoft project management tool for software project management. [8]
b) Discuss the various attributes of Performing Quality Assurance. [8]

OR

- Q8)** a) Enlist the Tools and Techniques for Quality Control and explain them in brief. [8]
b) Demonstrate with example various common Sources of Risk in IT Projects. [8]

- Q9)** a) Discuss the role of SCM repository, SCM process, & SCM tools in software Engineering. [9]
b) Contrast between collaborative development, & test-driven development with help an example. [9]

OR

- Q10)** a) Discuss in detail Project Management trends in software development. [9]
b) Enlist components of CASE and discuss in short. [9]



Total No. of Questions : 10]

SEAT No. :

P2410

[Total No. of Pages : 2

[5870]-1579

T.E. (Information Technology)

OPERATING SYSTEM

(2015 Pattern) (Semester - I) (314444)

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 indicate full marks.
- 4) Assume Suitable data, if necessary.

Q1) a) Explain with neat diagram process states & transition. [5]

b) Explain different types of schedulers in operating system. [5]

OR

Q2) a) Write a shell program for Arithmetic operations. [5]

b) Explain the basic functions of Operating System. [5]

Q3) a) Enlist different IPC mechanisms. Differentiate between named pipes & Unnamed pipe. [5]

b) Explain deadlock prevention techniques with example. [5]

OR

Q4) a) Explain deadlock free solution for Dinning Philosophers Problem. [5]

b) Explain with an appropriate example, how resource allocation graph determines a deadlock. [5]

Q5) a) What is page fault? How Operating System handles occurrence of page fault & what are the actions taken by Operating System. [8]

b) For the following reference string.

0, 1, 2, 3, 0, 1, 2, 3, 0, 1, 2, 3, 4, 5, 6, 7

Count the number of page faults that occur with 3 frames using FIFO and LRU page replacement methods. Discuss the result. [10]

OR

P.T.O.

Q6) a) Explain with the help of neat diagram how TLB can be used to improve effective access time? [10]

- b) Write a short note on: [8]
- i) Compaction
 - ii) Thrashing

Q7) a) A disk drive has 1000 cylinders, numbered 0 - 200. The drive is currently serving the request at cylinder 100 & the head is moving towards track 0. The queue of pending requests is 55, 58, 39, 18, 90, 160, 150, 38, 184. Starting from the current head position what is the total distance that disk arm moves to satisfy all the pending requests for the following disk scheduling algorithms. [12]

- i) FCFS
 - ii) SSTF
 - iii) SCAN
 - iv) C-SCAN
- b) Define following terms: [4]
- i) Seek time
 - ii) Rotational latency

OR

Q8) a) Explain free space management technique. [8]

- b) Describe methods of record blocking with the help of neat diagram. [8]

Q9) a) Describe the steps for adding new system call in the Linux Kernel. [8]

- b) Write short note on following: [8]
- i) Process management in Linux
 - ii) Linux file system

OR

Q10) a) Explain in detail Linux Booting process. [8]

- b) List and explain different inter-process communication mechanisms in Linux operating system. [8]



Total No. of Questions : 10]

SEAT No. :

P2411

[Total No. of Pages : 2

[5870]-1580

T.E. (Information Technology)
HUMAN COMPUTER INTERACTION
(2015 Pattern) (Semester - I) (314445)

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) What is HCI? Why HCI study is important? [5]
b) Explain disciplines contributing to HCI. [5]

OR

- Q2)** a) Explain the User centered design with example. [5]
b) What is ergonomics? Explain in detail. [5]

- Q3)** a) List human Input-Output channels & discuss briefly about it. [5]
b) What is WIMP? Explain elements of WIMP interfaces? [5]

OR

- Q4)** a) What is reasoning? Explain different types of reasoning with examples. [5]
b) Explain individual differences in detail. [5]

- Q5)** a) Enlist different interaction styles & describe different interaction styles used to accommodate the dialog between user & computer. [8]
b) What is interaction design? Explain software design process. [8]

- Q6)** a) Explain various forms of navigation design. [8]
b) Write a short note on Interactivity. [8]

P.T.O.

- Q7)** a) Write a short note on Interaction design. [8]
b) Explain the software design process and user focus. [8]

OR

- Q8)** a) Explain Model-View-Controller(MVC) Framework. [8]
b) What is prototype? Explain various techniques for prototyping. [8]

- Q9)** a) Explain 8 Golden rules and discuss any one in detail with diagram. [9]
b) Explain user interface management system (UIMS). [9]

OR

- Q10)** a) Explain BNF Linguistic model with example. [9]
b) Explain GOMS. Create GOMS description of task of photocopying an article from a journal. [9]



Total No. of Questions : 10]

SEAT No. :

P2412

[Total No. of Pages : 3

[5870]-1581

**T.E. (Instrumentation & Control Engineering)
DIGITAL SIGNAL PROCESSING
(2015 Pattern) (Semester - II) (306268)**

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

Q1) a) Derive Even and Odd component of DT sequence $x(n)$. [6]

b) Find the Z-transform of the system with $H(s) = \frac{1}{s(s+1)}$. [4]

OR

Q2) a) Check whether following signal is energy or power signal [6]

$$x(n) = \delta(n) \quad n = 0$$

b) Determine the Nyquist Rate of the signal $x(t) = \sin(200 \pi t)$. [4]

Q3) a) Determine the magnitude and phase response at $\omega = \frac{\pi}{4}$ rad/sec for the system with $h(n) = \{1, 2, 1\}$. [4]

b) Determine the step response of the system if initial condition is given as $y(-1) = 1$. [6]

$$y(n) - \frac{1}{2} y(n-1) = x(n) - \frac{1}{2} x(n-1)$$

OR

P.T.O.

Q4) a) Determine the impulse response of the system describe by [4]

$$H(z) = \frac{1}{1 - \frac{3}{4}z^{-1} + \frac{1}{8}z^{-2}}$$

b) Draw the Direct Form-I and Direct Form-II structure of the filter given by [6]

$$H(z) = \frac{1 - \frac{1}{4}z^{-1}}{1 - \frac{1}{6}z^{-1} - \frac{1}{6}z^{-2}}$$

Q5) a) Compute 4-point DFT of the sequence $x(n) = \begin{Bmatrix} 4 \\ \downarrow \\ 3, 2, 1 \end{Bmatrix}$ using radix-2 DIT-FFT algorithm. [10]

b) Prove the following properties of the DFT. [8]

- i) Periodicity
- ii) Linearity

OR

Q6) a) Compute the linear convolution between the following sequences using circular convolution method [10]

$$x_1(n) = \begin{Bmatrix} 4, 1, 3 \\ \downarrow \end{Bmatrix} \text{ and } x_2(n) = \begin{Bmatrix} 2, 5, 0, 1 \\ \downarrow \end{Bmatrix}$$

b) Compute the 4-point IDFT of the sequence $X(k) = \begin{Bmatrix} 1, 0, 1, 0 \\ \downarrow \end{Bmatrix}$ using Matrix method. [8]

Q7) a) Distinguish between Impulse-invariant method and Bilinear transformation method. [6]

b) Design an IIR low-pass Butterworth filter using impulse invariant method (Assume $T = 2$ sec) for the following specification : [10]

passband : $0.8 \leq |H(e^{j\omega})| \leq 1$ for $|\omega| \leq 0.2\pi$

stopband : $|H(e^{j\omega})| \leq 0.2$ for $0.6\pi \leq |\omega| \leq \pi$

OR

Q8) a) Determine the order of a Low-pass Butterworth filter with the following specifications : [6]

Passband attenuation : $\leq 1 \text{ dB}$

Stopband attenuation : $\geq 30 \text{ dB}$

Passband frequency : $200 \frac{\text{rad}}{\text{sec}}$

Stopband frequency : $600 \frac{\text{rad}}{\text{sec}}$

b) Use the bilinear transformation method to convert the LPF [10]

$H(s) = \frac{1}{s^2 + \sqrt{2}s + 1}$ into HPF with pass-band edge at 100Hz and $F_s = 1\text{kHz}$.

Q9) a) Explain the Gibbs phenomenon in FIR filter design. [6]

b) Design an linear-phase FIR LPF with the following desired frequency response [10]

$$H_d(e^{j\omega}) = \begin{cases} e^{-j2\omega} & 0 \leq |\omega| \leq \frac{\pi}{4} \\ 0 & \frac{\pi}{4} < |\omega| \leq \pi \end{cases}$$

Use a Hamming window

OR

Q10) a) Explain Absolute Specifications of filter with neat diagram. [6]

b) Design an ideal FIR LPF of length M = 5 with a frequency response [10]

$$H_d(e^{j\omega}) = \begin{cases} 1 & -\frac{\pi}{2} \leq \omega \leq \frac{\pi}{2} \\ 0 & \frac{\pi}{2} < |\omega| \leq \pi \end{cases}$$

Use Fourier series method.



Total No. of Questions : 10]

SEAT No. :

P2413

[Total No. of Pages : 2

[5870]-1582

T.E. (Instrumentation & Control)

PROCESS LOOP COMPONENTS

(2015 Pattern) (Semester - II) (306269)

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) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data if necessary.*

Q1) a) Draw and explain Pressure control loop using standard P and ID symbols. [6]

b) Explain the following terms related to various control actions. [4]

- i) Proportional Gain ii) Rate before reset

OR

Q2) a) Explain the following process characteristics w.r.t. typical Level control loop. [6]

- i) Process Lag
ii) Manipulated Variable
iii) Distance/velocity lag

b) Explain the concept of offset in P mode. [4]

Q3) a) Explain Floating control action in detail. Give its suitable application. [6]

b) Explain any two advantages and disadvantages of PI and PID control mode. [4]

OR

Q4) a) List various tuning methods & explain any one in detail. [6]

b) Explain following w. r. t. I/P convertor : [4]

- i) Construction
ii) Application

P.T.O.

Q5) a) Explain following terms with respect to PLC : [8]

- i) Rung
- ii) Output Module
- iii) Timer
- iv) Counter

b) Compare Relay & PLC logic. [8]

OR

Q6) a) Develop the ladder diagram for Flashing a LED for 10 sec and it should go off after 3 flashes. [8]

b) List out the different input & output field devices used in PLC. [8]

Q7) a) Write short notes on : [8]

- i) Types of Control valve
- ii) Selection criteria of control valve

b) Compare cavitations and flashing? List techniques to reduce it. [8]

OR

Q8) a) Explain w. r. t control valve : [8]

- i) Equal percentage Characteristics
- ii) Plug
- iii) Stem
- iv) Actuator

b) Compare double seated and single seated globe valves. [8]

Q9) a) Explain fail safe action Air to Open (ATO) and Air to Closed (ATC) valve applications. [10]

b) Explain with neat sketch the working of globe valve. State its advantages and disadvantages. [8]

OR

Q10) a) Explain the following terms w. r. t control valve : [10]

- i) Fail safe action with suitable example.
- ii) Application of 3 way globe valve.

b) What is the need of actuator? Explain with neat diagram pneumatic actuator. [8]



Total No. of Questions : 12]

SEAT No. :

P2414

[Total No. of Pages : 2

[5870]-1583

T.E. (Instrumentation and Control)

**UNIT OPERATIONS AND POWER PLANT INSTRUMENTATION
(2015 Pattern) (Semester - II) (306270)**

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, Q.11 or Q.12.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data, if necessary.

Q1) Enlist different pumps available? Explain principle of any one type of Pump? [6]

OR

Q2) What are various screening and sieving techniques? Explain one in detail with diagram? [6]

Q3) Explain principle of flash distillation? Carry out the material and energy balance for distillation? [8]

OR

Q4) Explain principle of evaporation? Write material balance equations for evaporation. [8]

Q5) Explain the working of Small Hydro? Draw neat diagram of it? [6]

OR

Q6) Explain the working of Solar thermal power plant? Enlist their types? [6]

Q7) a) Explain layout of a typical thermal power generation plant? Explain in brief functions of each book? [8]

b) Enlist various boiler ancillaries? Explain the water treatment unit of it? Draw suitable block diagram to support your answer? [8]

OR

P.T.O.

Q8) a) Explain Air pre-filter and Bag House filters in thermal power plant with appropriate diagrams? [8]

b) Explain the burner management system and boiler interlocks? [8]

Q9) a) Explain the concept of Excess Air produced, Flue gases emission and the Products of combustion? [9]

b) What are the types of Turbines? Explain the thermal stress control in turbines? [9]

OR

Q10) a) What is the role of speed, vibration and shell temperature monitoring in turbine? [9]

b) How does the optimization of boiler can be achieved? On what factors the efficiency of boiler depends on? [9]

Q11) a) Compare hydroelectric power plant, thermal power plant, and windpower plant on the basis of its Efficiency, site selection criterions, pollution caused and capital and running cost? [10]

b) Write a note on Sound, Smoke and dust detector in thermal power plant? [6]

OR

Q12) a) Differentiate among hydroelectric power, nuclear power plant and wind power, plant with respect to the points as follows? [10]

- i) Performance.
- ii) Effluent management.
- iii) Site selection.
- iv) Safety standards.
- v) Economics.

b) Draw a typical diagram of Electrostatic Precipitator and Explain its working? [6]



Total No. of Questions : 12]

SEAT No. :

P2415

[Total No. of Pages : 2

[5870]-1584

T.E. (Instrumentation & Control)
INSTRUMENT AND SYSTEM DESIGN
(2015 Pattern) (Semester - II) (306271)

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, 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) Assume suitable data, if necessary.

Q1) a) Differentiate between NEMA and IP standards. [5]

b) What is prototyping? Give example. [5]

OR

Q2) a) What are the functional requirements of any instrument? [5]

b) Explain in detail about IP54 standard. [5]

Q3) a) What is difference between grounding and shielding? [5]

b) What are the sources of EMI noises? [5]

OR

Q4) a) What are the aspects of control panel design? [5]

b) What is ergonomics? [5]

Q5) a) Draw block diagram of instrumentation amplifier AD620. [6]

b) Explain an application using instrumentation amplifier AD620. [6]

OR

Q6) a) Draw block diagram of Phase angle control TCA785. [6]

b) Explain an application using Phase angle control TCA785. [6]

P.T.O.

- Q7)** a) Draw block diagram of Phase Locked Loop CD4046. [7]
b) Explain an application using Phase Locked Loop CD4046. [6]
- OR
- Q8)** a) Draw block diagram of Programmable counters ICM 7217. [7]
b) Explain an application using Programmable counters ICM 7217. [6]
- Q9)** a) What are the rules for PCB layout? [6]
b) What are the rules for analog PCB design? [6]
- OR
- Q10)** a) Explain the different layers of PCB. [6]
b) What is a SMD PCB board? [6]
- Q11)** a) Distinguish between Quality and reliability. [6]
b) Explain MTBF? [5]
c) What is quality assurance? [2]
- OR
- Q12)** a) What is importance of documentation in system design? [7]
b) What is Cumulative Distribution Function? [6]

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Total No. of Questions : 10]

SEAT No. :

P2416

[Total No. of Pages : 2

[5870]-1585

T.E. (Instrumentation & Control)

BIOMEDICAL INSTRUMENTATION

(2015 Pattern) (Semester - II) (306272)

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) What is Bio potential? State & explain mechanism of generation of Bio potential in cells. [6]

b) Explain reference electrode. [4]

OR

Q2) a) Draw & explain basic biomedical instrumentation system. [6]

b) What is SA Node? Why it is called as natural pacemaker? [4]

Q3) a) Explain Phonocardiography with diagram. [5]

b) Compare invasive & noninvasive methods of blood pressure measurement. [5]

OR

Q4) a) Explain dye dilution method in brief. [5]

b) Elaborate photo plesytmography with proper diagram. [5]

Q5) a) Draw the anatomy of brain & explain. [8]

b) Explain Somatic nervous system. [8]

OR

P.T.O.

Q6) a) Explain muscle contraction mechanism in detail. [8]

b) Explain biofeedback of muscles. [8]

Q7) a) Explain mechanism of hearing. [8]

b) Explain air-bone conduction method in brief. [8]

OR

Q8) a) Draw the anatomy of eye & explain. [8]

b) Elaborate errors in vision. [8]

Q9) a) State the need of Spirometer. Elaborate spirometer in brief. [10]

b) Explain O₂ & CO₂ transportation in brief. [8]

OR

Q10) a) State the need of Oxygenator. Explain bubble type Oxygenator with diagram. [10]

b) Draw the diagram of infrared gas analyzer & explain. [8]



Total No. of Questions : 10]

SEAT No. :

P2417

[Total No. of Pages : 2

[5870]-1586

**T.E. (Instrumentation & Control)
EMBEDDED SYSTEM DESIGN
(2015 Pattern) (Semester - I) (306261)**

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 and Q.9 OR Q.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) Draw and explain power on reset circuit of 8051 microcontroller. [6]
b) Explain in detail the SWAP instruction of 8051. [4]

OR

- Q2)** a) List the addressing modes of 8051. Explain Register addressing mode with example. [6]
b) Explain following assembler directives of 8051 microcontroller. [4]
i) ORG ii) EQU
iii) END iv) DB

- Q3)** a) Explain Conditional Flags used in 8051 microcontroller. [6]
b) List the interrupts of 8051. Explain INT0 and INT1 interrupts. [4]

OR

- Q4)** a) Define Baud Rate. Calculate Baud rate of 8051 with crystal frequency 11.0592 MHz when Mode 1 of serial communication is used with TH1 = FDH. [6]
b) Explain the working of STACK memory and its role in subroutines. [4]

P.T.O.

- Q5)** a) With a neat schematic, explain the interfacing of 16X2 LCD display to 8051 microcontroller. [10]
 b) With a neat schematic, explain the interfacing of ADC 0808 to 8051 microcontroller. [8]

OR

- Q6)** Explain with circuit diagram to interfacing of stepper motor with 8051 microcontroller. Also explain how speed and direction of the stepper motor is changed. [18]

- Q7)** a) What is Watch Dog timer? Explain the watch dog timer in AVR microcontrollers. [8]
 b) Explain the stack operation in AVR. Explain the situations when the stack memory is used. [8]

OR

- Q8)** a) With an example, describe the following instructions of AVR microcontroller. [8]
 i) BREQ
 ii) BRNE
 b) Explain the addressing modes of AVR microcontroller giving an example from the instruction set. [8]

- Q9)** a) The ADCSRA register of AVR microcontroller is shown below. Explain the bits of this register. [8]

7	6	5	4	3	2	1	0
ADEN	ADSC	ADATE	ADIF	ADIE	ADPS2	ADPS1	ADPS0

- b) Describe the normal mode of operation of Timer 0 of ATmega 8535. Draw a suitable diagram. [8]

OR

- Q10)** With a neat schematic, explain the interfacing of 16X2 LCD display to ATmega 8535 microcontroller. Write down the algorithm to program ADC using it. [16]



Total No. of Questions : 10]

SEAT No. :

P2418

[Total No. of Pages : 2

[5870]-1587

T.E. (Instrumentation & Control)

INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS

(2015 Pattern) (Semester - I) (306262)

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.

Q1) a) What is Qualitative and Quantitative Analysis? Give examples. [4]

b) Define:

- i) Electromagnetic Spectrum
- ii) Electromagnetic Radiation

What are the various types of Electromagnetic Radiation?

[6]

OR

Q2) a) Explain the principle and Setup of Coulometry. [6]

b) With sketches Derive Beers. [4]

Q3) a) Explain with neat sketch Single beam filter photometer. [4]

b) Explain the Instrumentation of Atomic Absorption Spectrophotometer (AAS). [6]

OR

Q4) a) State the principle of IR Spectroscopy. List the IR Sources. [4]

b) Compare: [6]

- i) Inductively Coupled Plasma & Direct Coupled Plasma.
- ii) AAS & AES.

P.T.O.

- Q5)** a) What is Fluorescence and Phosphorescence? Explain the working of Spectrofluorimeter with block diagram. [9]
b) Explain principle of NMR Spectroscopy along with Chemical Shift. Draw and Explain instrumentation of Fourier Transform Nuclear Magnetic Resonance Spectroscopy (FT-NMR). [9]

OR

- Q6)** a) What is Raman Effect? Explain working of Raman Spectrometer with the help of suitable block diagram. [9]
b) What are the various types of Gas Analyzers? Explain any one with neat sketch. [9]

- Q7)** a) Explain principle of Mass Spectrometer. With the help of neat sketches explain the working of Magnetic Deflection type and Quadrupole Mass Analyzer. [8]
b) Define the term Chromatography. With neat diagram explain Gas Chromatography. [8]

OR

- Q8)** a) Write Short Note on: [8]
i) HPLC
ii) HPLC Detectors
b) State and Explain Bragg's Law. [8]

- Q9)** a) Explain the principle and working of Auger Electron Spectroscopy with neat diagram. [8]
b) Draw and explain X-Ray diffractometer. [8]

OR

- Q10)** a) Explain Geiger-Muller Counter with neat sketch and list the applications. [8]
b) Draw and explain the Scintillation Counter with different applications. [8]



Total No. of Questions : 8]

SEAT No. :

P2419

[Total No. of Pages : 2

[5870]-1588

T.E. (Instrumentation and Control Engineering)
CONTROL SYSTEM COMPONENTS
(2015 Pattern) (Semester - I) (306263)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right side indicate full marks.

- Q1)** a) List and explain different types of switches. [6]
b) Discuss the Concept of sequencing with suitable diagram in motor control. [7]
c) List different components of pneumatic system and pneumatic cylinder in detail. [7]

OR

- Q2)** a) Explain construction and working of electromechanical relay. [6]
b) Explain reversing direction of rotation in motor with electrical wiring diagram. [7]
c) Describe Filter regulator Lubricator (FRL) in detail. [7]

- Q3)** a) Draw Standard Symbols used for developing hydraulic circuits. [8]
b) Discuss Meter in and Meter out hydraulic circuit. [8]

OR

- Q4)** a) Explain different types of hydraulic valves. [8]
b) Draw and explain speed control and direction control hydraulic circuit. [8]

- Q5)** a) Explain construction, working and applications of synchros. [8]
b) Explain operating principle and types of circuit breakers in detail. [10]

OR

P.T.O.

- Q6)** a) List types of fuses and define fusing current, current rating of fuse element, fusing factor. [8]
b) Explain working and application of alarm annunciator with suitable diagram. [10]

- Q7)** a) Explain hazardous area and its classification as per NEC Standards.[8]
b) Explain explosion proof housing technique in safety instrumentation.[8]

OR

- Q8)** a) Discuss intrinsic safety technique in detail. [8]
b) Explain purging systems in safety instrumentation. [8]



Total No. of Questions : 10]

SEAT No. :

P2420

[Total No. of Pages : 3

[5870]-1589

T.E. (Instrumentation and Control)

CONTROL SYSTEM DESIGN

(2015 Pattern) (Semester - I) (306264)

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) Use of electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.

Q1) Design a phase lead compensator if the open loop transfer function is given by $G(s)H(s) = K/\{s(s+3)\}$ is 35%. Steady state error, peak time $t_p = 2.71$ sec, $M_p = 10\%$. **[10]**

OR

Q2) a) Derive transfer functions for Lag network. **[6]**
b) If required damping factor is 0.55 and natural frequency of oscillation is 20 radian/sec determine dominant poles. **[4]**

Q3) Find tuning parameters for P, PI, PID and write resulting equations for these configuration if open loop transfer function is given by **[10]**

$$G(s) = 25 / (s^2 + 3s + 25).$$

OR

P.T.O.

- Q4)** Apply Bode plot method to design a lag compensator for unity feedback system having $G(s) = k / (s(s+1)(s+3))$ Such that P.M $\approx 35^\circ$ G M at least 20 dB and ess = 0.3 rad for unit ramp input. [10]

- Q5)** a) Design a controller if the process open loop transfer function is given by $G(s) = 1 / (3s+1)$ and desired close loop behavior is given by $G(s) = 1 / (5s+1)$. [8]

- b) Design a PI controller having a unity feedback forward path transfer function as $G(s) = 150 / (s+1)(2s+1)$ so that PM = 30° at w = 5 rad/sec. [8]

OR

- Q6)** a) Design a PD controller for an open loop transfer function $G(s) = 15 / (s(s+1)(2s+3))$ so that PM = 40° at w = 5 rad/sec. [8]

- b) A unity feedback control system having an open loop transfer function $G(s) = 50 / (s+1)(s+3)(s+5)$ required $e_{ss} \leq 0.06$ for unit ramp unit and Phase margin $>30^\circ$ at a frequency of 6 rad/sec. Design PID controller. [8]

- Q7)** a) Diagonalize the matrix given below and determine the state transition matrix $A = \begin{bmatrix} 1 & 5 \\ -3 & 4 \end{bmatrix}$. [8]

- b) The state space system is represented by [8]

$$A = \begin{bmatrix} -1 & -2 & -3 \\ 0 & -1 & -1 \\ 1 & 0 & -1 \end{bmatrix}, B = \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix}, C = \begin{bmatrix} 1 & 1 & 0 \end{bmatrix}$$

Determine whether system is completely controllable and observable or not.

OR

Q8) a) Determine state transition matrix using $A = \begin{bmatrix} -1 & -1 \\ 3 & -5 \end{bmatrix}$ Laplace transformation method. [8]

b) Derive the equation for solution of state space equation. [8]

Q9) Design a full state observer for a system given so that desired poles are $-1, -3, -5$. [18]

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -11 & -21 & -13 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u, \quad y = \begin{bmatrix} 2 & 5 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + 8u$$

OR

Q10) The state equations are given below [18]

$$\dot{x}_1 = x_2$$

$$\dot{x}_2 = x_3$$

$$\dot{x}_3 = -8x_1 - 14x_2 - 7x_3 + u$$

The desired closed loop poles are to be located at, $s = -3, s = -4$ and $s = -5$. Determine the state variable feedback gain matrix.

→ → →

Total No. of Questions : 10]

SEAT No. :

P2421

[Total No. of Pages : 2

[5870]-1590

T.E. (Instrumentation & Control)

**INDUSTRIAL ORGANIZATION AND MANAGEMENT
(2015 Pattern) (Semester - I) (306265)**

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) Use of calculator is allowed.
- 5) Assume suitable data if necessary.

- Q1)** a) State and explain Porter's five forces. How they will be helpful in competitive business? [5]
- b) What are the different types of Business organizations? Explain any two. [5]

OR

- Q2)** a) Explain the following quality standards : [5]
- i) ISO-9000
 - ii) ISO-14000
- b) Explain BCG matrix. [5]

- Q3)** a) Can merging is used for business expansion? How? [5]
- b) Determine EOQ for the following data. Annual requirement quantity (D) is for a manufacturing industry is 10000 units. Cost of each unit is \$8. The cost of placing the order is Rs. \$2. The carrying cost precentage (h/c) = 0.02. [5]

OR

- Q4)** a) What is SPC? What are its advantages? [5]
- b) Write a short note on 'Supply chain management'. [5]

P.T.O.

- Q5)** a) What is Finance? Also explain Sources of finance. [8]
b) Define manpower planning. Explain the functions and process of manpower planning. [8]

OR

- Q6)** a) Explain : [8]
i) Net present value
ii) Payback period
iii) Shares
iv) Debentures
b) What is performances appraisal? Explain its importance. [8]

- Q7)** a) Explain budgeting and different methods of capital budgeting. [8]
b) What is capital? What are the two types of capital? Give the different source of finances. [10]

OR

- Q8)** a) Write a short note on Assets management. [8]
b) What are the functions of Money market and Capital market. [10]

- Q9)** a) Explain basic Concept of Ethics. [8]
b) Explain Management Information System (MIS) in details? [8]

OR

- Q10)** a) Explain Need for professional and business ethics. [8]
b) Explain Enterprise Resource Planning (ERP) system with example. [8]



[5870]-1591**T.E. (Mechanical)**
REFRIGERATION AND AIR CONDITIONING
(2015 Pattern) (Semester - II) (302049)
*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) Draw neat diagrams wherever necessary.
- 3) Use of scientific calculator, psychrometric chart is allowed.
- 4) Assume suitable data, if necessary.
- 5) Figures to the right indicate full marks.

- Q1) a)** How are halocarbon refrigerants designated. Write chemical formula of R22 and R152. [4]
- b)** An ideal vapour compression refrigeration system works between the pressures of 4.98 bar and 1.86 bar. The vapour is superheated at the end of compression, its temperature being 25°C. The dry and saturated vapour enters the compressor. Using the data given below find COP of refrigerator and heat rejected by refrigerant. $C_{PL} = 0.97 \text{ kJ/kg.K}$ & $C_{PV} = 0.65 \text{ kJ/kg.K}$. [6]

P bar	T °C	h_f kJ/kg	h_{fg} kJ/kg
4.98	14.45	49.22	148.3
1.86	-15	21.74	162

OR

- Q2) a)** What is ODP and GWP and what are their sources to contribute? [4]
- b)** Draw the schematic and p-h diagram of two evaporator with individual compressors and individual expansion valves and with a common compressor vapour compression cycle. Formulate compression, power and COP of the system. [6]

- Q3)** a) Draw practical ammonia water vapour absorption cycle. [3]
b) A refrigeration installation using R134a comprises one compressor, one condenser and two evaporators with refrigerant flow rates of 2 kg/s, and 5 kg/s, operating temperatures 5°C and - 10°C, respectively. Each evaporator is fitted with an individual expansion valve & back pressure valves. The condenser is maintained at 40°C. Use *p-h* chart and determine:
(i) capacities of different evaporator units, and (ii) COP of the system.[7]

OR

- Q4)** a) Discuss the effect of heat exchange between liquid refrigerant after condenser and refrigerant vapor before compression on performance of Vapor compression cycle. Draw its schematic and *p-h* diagram. [4]
b) Draw schematic and *T-s* diagram for Linde Hampson System for Liquefaction of Gases and explain the system operation. [6]

- Q5)** a) The moist air is passed through a cooling section where it is cooled and dehumidified. How do the specific humidity and relative humidity of air change during this process? Show the process on psychrometric chart.[6]
b) An office of 25 people in Mumbai is to be air-conditioned when outdoor conditions are 30°C DBT and 70% RH. The required comfort conditions are 23°C DBT and 55% RH with 0.5 m³/min/ person fresh air supply. Air is first cooled, dehumidified and then heated. Show the process on psychrometric chart and calculate : [10]
i) the cooling coil capacity,
ii) heating coil capacity and
iii) capacity of the dehumidifier.

OR

- Q6)** a) Define effective temperature. Discuss minimum four factors affecting Optimum Effective Temperature from the following : [8]
i) Climate and seasonal variation,
ii) Clothing culture
iii) Age, Health and Gender
iv) Duration of stay
v) Kind of activity
vi) Density of Occupation

- b) $142 \text{ m}^3/\text{min}$ moist air at 5°C with specific humidity of 0.002 kg/kg of dry air is mixed adiabatically with $425 \text{ m}^3/\text{min}$ of moist air stream at 24°C and 50% relative humidity. If the pressure is constant throughout at 1 bar. Determine (a) the humidity ratio, and (b) the temperature of the mixed stream. Show the process on psychrometric diagram. [8]

- Q7)** a) Draw the schematic of winter air conditioning and explain its working. [6]
b) Classify the variable refrigerant flow air conditioning system and state any four advantages of VRF. [6]
c) Draw schematic of flooded evaporator. Explain its working and advantages over dry evaporator. [6]

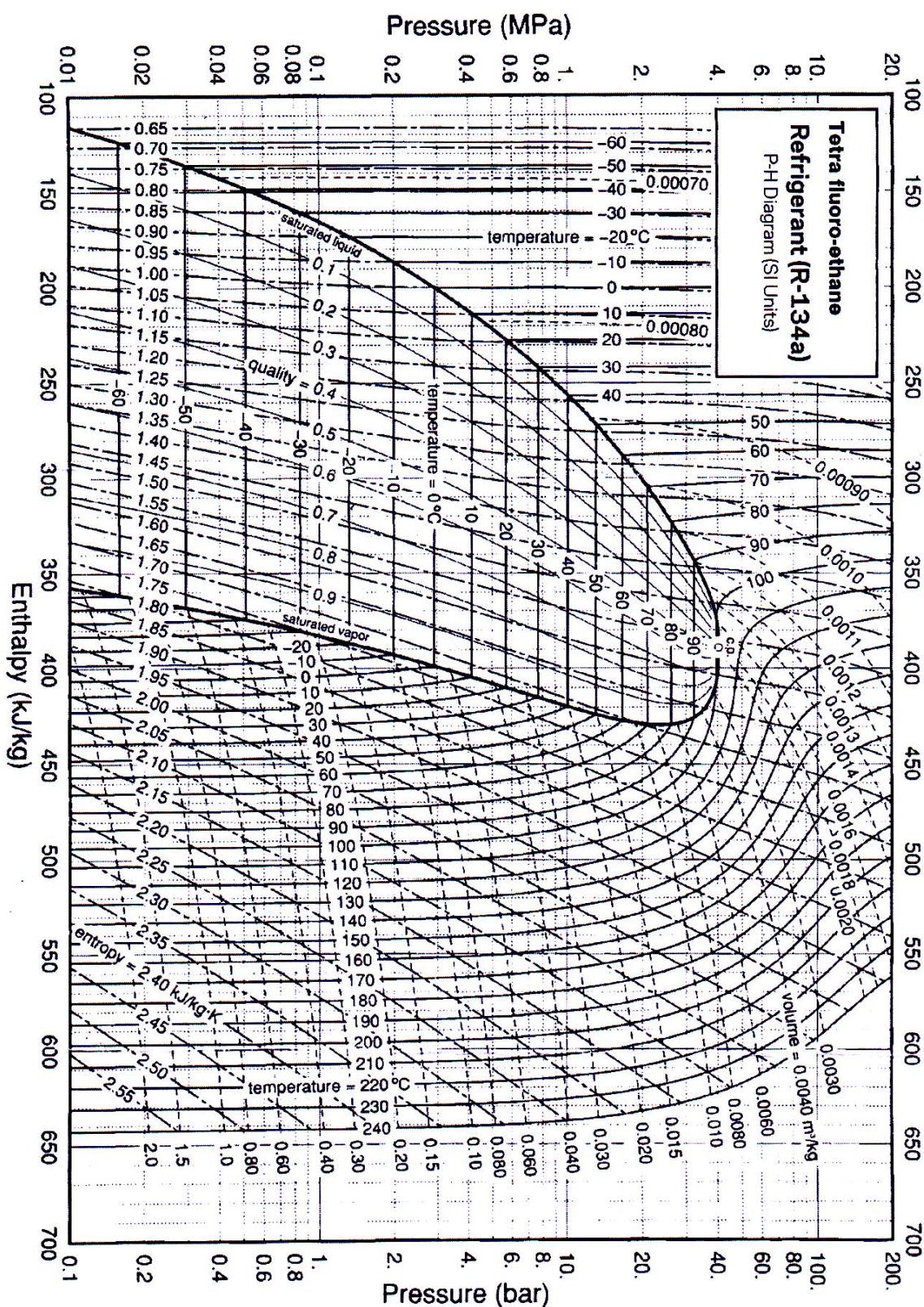
OR

- Q8)** a) Draw schematic of thermostatic expansion valve and explain its operation. [6]
b) Explain the working of scroll compressor with a schematic. [6]
c) Explain the working of a split air conditioner with a line diagram. [6]

- Q9)** a) Compare velocity reduction method with equal friction method of duct design. [4]
b) State any four requirements of good room air distribution. [4]
c) A 12 m long duct passes air at a rate of $1.2 \text{ m}^3/\text{s}$. If the friction factor is 0.0048, calculate the pressure drop in the following ducts [8]
i) Circular duct of 280 mm diameter, and
ii) Square duct of 280 mm side.

OR

- Q10)** a) Draw an air handling unit and state its minimum three components with their function(s). [8]
b) A circular duct of 400 mm is selected to carry air at a velocity 440 m/min . If duct is replaced by rectangular duct of aspect ratio 1.5, find the size of rectangular duct for equal friction when : [8]
i) Velocity in two ducts is same
ii) Discharge in two ducts is same.
If $f = 0.015$, find the pressure loss per 100m length of duct. Take density of air = 1.15 kg/m^3 .



Total No. of Questions : 12]

SEAT No. :

P2423

[Total No. of Pages : 3

[5870]-1592

T.E. (Mechanical, Mechanical (Sandwich) & Automobile)

NUMERICAL METHODS AND OPTIMIZATION

(2015 Pattern) (Semester - II) (302047)

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) Using Newton Raphson method solve the following equation $f(x) = e^{(x)} \cdot \cos(x) - 1.4 = 0$ upto accuracy of 0.01.
Take initial gauss 0.2 [6]

OR

Q2) Explain the convergence and divergence of Successive Iterative method with graphical representation. [6]

Q3) Solve the following equation by Gauss Elimination method, [6]

$$x + 4y - z = -5;$$

$$x + y - 6z = -12;$$

$$3x - y - z = 4$$

OR

Q4) Solve by Jacobi's iteration method, the equations, [6]

$$20x + y - 2z = 17;$$

$$3x + 20y - z = -18;$$

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

P.T.O.

Q5) a) Maximize $Z = 14x + 11y$ [5]

Subjected to the constraints

$$3x + 2y \leq 1800$$

$$x + 2y \leq 1000$$

$$x, y \geq 0$$

Use graphical method.

b) Write a short note on Simulated Annealing. [3]

OR

Q6) Maximize $Z = 3x + 2y$ [8]

Subjected to the constraints

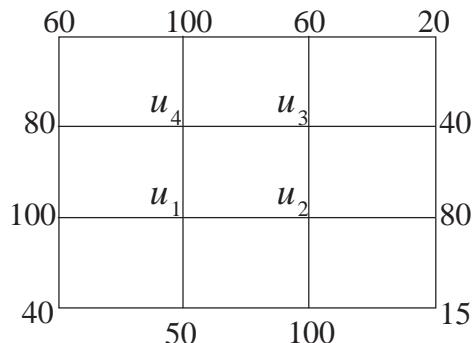
$$x + y \leq 4$$

$$x - y \leq 2$$

$$x, y \geq 0$$

Use Simplex method.

Q7) a) Solve the Laplace equation $u_{xx} + u_{yy} = 0$ for the square mesh with the boundary values as shown below: [10]



b) Use Runge Kutta 4th order to solve $10 \frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$ for the interval $0 \leq x \leq 0.5$ with $h = 0.10$ [8]

OR

Q8) a) Draw the flowchart for Simultaneous Equations by RK 2nd order method. [6]

b) Solve the equation $\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial t} = 0$

subjected to $u(0, t) = u(5, t) = 0$ and $u(x, 0) = x^2 (25 - x^2)$

Find values upto 3 sec. Take $h=1$

[12]

- Q9)** a) Draw the flow chart for straight line fit $y = mx + c$. [8]
 b) Find the values of y for $x = 0.5$ for the following table of x, y , values using Newton's forward interpolation. [8]

x	0	1	2	3	4
y	1	3	25	91	225

OR

- Q10)** a) It is known that the curve $y = ab^x$ fits the data given below. Find the best values of a and b . [8]

x :	1	3	4	6	9
y :	0.84	0.4116	0.2888	0.141	0.048

- b) Find the polynomial $f(x)$ by using Lagrange's interpolation formula and hence find $f(1.1)$ dx for the following series : [8]

x	1.0	1.2	1.3	1.5
$y = f(x)$	1.000	1.0954	1.1402	1.2247

- Q11)** a) Draw the flowchart for Simpson's 1/3 rule. [8]
 b) Using Gauss Legendre three-Point formula, [8]

$$\text{find } \int_0^1 e^x (\cos x - 2x) dx$$

OR

- Q12)** a) Find the integral $\int_0^6 \frac{dx}{1+x^2}$ by using Trapezoidal rule. Do 6 iteration. [8]
 b) Find double integration $I = \int_2^{2.6} \int_4^{4.4} \frac{dx dy}{xy}$ Take h = 0.2 and k = 0.3, and m = n = 2. [8]



Total No. of Questions : 10]

SEAT No. :

P2424

[Total No. of Pages : 3

[5870]-1593

T.E. (Mechanical)
MANUFACTURING PROCESS - II
(2015 Pattern) (Semester - II) (302051)

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) Use of Calculator is allowed.
- 5) Assume Suitable data, if necessary.

Q1) a) Specify radial drilling machine. [4]

b) Derive an expression between the chip thickness ration (r), shear plane angle (Φ) and top rake angle (α). [6]

OR

Q2) a) Taylor's tool life equation for machining C-40 steel $VT^n = C$. Feed is 0.2 mm/rev. Determine n, C and cutting speed for 60 minutes tool life. [4]

V (m/min) 25 35

T (min) 90 20

b) Calculate the index crank movement for 69 divisions by compound indexing methods. [6]

Hole circles are,

Plate no. 1 : 15, 16, 17, 18, 19, 20

Plate no. 2 : 21, 23, 27, 29, 31, 33

Plate no. 3 : 37, 39, 41, 43, 47, 49

P.T.O.

Q3) a) Calculate machining time required to produce 10 holes on 40 mm thick plate with following data. Cutting speed : 25 m/min, feed : 0.1 mm/rev, Drill Diameter : 30 mm, overrun : 15 mm. [4]

b) Sketch Broach Tool geometry and discuss main parts. [6]

OR

Q4) a) Enlist advantages and limitations of Column and knee type-milling machine. [4]

b) Explain Centre-less grinding operation with neat sketch. [6]

Q5) a) Explain working principle of EDM process in detail with neat sketch. Discuss the role of dielectric fluid. [8]

b) With neat sketch of USM process, discuss its principle and the effect of followings with neat graph : [8]

- i) Slurry concentration
- ii) Grain size
- iii) Frequency of vibration
- iv) Amplitude on MRR

OR

Q6) a) Compare the principle of ECM and EDM along with various process parameters. [8]

b) Explain LBM process principle with neat sketch. State its advantages, limitations and applications. [8]

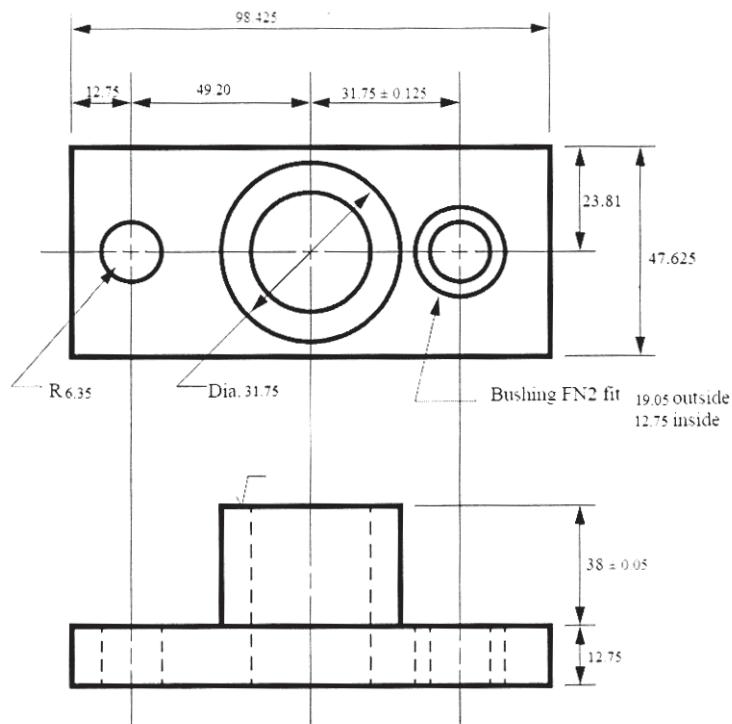
Q7) a) Differentiate between NC, CNC and DNC with neat sketch. Discuss advantages of DNC. [8]

b) Explain automatic pallet changer with neat sketch. State its advantages, limitations and applications. [8]

OR

- Q8)** a) Explain the machining center with neat sketch. How ATC will work on it? [8]
 b) Explain following codes : G01, G02, G03, G70, G71, M02, M04, M05. [8]

- Q9)** a) Explain 3-2-1 principle of location with neat sketch. [6]
 b) Draw a drill jig for drilling holes of radius 6.35 mm and diameter 31.7 mm for the component as shown in the Fig. 1 below. Suggest [12]
 i) Types of drilling machine. ii) Locating devices.
 iii) Clamping elements. iv) Drill bushes etc.



OR

- Q10)** a) What are the types of locators? Draw and explain diamond pin locator. [6]
 b) Explain design principles of Jigs and Fixtures. [6]
 c) List out main elements of Jigs and Fixtures. [6]



Total No. of Questions : 10]

SEAT No. :

P2425

[Total No. of Pages : 4

[5870]-1594

T.E. (Mechanical)

DESIGN OF MACHINE ELEMENTS - II

(2015 Pattern) (Semester - II) (302048)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer five questions from following.
- 2) Neat sketch must draw wherever necessary.
- 3) Figures to the right indicates full marks.
- 4) Use of electronics pocket calculator is allowed.
- 5) Use of programmable calculator is not permitted.
- 6) Assume suitable data if necessary.

Q1) a) State and explain different type of gear tooth failures. [4]

b) What are the advantages and disadvantages of straight bevel gears over spiral bevel gears? [6]

OR

Q2) A single row deep groove ball bearing is subjected to a 30 second work cycle that consists of the following two parts. [10]

	Part I	Part II
Duration (S)	10	20
Radial load (kW)	45	15
Axial load (kW)	12.5	6025
Speed (rpm)	720	1440

The static and dynamic load capacity of ball bearing is 50 and 68 kN respectively. Calculate the expected life of the bearing in hours.

P.T.O.

Table : X and Y factors for single row deep groove ball bearings

$\left(\frac{Fa}{Co}\right)$	$\left(\frac{Fa}{Fr}\right) \leq e$	$\left(\frac{Fa}{Fr}\right) \geq e$	e		
	X	Y	X	Y	
0.025	1	0	0.56	2	0.22
0.040	1	0	0.56	1.8	0.24
0.0170	1	0	0.56	1.6	0.27
0.130	1	0	0.56	1.4	0.31
0.250	1	0	0.56	1.2	0.37
0.500	1	0	0.56	1.0	0.44

- Q3)** a) Derive the equation for Virtual Number of teeth on bevel gear. [4]
- b) A single-row deep groove ball bearing is subjected to a radial force of 8 kN and a thrust force of 3 kN. The values of X and Y factors are 0.56 and 1.5 respectively. The shaft rotates at 1200 rpm. The diameter of the shaft is 75 mm and Bearing No. 6315 ($C = 112000$ N) is selected for this application. [6]
- i) Estimate the life of this bearing, with 90% reliability.
 - ii) Estimate the reliability for 20000 hrs life.

OR

- Q4)** A pair of spur gears with 20° full-depth involute teeth consists of a 20 teeth pinion meshing with a 41 teeth gear. The module is 3 mm while the face width is 40 mm. The material for pinion as well as gear is steel with an ultimate tensile strength of 600 N/mm 2 . The gears are heat treated to a surface hardness of 400 BHN. The pinion rotates at 1450 rpm and the service factor for the application is 1.75. Assume that velocity factor accounts for the dynamic load and the factor of safety is 1.5. Determine the rated power that the gears can transmit.

Use Lewis form factor $Y = 0.484 - 2.87/Z$, Velocity factor $C_v = \frac{3}{3+v}$. [10]

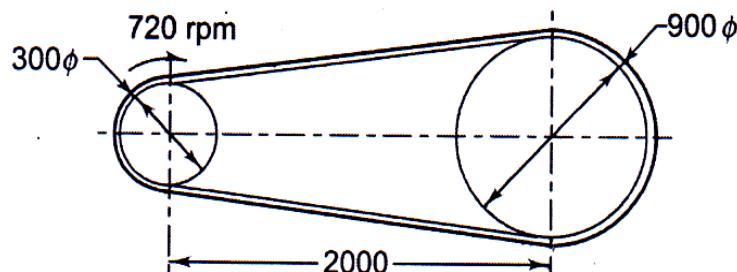
- Q5)** a) Why the soft material like phosphor bronze is chosen for worm gear and alloy steel for worm [4]
- b) What are the advantages of double-enveloping worm-gear drives over single-enveloping worm gear drives? [4]
- c) A pair of worm and worm wheel is designated as 3/60/10/6. The worm is transmitting 5 kW power at 1440 rpm to the worm wheel. The coefficient of friction is 0.1 and the normal pressure angle is 20° . Determine the components of the gear tooth force acting on the worm and the worm wheel. Also sketch the arrangement showing the component of tooth forces. [8]

OR

- Q6)** a) A worm gear box with an effective surface area of 1.5 m^2 is operating in still air with a heat transfer coefficient of $15 \text{ W/m}^2\text{C}$. The temperature rise of the lubricating oil above the atmospheric temperature is limited to 50°C . The worm gears are designated as, 1/30/10/8. The worm shaft is rotating at 1440 rpm and the normal pressure angle is 20° . The coefficient of friction is 0.024. Calculate efficiency of worm gear drive and power transmitting capacity based on the thermal considerations. [6]
- b) Derive equations for face width of worm wheel and length of the root of the worm wheel teeth. [10]

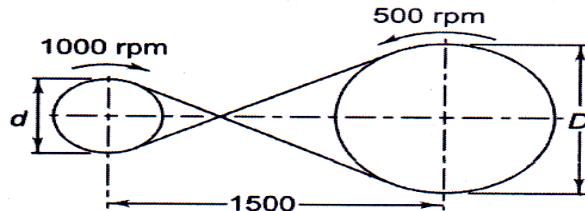
- Q7)** a) Distinguish between open and cross belt drives. [4]
- b) Explain step by step basic selection procedure of flat-belts from manufacturer's catalogue. [8]
- c) The layout of a double-ply leather belt drive is shown in Fig. The mass of the belt is 2 kg per meter length and the coefficient of friction is 0.35. Calculate [6]
- the tensions on the tight and loose sides, and
 - the length of the belt.

The belt is transmitting 35 kW of power.



OR

- Q8)** a) What is the polygonal action in roller chain? How will you reduce it? [6]
 b) The layout of a crossed leather belt drive is shown in Fig. The belt, 6 mm thick, transmits 7.5 kW and operates at a velocity of 13 m/s approximately. The coefficient of friction is 0.3 and the permissible tensile stress for the belt material is 1.75 N/mm². The density of leather is 0.95 g/cc. Calculate [12]
- the diameters of pulleys.
 - the length and width of the belt and
 - belt tensions on the tight and loose sides.



- Q9)** a) State desirable properties of a good bearing material. [4]
 b) Explain with sketches how to generate pressure within the system in Hydrodynamic Bearing. [4]
 c) Explain the parameters of bearing design, [8]
- Length to Diameter ratio
 - Unit bearing Pressure
 - Radial Clearance
 - Minimum oil film thickness

OR

- Q10)** The following data is given for a 360° hydrodynamic bearing: [16]

Radial load = 10 kN

Journal speed = 1440 rpm

Unit bearing pressure = 1000 kPa

Clearance ratio (r/c) = 800

Viscosity of lubricant = 30 mPa s

Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing and $1/d = 1$, calculate :

- Dimensions of bearing
- Coefficient of friction
- Power lost in friction
- Total flow of oil
- Side leakage and
- temperature rise

Table Dimensionless performance parameters for full journal bearing with side flow

$\left(\frac{l}{d}\right)$	ϵ	$\left(\frac{h_o}{c}\right)$	s	ϕ	$\left(\frac{r}{c}\right)f$	$\left(\frac{\varrho}{rcn_s l}\right)$	$\left(\frac{\varrho}{\varrho}\right)$	$\left(\frac{p}{p_{max.}}\right)$
1	0	1.0	∞	(85)	∞	π	0	-
	0.1	0.9	1.33	79.5	26.4	3.37	0.150	0.540
	0.2	0.8	0.631	74.02	12.8	3.59	0.280	0.529
	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.680	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152
	1.0	0	0	0	0	0	1.0	0



Total No. of Questions : 8]

SEAT No. :

P2426

[Total No. of Pages : 3

[5870]-1595

**T.E. (Mechanical /Mechanical(Sandwich))
MECHATRONICS
(2015 Pattern) (Semester - II) (302050)**

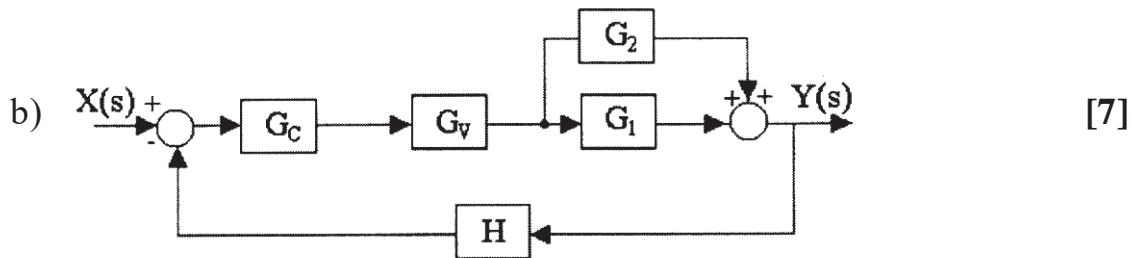
Time : 2½ Hours]

[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) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Make suitable assumptions whenever necessary.

Q1) a) Using a suitable sketch, explain the working of capacitive proximity sensor.
Determine the Transfer function by simplifying following block diagram. [6]



c) Write Specifications of Digital to Analog Converter. [7]

OR

Q2) a) Explain typical LVDT specifications. [6]
b) Explain with block diagram any one of the following Mechatronics system used as household appliances. [7]
i) Washing Machine ii) Refrigerator
c) What is a 4-bit R-2R type DAC, if it is supplied with 2.56 volts dc reference potential. Determine the full scale analog output potential. [7]

P.T.O.

Q3) a) Draw a ladder diagram for the following sequence. [6]

- i) Turn the green ON for 25 seconds.
- ii) Turn yellow ON for 4 seconds.
- iii) Turn red ON for 30 seconds

b) What are the different programming languages used in PLC? [6]

c) What are the different types of counters used in PLC? [6]

OR

Q4) a) Draw ladder diagram for the a small electric furnace which has two heating elements that are energized in two stages 4 min apart i.e. when the furnace is turned on first heating element comes on right away and the second element comes on 4 min later. A temperature switch will shut down the furnace if it gets too hot. [6]

b) What are the different components of PLC? [6]

c) What are the different types of PLC timers? [6]

Q5) a) Explain role of Pole Location on Stability. [5]

b) Construct Routh array and determine the stability of the system whose characteristics equation is $S^3 + 6S^2 + 11S + 6 = 0$. [6]

c) Explain Gain and Phase Margins with significance related to Bode plot? [5]

OR

Q6) a) Explain building blocks of thermal and fluid system. [5]

b) For a system with characteristic equation

$$F(s) = S^4 + S^4 + 2S^3 + 2S^2 + 3S + 15 = \infty \text{ examine the stability.} [6]$$

c) What is Routh stability criterion explain in detail? [5]

Q7) a) Explain the features of PI controller. [5]

b) An Integral controller is used for speed control with a set point of 12 rpm within a range of 8 to 16 rpm. The controller output is 20% initially. The constant $K_i = -0.15\%$ controller output per second per percentage error. If the speed jumps to 14.5 rpm, calculate the controller output after 2 sec. for constant ϵ_p . [6]

c) Define steady state error and delay time. [5]

OR

Q8) a) Explain PI control mode, stating its characteristics. [5]

b) Explain the manual procedure for PID controller tuning with suitable example. [6]

c) A proportional controller is used to control temperature within 50°C to 130°C with a set point of 73.5°C. The set point is maintained with 50% controller output. The offset error is corresponding to load change which causes 55% controller output. If the proportional gain is 2. Find the percentage controller output if the temperature is 61°C. [5]



Total No. of Questions : 10]

SEAT No. :

P2427

[Total No. of Pages : 3

[5870]-1596

T.E. (Mechanical)

DESIGN OF MACHINE ELEMENTS - I

(2015 Pattern) (Semester - I) (302041)

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 from the following.
- 2) Draw neat labeled diagrams wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of non programmable electronic calculator is permitted.
- 5) Assume Suitable/Standard data if necessary.

- Q1)** a) Write in brief use of standards in design on machine element. What are three basic types of standards used in a design office? [4]
- b) The Standard cross section for a flat key, which is fitted on a 50mm diameter shaft, is 16×10 mm. The key is transmitting 475 Nm torque from the shaft to the hub. The key is made of commercial steel ($S_{yt} = S_{yc} = 230 \text{ N/mm}^2$) Determine the length of the key, if the factor of safety is 3. [6]

OR

- Q2)** a) Classify the keys and explain it with neat diagram. [4]
- b) Write design steps of cotter joint and state their applications. [6]

- Q3)** a) Explain different methods of reduction of stress concentration. [4]
- b) A propeller shaft is required to transmit 45 kW power at 500 rpm. It is a hollow shaft, having an inside diameter 0.6 times of outside diameter. It is made of plain carbon steel and the permissible shear stress is 84 N/mm^2 . Calculate the inside and outside diameters of the shaft. [6]

OR

- Q4)** a) Explain the design procedure for rigid flange coupling. [6]
- b) Explain the Soderberg and Goodman line diagram with neat sketch. [4]

P.T.O.

Q5) a) Explain different forms of threads with neat sketch. [6]

b) A double threaded power screw, with ISO metric trapezoidal threads is used to raise a load of 300 kN. The nominal diameter is 100 mm and the pitch is 12 mm. The coefficient of friction at the screw threads is 0.15. Neglecting collar friction. Calculate : [10]

- i) Torque required raising the load;
- ii) Torque required to lower the load;
- iii) Efficiency of the screw.

OR

Q6) a) Explain Re-circulating ball screw with neat sketch and its applications. [6]

b) The lead screw of a lathe has single start ISO metric trapezoidal threads of 52 mm nominal diameter and 8 mm pitch. The screw is required to exert an axial force of 2 kN in order to drive the tool carriage during turning operation. The thrust is carried on a collar of 100 mm outer diameter and 60 mm inner diameter, The values of coefficient of friction at the screw threads and the collar are 0.15 and 0.12 respectively. The lead screw rotates at 30 rpm. Calculate : [10]

- i) The power required to drive the lead screw.
- ii) The efficiency of the screw.

Q7) a) What are the advantages of welded joints and threaded joints? [8]

b) Explain eccentrically loaded bolted joints in shear. [10]

OR

Q8) a) A steel plate 100 mm wide and 10 mm thick is welded to another steel plate by means of double parallel fillet welds. The plates are subjected to a static tensile force of 50 kN. Determine the required length of welds if the permissible shear stress in the weld is 94 N/mm². [10]

b) Explain and draw the neat sketch of Cap screws. [8]

Q9) a) Explain and draw the neat sketch of the styles of ends of helical compression spring. [6]

b) Design a helical compression spring subjected to a maximum force of 1250 N. The deflection of the spring corresponding to the maximum force should be approximately 30 mm. The spring index can be taken as 6. The spring is made of patented and cold drawn steel wire. The ultimate tensile strength and modulus of rigidity of the spring material are 1090 and 81370 N/mm² respectively. The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring and calculate, [10]

- i) Wire diameter; ii) Mean coil diameter;
- iii) Number of active coils; iv) Total number of coils;
- v) Free length of the spring; vi) Pitch of the coil

OR

Q10) a) What is meant by spring surge and explain its effect. [6]

b) A railway wagon moving at a velocity of 1.5 m/s is brought to rest by a bumper consisting of two helical springs arranged in parallel. The mass of the wagon is 1500 kg. Springs are compressed by 150 mm in bringing the wagon to rest. The spring index can be taken as 6. The springs are made of oil hardened and tempered steel wire with ultimate tensile strength of 1250 N/mm² and modulus of rigidity of 81370 N/mm². The permissible shear stress for the spring wire can be taken as 50% of the ultimate tensile strength. Calculate; [10]

- i) Wire diameter;
- ii) Mean coil diameter;
- iii) Number of active coils;
- iv) Total number of coils;
- v) Solid length of the spring;
- vi) Free length of the spring;
- vii) Pitch of the coil;
- viii) Required spring rate;
- ix) Actual spring rate.



Total No. of Questions : 10]

SEAT No. :

P2428

[Total No. of Pages : 3

[5870]-1597

T.E. (Mechanical/Automobile/Mechanical Sandwich)

HEAT TRANSFER

(2015 Pattern) (Semester - I) (302042)

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, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right of each question indicate full marks.
- 4) Assume suitable data wherever necessary and mention the same clearly.
- 5) Use of steam tables, Mollier chart and non programmable calculator is allowed.

Q1) a) A rod of 5 mm dia. and 100 mm length is used as a fin. The convection coefficient is 30 W/m²K. Determine for what value of thermal conductivity above which the fin can be considered as in infinite or long fin. Assume 1 to 2% difference. [6]

b) What do you mean by fins? Describe types of fins and its applications. [4]

OR

Q2) a) A copper pipe carrying refrigerant at - 20°C is 10 mm in OD and is exposed to convection at 50 W/m²K to air at 25°C. It is proposed to apply insulation of conductivity 0.5 W/mK. Determine the thickness beyond which the heat gain will be reduced. Calculate the heat gains for 2.5 mm, 5.0 mm and 7.5 mm thicknesses for 1 m length. The convection coefficient remains constant. [6]

b) Explain the concept of thermal resistance and thermal contact resistance. [4]

Q3) a) An average convective heat transfer coefficient for flow of 90°C air over a flat plate is measured by observing the temperature time history of a 40 mm thick copper slab ($\rho = 9000 \text{ kg/m}^3$, $c = 0.38 \text{ kJ/kg } ^\circ\text{C}$, $k = 370 \text{ W/m } ^\circ\text{C}$), exposed to 90° C air. In one test run, the initial temperature of the plate was 200°C, and in 4.5 minutes the temperature decreased to 35° C. Find the heat transfer coefficient for this case. [6]

b) What do you mean by transient heat conduction? What is lump capacity analysis? What are criteria for use of lump capacity analysis? [4]

OR

P.T.O.

- Q4)** a) A cylindrical ingot 10 cm diameter and 30 cm long passes through a heat treatment furnace which is 6 m in length. The ingot must reach temperature of 800°C before it comes out of the furnace. The furnace gas is at 1250°C and initial temperature of ingot is 90°C. What is the maximum speed with which the ingot should move in the furnace to attain the required temperature? The combined relative and convective surface heat transfer coefficient is 100 W/m² °C. Take $k(\text{ingot}) = 40 \text{ W/m } ^\circ\text{C}$ and α (thermal diffusivity) = $1.16 \times 10^{-3} \text{ m}^2/\text{sec}$. [6]
- b) Discuss the Economic, cost considerations and Payback period of insulating Materials. [4]

- Q5)** a) A plate type 200 mm × 300 mm heater is immersed in water bath at 40°C. The larger side of heater is maintained vertical. The heater rating is 3.5 kW. Determine the steady state temperature attended by the heater using following thermo physical properties. Consider heat transfer from one side of the plate $k = 0.667 \text{ W/m } ^\circ\text{C}$, $v = 0.415 \times 10^{-6} \text{ m}^2/\text{s}$, $\rho = 977.8 \text{ kg/m}^3$, $C_p = 4187 \text{ KJ/kg } ^\circ\text{C}$, $\beta = 4.15 \times 10^{-4}$ per degree Kelvin. For heat transfer by convection use following correlation. $Nu = 0.13 (Ra)^{(0.33)}$ [8]
- b) Explain in brief: [10]
- i) Local and average Heat Transfer coefficient
 - ii) Mechanism of Natural and Forced convection
 - iii) Define and write significance of Nusselt Number and Prandtl Number

OR

- Q6)** a) Water enters a tube with fully developed velocity and uniform temperature of 20°C. The inside diameter of the tube is 4 cm and its length is 9 m. It is desired to heat the water to 60°C by maintaining the surface at 90°C uniform temperature. Determine the mass flow rate to satisfy the above condition. Take $k = 0.64 \text{ W/m } ^\circ\text{C}$, $v = 0.62 \times 10^{-6} \text{ m}^2/\text{s}$, $\rho = 995 \text{ Kg/m}^3$, $C_p = 4187 \text{ KJ/kg } ^\circ\text{C}$, $\beta = 4.25 \times 10^{-4}$ per degree kelvin. Use following correlations $Nu = 0.023 Re_d^{0.8}Pr^{0.4}$ [8]
- b) Explain the following terms in boundary layer [10]
- i) Boundary Layer Thickness
 - ii) Displacement Thickness
 - iii) Momentum Thickness
 - iv) Thermal Boundary layer
 - v) Hydrodynamic entrance region

Q7) a) The energy received from the sun at the earth's atmosphere has been measured as 1353 W/m^2 . The diameter of the earth = $1.29 \times 10^7 \text{ m}$. Diameter of the sun = $1.39 \times 10^9 \text{ m}$. Mean distance = $1.5 \times 10^{11} \text{ m}$. Estimate the emissive power of the sun and the surface temperature assuming it to be black. Assuming that the source of energy for the earth is from the sun and earth to be black, estimate the temperature of the earth. [8]

b) Explain in brief: [8]

- i) Kirchoff's Law
- ii) Stefan Boltzmann's law
- iii) Wiens Displacement law
- iv) Emissivity

OR

Q8) a) Two large parallel plates with $\epsilon = 0.5$ each are maintained at different temperatures and are exchanging heat only by radiation. Two equally large radiation shields with surface emissivity 0.05 are introduced in parallel to the plates; find the percentage reduction in net radiative heat transfer. [8]

b) Define shape factor. Explain any 4 salient features of shape factor. Explain rules for determination of shape factor. [8]

Q9) a) Derive LMTD for parallel flow heat exchanger. Write assumptions also. [8]

b) In a double pipe heat exchanger hot water flows at the rate of 5000 kg/h and gets cooled from 95°C to 65°C . At the same time 50000 kg/h of cooling water at 30°C enters heat exchanger. The flow conditions are such that overall heat transfer coefficient remains constant at $2270 \text{ W/m}^2\text{K}$. Determine the heat transfer area required and the effectiveness, assuming two streams are in parallel flow. Assume for both the streams $C_p = 4.2 \text{ kJ/kgK}$. [8]

OR

Q10) a) A counter flow double pipe heat exchanger uses superheated steam to heat water at the rate of 10500 kg/h. The steam enters the heat exchanger at 180°C , and leaves at 130°C . The inlet and exit temperatures of water are 30°C and 80°C . If the overall heat transfer coefficient from steam to water is $814 \text{ W/m}^2\text{C}$. Calculate the heat transfer area. What would be the increase in area if the fluid passes are in parallel? [8]

b) Explain different regimes of pool boiling with neat sketch. What are different factors which affect nucleate boiling? [8]



Total No. of Questions : 10]

SEAT No. :

P2429

[Total No. of Pages : 4

[5870]-1598

**T.E. (Mechanical / Automobile Engineering)
THEORY OF MACHINES - II
(2015 Pattern) (Semester - I) (302043)**

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 non programmable calculator is allowed.
- 4) Assume suitable data if necessary.

Q1) a) Define the following terms : [4]

- i) Pitch Point
- ii) Module
- iii) Circular pitch
- iv) Backlash

b) A two start worm rotating at 800 rpm drives a 26 tooth worm. The worm has a pitch diameter of 54 mm and a pitch of 18mm. If a coefficient of friction is 0.06, find. [6]

- i) The helix angle of worm
- ii) The speed of gear
- iii) The center distance
- iv) The lead angle of maximum efficiency
- v) The efficiency

OR

Q2) a) Two gears in mesh have a module of 8mm and a pressure angle of 20°. The larger gear has 57 while the pinion has 23 teeth. If the addenda on pinion and gear wheel are equal to one module, find number of pairs of teeth in contact and angle of action of pinion. [6]

b) Find the relation to determine velocity ratio of helical gears. [4]

P.T.O.

Q3) In an epicyclic gear train, the internal gears A and B and compound gears C and D rotate independently about point O. All the gears have same module and the number of teeth are $T_C = 28$, $T_D = 26$, $T_E = T_F = 18$. the gear E and F rotate on pins fixed to the arm G. Gear E gear A and C whereas gear F meshes with B and D. [10]

Draw the arrangement and find

- Number of teeth on gears A and B
- Speed of gear B if arm G makes 200 rpm clockwise and gear A is fixed.
- Speed of gear B if arm G makes 200 rpm clockwise and gear A makes 20 rpm in anticlockwise direction.

OR

Q4) a) A compound gear train consist of four gears. The number of teeth on gears A, B, C and D are 54, 75, 36 and 81 respectively. The gears B and C forms a compound gear. If the gear A transmits 9 KW power at 200 rpm and gear train is 80%. Calculate output power. [6]
b) Explain in detail difference between gearbox and gear train. [4]

Q5) a) How the cams are classified? Describe in detail. [6]
b) An eccentric plate circular cam of eccentricity 40 mm provides motion to a spring loaded follower of mass 2 kg whose axis is perpendicular to the axis of a cam and passes through its center. The spring has a stiffness of 25N/mm. It is found that at certain speed the follower ceases contact with cam when it is rotate through 110° from its lowest position. Determine the speed if initial compression of the spring is 32 mm determine also the limiting speed of the cam to avoid jump. [10]

OR

Q6) a) Draw a cam profile using following data : [12]

- Radial roller follower with diameter 20 mm.
- Minimum radius of the cam 40 mm.
- Maximum displacement of the follower 50 mm.
- Cam rotation angle during rise of follower 60° .

- v) Type of follower motion during rise Uniform Acceleration and Retardation.
 - vi) Cam rotation angle during return of follower 180° .
 - vii) Type of follower motion during return SHM.
 - viii) Dwell at highest position of the follower 20° .
 - ix) Cam rotates clockwise.
- b) Explain cam jump phenomenon with diagram [4]

- Q7)** a) Explain the following terms. [6]
- i) Type synthesis
 - ii) Number synthesis
 - iii) Dimensional synthesis
- b) Determine the Chebychev spacing for the function $y = x^{1.4}$ for the range $1 \leq x \leq 4$ where three precision points are required. For these points, determine θ_2, θ_3 and ϕ_2, ϕ_3 if $\Delta\phi = 30^\circ$ and $\Delta\phi = 90^\circ$. [10]

OR

- Q8)** a) Explain the following terms [6]
- i) Function generation
 - ii) Path generation
 - iii) Motion generation
- b) Design a four bar mechanism with input link a and output link c, angle θ and ϕ for three successive positions are given in table below. [10]

Position	1	2	3
θ	55	25	-25
ϕ	110	40	-50

If the grounded link 40 mm using Freudenstein's equation find out length of other links to satisfy the given positional conditions.

- Q9)** a) Describe axially displaceable cone CVT. [6]
- b) The rotor of the turbine of a ship has a mass of 30 tonnes, a radius of gyration of 600 mm and rotates at a speed of 2400 rpm in clockwise direction when viewed from the aft. The ship pitches through angle of 15° 7.5° above and 7.5° below the horizontal, the motion being simple harmonic and having a period of 12 sec. Determine the maximum gyroscopic couple and its effect when bow rises. [12]

OR

- Q10)** a) Write short note on spheroidal and cone variators. [6]
- b) An aero plane flying at 250 Km/h turns towards right and completes a quarter circle of 75 m radius. The mass moment of inertia of rotary engine and propeller is 80 kg-m^2 . The engine speed is 2400 rpm clockwise when viewed from rear end. Find the gyroscopic couple on the air craft and state its effect on it. Also explain. [12]

The effect if the aeroplane performs a loop in the vertical plane.



[5870]-1599**T.E. (Mechanical Engineering)****TURBO MACHINES****(2015 Pattern) (Semester - I) (302044)****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) Draw neat and suitable figure wherever necessary.
- 4) Use of non-Programmable Scientific Calculator is allowed.
- 5) Use of steam table is permitted.

- Q1)** a) A 6 mm diameter jet of water having a velocity of 30 m/s strikes a flat plate, the normal from which is inclined at 33° to the axis of the jet. Find the force exerted by jet on plate in the direction of motion of plate when [6]
- i) the plate is stationary and
 - ii) the plate is moving with a velocity of 18 m/s away from the jet.
- Determine the power and efficiency of the jet when the plate is moving.
- b) Derive the relation for force exerted by jet of water on inclined fixed plate in the direction of jet. [4]

OR

- Q2)** a) Define turbo machine. Explain salient features of turbo machines. [4]
- b) A Pelton wheel of 2.5 m diameter operates under the following conditions: Net available head = 300 m; speed = 300 rpm. Blade angle at outlet = 165° ; Cv of nozzle = 0.98; Mechanical Efficiency = 95%. Determine: [6]
- i) The Power developed
 - ii) Specific speed
 - iii) Hydraulic Efficiency

- Q3)** a) Define the term: Degree of reaction and explain the meaning of pure reaction and 50% reaction turbines. [4]
- b) A Kaplan turbine develops 1500 kW under a head of 6 m. The turbine is set 2.5 m above the tailrace level. A vacuum gauge inserted at the turbine outlet records a suction head of 3.2 m. If the turbine efficiency is 85%, what will be efficiency of the draft tube having inlet diameter of 3 m. (Neglect losses in draft tube). [6]

OR

Q4) 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 following: [10]

- i) Blade inlet angle,
- ii) Tangential force on the ring of a moving blade,
- iii) Power developed in a stage.

Q5) a) Derive an expression for diagram efficiency of single stage Impulse Turbine. Obtain the Condition for Maximum efficiency & its value. [8]

b) In a single stage impulse turbine the mean diameter of the blade ring is 1 m and the rotational speed is 3000 rpm. The steam is issued from the nozzle at 300 m/sec and nozzle angle is 20°. The blades are equiangular. If the friction loss in the blade channel is 19% of the kinetic energy corresponds to relative velocity at the inlet to the blades. What is the power developed in the blading when the axial thrust on the blades is 98 N. Solve the problem graphically. [8]

OR

Q6) a) Write difference between throttle and nozzle governing used in steam turbines and explain with neat sketch of nozzle governing. [8]

b) Steam issues from the nozzles of an angle of 20° at a velocity of 440 m/s, the friction factor is 0.9, for a single stage turbine designed for a maximum efficiency determine: [8]

- i) Blade velocity
- ii) Moving blade angles for equiangular blades
- iii) Blade efficiency
- iv) Stage efficiency if the nozzle efficiency is 93% & power developed for mass flow rate of 3 kg/s

Q7) a) Name the various types of casings used in centrifugal pump. Explain briefly any two types of casings with neat sketches. [6]

b) A centrifugal pump running at 800 rpm is working against a total head of 20.2 m. The external diameter of the impeller is 480 mm and outlet width 60 mm. If the vanes angle at outlet is 40 degree and manometric efficiency is 70%, Determine: [10]

- i) Flow velocity at outlet
- ii) Absolute velocity of water leaving the vane
- iii) Angle made by the absolute velocity at outlet with direction of motion at outlet and
- iv) Rate of flow through pump
- v) Specific speed

OR

Q8) a) Write a short note on main and operating characteristics of Centrifugal Pump. [6]

- b) i) What is NPSH? Discuss available and required NPSH.
ii) A centrifugal pump running at 900 rpm has an impeller diameter of 500 mm and eye diameter of 300 mm. The blade angle at outlet is 35° with the tangent. Determine assuming zero whirl at inlet, the inlet blade angle, absolute velocity at outlet and its direction, and the manometric head, The flow velocity is constant at 3 m/s.

[10]

Q9) a) Explain slip and pre whirl, surging and choking in rotary compressor.[8]

- b) A centrifugal compressor delivers $10 \text{ m}^3/\text{s}$ of air when running at 10000 rpm. The air is drawn in at 1 bar and 300 K and delivered at 4 bar. The isentropic efficiency is 80%. The blades are radial at outlet and constant flow velocity is 64 m/s. The outer dia. of the impeller is twice the inner dia. and slip factor may be taken as 0.9. Calculate: [10]

- i) Temperature of air at outlet of impeller
- ii) Power required driving the compressor
- iii) Impeller diameters at inlet and outlet
- iv) Impeller blade angle at inlet
- v) Diffuser blade angle at inlet

OR

Q10) a) Explain pressure coefficient, flow coefficient and work input factor. [8]

- b) Represent and explain process involved in axial flow compressor on h-s diagram and derive an expression for isentropic efficiency and stage pressure ratio. [10]



Total No. of Questions : 9]

SEAT No. :

P2431

[Total No. of Pages : 2

[5870]-1600
T.E. (Mechanical & Automobile)
METROLOGY AND QUALITY CONTROL
(2015 Pattern) (Semester - I) (302045)

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

- Q1)** a) Write a note on ‘Pneumatic Comparator’. [5]
b) Explain sources of error and types of error. [5]

OR

- Q2)** a) Find the shaft and hole dimensions with tolerance for a 60H8f8 pair.
Use the following data with standard notations: [6]
- i) Diameter step 50 to 80 mm.
 - ii) Fundamental deviation for ‘f’ shaft = - 5.5 D^{0.41}
 - iii) IT8 = 25i
 - iv) $i = 0.45\sqrt[3]{D} + 0.001D$
- b) Explain Tool maker’s microscope and their application. [4]

- Q3)** a) Explain working of Gear Tooth Vernier Caliper. [5]
b) Write short note on Machine Vision System. [5]

OR

- Q4)** a) Explain hole basis and shaft basis system. [4]
b) Explain laser interferometer and its application. [6]

- Q5)** a) Write a note on Cost of Quality and value of Quality. [8]
b) Explain Juran’s trilogy approach with diagram. [8]

OR

P.T.O.

Q6) Explain the following :

- a) Quality Circle. [4]
- b) Seven Quality New Tools. [6]
- c) Deming's 14 points for improve quality. [6]

Q7) a) Write short note on OC curve and it's characteristics. [8]

- b) What are advantages of sampling inspection over 100% inspections? Explain the difference between single sampling and double sampling plan. [8]

OR

Q8) a) The numbers of defects found in each sample of cloth of 1 square meter area are noted down as follows. Draw appropriate control chart & state whether the process is under control or not. [8]

Sample Number	1	2	3	4	5	6	7	8	9	10	11	12
Number of defects found	8	9	5	8	5	9	9	11	8	7	6	4

- b) Enlist different types of control charts & their applications/uses. Elaborate on 'Control Chart Patterns'. [8]

Q9) Write note on (Any 3) : [18]

- a) Poka yoke
- b) Kaizen
- c) 5S
- d) Zero defect
- e) Six sigma
- f) TPM



Total No. of Questions : 10]

SEAT No. :

P2432

[Total No. of Pages : 2

[5870]-1601

T.E. (Mechanical Sandwich)

**MATERIALS AND MANUFACTURING ENGINEERING
(2015 Pattern) (Self-Study-I) (Semester - II) (302066)**

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.
- 5) No separate drawing sheet will be provided.

- Q1)** a) How Metal Matrix Composites are prepared? [4]
b) Discuss some biomaterials used for implant of human joints and dental implants. [6]

OR

- Q2)** a) What are carbon nanotubes? Explain different application of CNT. [4]
b) What are composites materials? Classify composites and name at least four engineering applications of composite material. [6]

- Q3)** a) What is corrosion? Classify and explain different types of corrosion.[4]
b) What are the different methods of prevention of corrosion? Discuss. [6]

OR

- Q4)** a) Discuss the need of modern materials and their processing. [4]
b) Differentiate between dry corrosion and wet corrosion. [6]

- Q5)** a) Explain the broaching, its applications and how do you specify Broaching machine? [6]
b) Explain the working principle of gear shaping with neat sketch. [6]
c) Write a note on Tread Tapping. [4]

OR

P.T.O.

- Q6)** a) Differentiate between push and pull broaching and broaches. [6]
b) Explain in details Gear Hobbing with neat sketch. [6]
c) Write a note on Thread Rolling. [4]

- Q7)** a) Describe the construction and working of a universal “Tool and Cutter Grinder”. [6]
b) Explain with neat sketch abrasive flow machining. [6]
c) Explain honing process. Discuss honing tools. [4]

OR

- Q8)** a) Differentiate lapping and honing processes. [4]
b) Explain Magneto-rheological Finishing process with neat sketch. [6]
c) How a grinding wheel is specified according to Indian Standard Marking System? Explain with suitable example. [6]

- Q9)** a) What is the use of drill bush? State their types. Enumerate materials used for manufacturing of drill bushes. [6]
b) Differentiate between jigs and fixtures. [6]
c) What is fixture? Discuss various locating and clamping devices. [6]

OR

- Q10)**a) What is 3-2-1 principle? Apply 3-2-1 principle to a cube and a rectangle and draw position of all 5 pins. [6]
b) Explain the use and selection criteria for different clamping and locating devices while designing a jig or Fixture. [6]
c) What is quick acting clamp? Sketch any one and explain. [6]



Total No. of Questions : 10]

SEAT No. :

P2433

[Total No. of Pages : 3

[5870]-1603

T.E. (Mechanical-Sandwich)

INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT

(Self Study - II)

(2015 Pattern) (Semester - II) (302067)

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) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

Q1) a) What are the basic techniques of Industrial Engineering? Explain. [5]

b) Define organization. Explain principles of organization. [5]

OR

Q2) a) What is meant by Management? Describe various functions of Management. [5]

b) What is motivation? Explain theory of motivation in detail. [5]

Q3) a) Discuss in detail the steps involved in Layout Planning. [5]

b) What do you mean by Industrial Safety? State the objectives of safety programme in industry. [5]

OR

Q4) a) Describe the relationship between Material handling and plant layout. [5]

b) State and explain objectives and principles of good plant layout. [5]

P.T.O.

Q5) a) Explain the need of Production Planning and control in modern industry. With the help of suitable example explain role of Capacity planning in PPC. [8]

b) A production department for a company requires 3600 Kg of raw material for Manufacturing a particular item per year. It has been estimated that cost of placing an order is Rs. 35 cost of carrying an inventory is 25% of investment in inventories. The price is Rs. 10 Kg. The Purchase Manager wishes to determine an ordering policy for raw material. Find out : [8]

- i) The Optimal lot size
- ii) The optimal order cycle time
- iii) The minimum yearly variable inventory cost
- iv) The minimum yearly total cost

OR

Q6) a) Explain the types of Inventories. Describe Cost associated with different types of inventories. [8]

b) Define the term “Production Planning and Control”. Describe advantages of better Production planning and control. [8]

Q7) a) What is Method study? How will you define the areas those are required to apply method study in Industrial Practice? Describe various charts used in recording phase of methods study. [8]

b) A work sampling study was carried out which has provided following facts: [8]

- i) Total time observed = 6500 min
- ii) Number of working observations = 2500
- iii) Number of ideal observations = 250
- iv) Performance rating during observations = 90
- v) Number of parts produced = 400
- vi) Allowances = 10 percentage

Calculate :

- 1) Standard Time.
- 2) Estimate the accuracy of 95% confidence level.
- 3) Comment on result for accuracy of (+) (-) 10 percentage.

OR

Q8) a) Describe various phases of process planning. [8]

b) Write short note on: [8]

- i) Process chart.
- ii) Network technique.

Q9) a) Explain Fulkerson's rule for numbering events in CPM/PERT. Describe the difference between CPM and PERT. [9]

b) Discuss the role and significance of Technology and Management. Discuss the growth of Technology. [9]

OR

Q10) Write short note on the following (Any three): [18]

- a) Evolution of Technology.
- b) Mission Flow Diagrams.
- c) Scope of Technology Strategy.
- d) Intellectual property right.
- e) Role of Government in Technology Development.



Total No. of Questions : 10]

SEAT No. :

P2434

[Total No. of Pages : 4

[5870]-1606

T.E. (Mechanical Sandwich)

**APPLIED COMPUTER AIDED ENGINEERING
(2015 Pattern) (Semester - I) (302061)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *Draw neat figures wherever necessary.*
- 3) *Use of Scientific calculators is allowed.*

Q1) a) Calculate the composite transformation matrix for the following operations performed in sequence as below for a triangle PQR with vertices P(4,4), Q(8,4), and R(6,8) : [6]

- i) Translation by 4 and 5 units along the X and Y axis;
- ii) Scaling by 2 units in the X direction and 4 units in the Y direction.
- iii) Rotation by 60° in CCW direction about Z axis passing through the point (4,4).

b) Explain geometry and topology in solid modeling. [4]

OR

Q2) a) Line L1 has endpoints (3,4,7) and (5,6,1), while line L2 has endpoints (1,5,-2) and (2,9,0). [6]

- Find :
- i) the parametric equations of the lines;
 - ii) the tangent vectors of the lines;
 - iii) Are the two lines perpendicular?

b) Explain the Constructive solid geometry (CSG) approach used for solid modeling with suitable examples. List softwares that use this approach. [4]

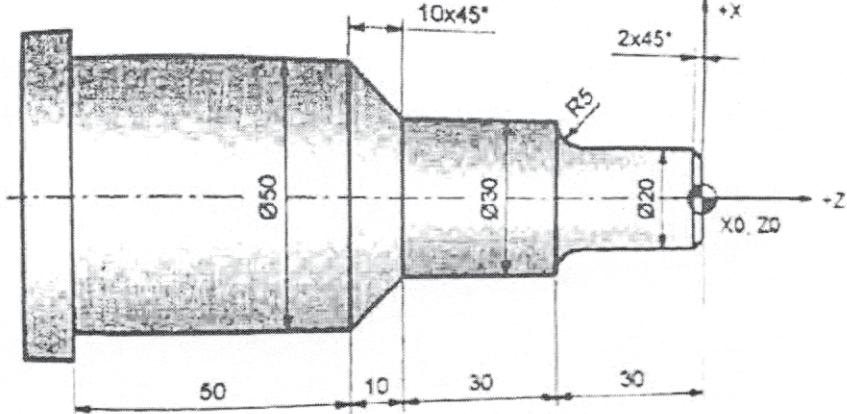
Q3) a) List different types of end effectors and explain hook and scoop types of end effectors in detail. [6]

b) Explain four islands of automation of computer integrated manufacturing. [4]

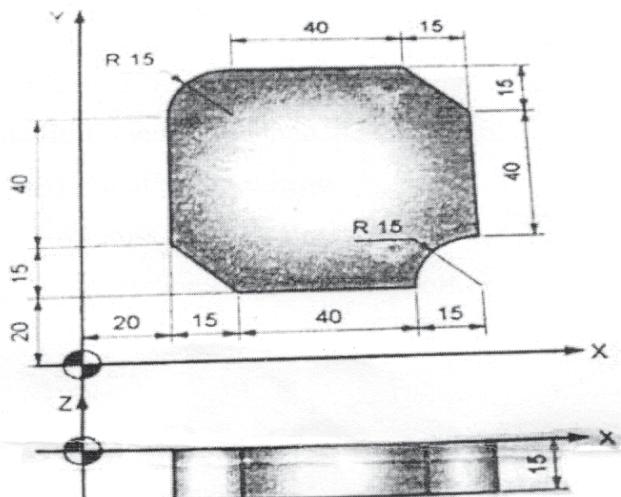
OR

P.T.O.

- Q4)** a) Explain Group Technology and its advantages over process layout. [6]
 b) Explain various types of robot joints. [4]
- Q5)** a) Write an NC program for the part shown in the figure. Take spindle speed as 200 RPM and feed rate 0.25 mm/rev. [10]



- b) Explain the classification of CNC machines according to the type of tool motion control. [6]
- OR
- Q6)** a) Develop a part program for the part as shown in Fig. The part is 15 mm thick. Use end mill cutter diameter of 15mm, cutting speed of 700 RPM, and feed rate of 100 mm/min. [10]



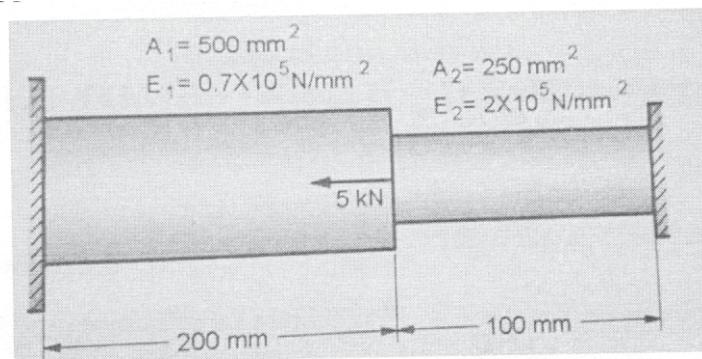
- b) Write a short note on tool length compensation and cutter radius compensation. [6]

- Q7)** a) Explain the stereolithography (SLA) process with a neat sketch. State its limitations. [10]
- b) Classify various rapid prototyping processes and give examples of each category. [6]

OR

- Q8)** a) Explain the fused deposition modeling (FDM) process with a neat sketch. State its applications. [10]
- b) Compare Selective Laser Sintering and 3D printing process on following basis: (i) Material used; (ii) surface finish; (iii) dimensional accuracy; (iv) Support structures; (v) Post processing; (vi) Post curing. [6]

- Q9)** a) Determine the nodal displacements, element stresses, and support reactions for the stepped bar shown in the below figure using finite element analysis. [12]

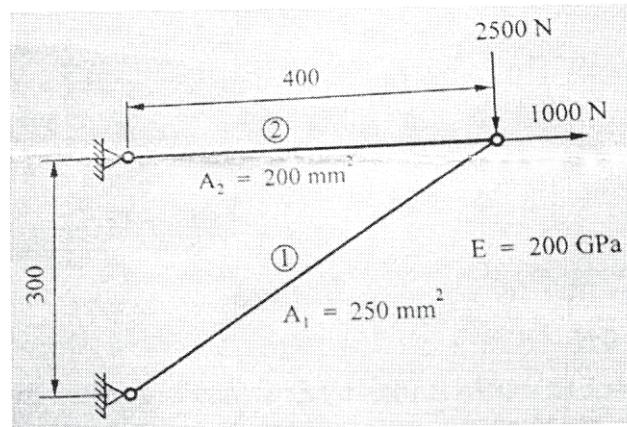


- b) The 1-D element has a length of 200mm. The temperatures at nodes 1 and 2 are 100°C and 40°C respectively. Evaluate the shape functions associated with nodes 1 and 2, if the temperature is to be estimated at point P within the element, situated at 150mm from node 1. Also, calculate the temperature at point P. [6]

OR

Q10)a The arrangement of the truss element is shown in the below figure. Using the finite element method, determine: [12]

- i) Nodal displacements
- ii) Stress in each element
- iii) Reaction force at the support.



b) Explain the potential energy approach in finite element analysis. [6]



Total No. of Questions : 10]

SEAT No. :

P2435

[Total No. of Pages : 3

[5870]-1607

T.E. (Mechanical Sandwich)

MACHINE DESIGN

(2015 Pattern) (Semester - I) (302062)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.1 or Q.2, Q3 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 the causes and remedies and remedies for Stress Concentration. [4]

b) With neat sketch explain the Modified Goodman Approach. [6]

OR

Q2) a) Draw neat diagram of knuckle joint and explain its construction. [4]

b) A 40 mm shaft is made of steel 50C4 ($\sigma_{ut} = 660 \text{ MPa}$) & has a machined surface. The expected reliability is 99%. The theoretical stress concentration factor for the shape of the shaft is 1.6 & the notch sensitivity factor is 0.9. Determine the endurance limit of the shaft $K_a = 0.76$, $K_b = 0.85$, $K_c = 1$, $K_g = 0.814$. [6]

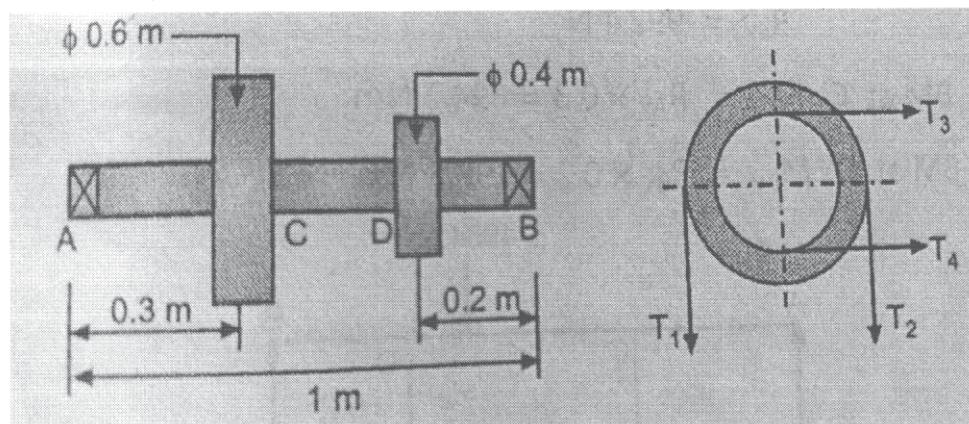
Q3) a) Explain the meaning of self-locking and overhauling of power screws. [5]

b) Explain in detail springs in series and parallel. [5]

OR

P.T.O.

- Q4)** A shaft is supported by two bearings placed 1 m apart. A 600mm diameter pulley is mounted at a distance of 300 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 2.25 kN. Another pulley 400 mm diameter is placed 200 mm to the left of right hand bearing is driven with the help of electric motor and belt, which is placed horizontally to the right. The angle of contact for both the pulleys is 180° and $\mu = 0.24$. Determine the suitable diameter for a solid shaft, allowing stress of 42 MPa in shear for material of shaft. Assume that the torque on one pulley is equal to that on the other pulley. [10]



- Q5)** a) Explain different causes of gear tooth failure with remedial action. [4]
- b) The P.C.D. of spur pinion and gear are 100 mm and 300 mm respectively. The pinion is made of plain carbon steel 40C8 ($S_{ut} = 600 \text{ N/mm}^2$) while gear is made of Cast Iron FG300. The pinion receives 5 KW power at 500 rpm through its shaft. The service factor and factor of safety is 1.5 each. The face width of gear is ten times of module. If velocity factor accounts the dynamic load, calculate the module and the number of teeth on pinion and gear. Specify the surface hardness for a gear pair. (Assume $K_m = 1$, 20° full depth involute system) [12]

OR

- Q6)** a) Explain the term effective load with reference of spur gear. How to estimate effective load of spur gear tooth? [6]
- b) Define formative or virtual number of teeth on a helical gear. Derive the expression for the same. [6]
- c) What are the various forces acting on worm and worm gears? Explain in brief. [4]

- Q7)** a) Explain failures in rolling contact bearing with causes and remedies. [4]
b) A ball bearing operates on work cycle consisting of three parts: a radial load of 3000 N at 720 rpm for 30% of the cycle, a radial load of 7000 N at 1440 pm for 40% of the cycle and radial load of 5000 N at 900 rpm for remaining part of the cycle. The dynamic capacity of the bearing is 30700 N. [12]

Calculate:

- i) The rating life of bearing in hours.
- ii) The average speed of rotation;
- iii) The life of bearing with 95% reliability.

OR

- Q8)** a) Derive the stribecks equation for rolling contact bearing. [6]
b) A ball bearing subjected to a radial load of 5 kN, is expected to have a life of 8000 hours at 1450 rpm with a reliability of 99%. Calculate the dynamic load capacity of the bearing, so that it can be selected from manufacturer's catalogue based on reliability of 90%. [10]

- Q9)** a) It is stated that the speed at which a belt should be run to transmit maximum power is that at which the maximum allowable tension is three times the centrifugal tension in the belt at that speed. Prove the statement. [6]
b) Explain the different types of stresses induced in the wire ropes. [6]
c) Explain the polygon effect in case of chain drives. [6]

OR

- Q10)** a) Explain the procedure to select the V-belt from manufacturer's catalogue. [6]
b) Two parallel shafts whose centre lines are 4.8 m apart, are connected by an open flat belt drive. The diameter of the larger pulley is 1.5 m and that of smaller pulley 1 m. The initial tension in the belt when stationary is 3 KN. The mass of the belt is 1.5 kg/m. The coefficient of friction between the belt and the pulley is 0.3. Taking centrifugal tension into account, calculate the power transmitted, when the smaller pulley rotates at 400 RPM. [12]



Total No. of Questions : 10]

SEAT No. :

P6520

[Total No. of Pages : 2

[5870]-2001

T.E. (Computer Engineering)

DATA COMMUNICATION AND WIRELESS SENSOR NETWORKS

(2012 Pattern) (Semester - I) (310243)

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, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume Suitable data if necessary.
- 4) Figures to the right indicate full marks.

Q1) a) Explain Go Back N ARQ protocol with neat diagram. [5]

b) Justify the use of Wireless Sensor Network in Internet of Things. [5]

OR

Q2) a) How Character oriented approach of framing differs from Bit oriented approach of framing. [5]

b) List the properties a line code should have. Draw the following bit pattern in RZ, NRZ, AMI and Manchester code. [5]

Q3) a) Describe how Delta Modulation system works. What is meant by slope overload? [6]

b) Explain sensor network organization and tracking. [4]

OR

Q4) a) Explain how adaptive delta modulation improves systems tolerance to slope overload. [6]

b) Describe the working of Piconet. [4]

Q5) a) What is the main purpose of leach protocol? List and explain various approaches for the cluster selection in LEACH protocol. [6]

b) How hidden station and exposed station problem affects the communication in wireless network. Explain in brief. [5]

c) SMAC protocol is used for efficient energy utilization in WSN. Explain how? [5]

OR

P.T.O.

Q6) a) Explain techniques to handle Address and name management in wireless sensor networks. [6]

b) Differentiate between Contention-based protocols and Schedule-based protocols. [5]

c) With neat diagram, explain ZigBee technology. [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? [5]

c) Write a short note on: [5]

i) Directed diffusion

ii) Rumor routing

OR

Q8) a) Explain Attribute based routing in WSN. [6]

b) Explain the Flooding technique and its drawbacks. [5]

c) Explain in detail data dissemination and gathering. [5]

Q9) a) Why localization is needed. Explain phases localization in detail. [8]

b) Write a note on joint routing and information aggregation in sensors. [5]

c) Explain information based sensor tracking with neat diagram. [5]

OR

Q10) a) Explain in detail the operating system design issues in WSN with reference to architecture, function etc. [8]

b) Explain the impact of anchor placement in WSN. [5]

c) How big data is handled in sensor network. [5]



Total No. of Questions : 10]

SEAT No. :

P6521

[Total No. of Pages : 2]

[5870]-2002

T.E. (Computer Engineering)

PRINCIPLES OF CONCURRENT AND DISTRIBUTED PROGRAMMING

(2012 Pattern) (Semester - II) (310249)

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 Platform Model in OpenCL in detail with suitable diagram. [6]
b) Explain the structure of YACC file. [4]

OR

Q2) a) Explain how to count task dependency. [6]
b) Explain how to send and receive a message in MPI. [4]

Q3) a) Explain the mechanism of process migration. [6]
b) Compare GPU and CPU. [4]

QR

Q4) a) Describe two ways of creating threads in Java. [6]
b) Explain: [4]

- | | |
|-----------------|---------------|
| i) YYTEXT | ii) YYLVAL |
| iii) YYPARSE() | iv) YYWRAP() |

Q5) a) Explain the following terms with respect to operating system: [8]

- i) System image
 - ii) Autonomy
 - iii) Fault Tolerance Capability

b) Compare workstation model with workstation server model.

QR

PTO.

Q6) a) Explain the processor pool model along with advantages and disadvantages of it. [8]

b) Write short note on DCE Components. [8]

Q7) a) Explain Xen architecture with neat diagram. [8]

b) What is the need of Virtualization? [4]

c) Explain para virtualization. [4]

OR

Q8) a) Explain Dom0 and DomU Communication in Xen. [8]

b) Differentiate between Virtual Machine and Distributed Machine. [4]

c) Explain full virtualization. [4]

Q9) a) Write a CUDA program for addition of two matrices. [8]

b) What is meant by single node and multiple nodes systems, with respect to multi CPU and multi GPU? [10]

OR

Q10) a) What are different types of data storage in CUDA? [8]

b) Explain the concept of mobile computing with respect to the following points: [10]

i) Mobile computing classification

ii) Advantages

iii) Future trends

iv) Limitations

v) Security issues before mobile computing



Total No. of Questions : 8]

SEAT No. :

P6522

[Total No. of Pages : 2

[5870]-2003

**T.E. (Computer Engineering)
SOFTWARE ENGINEERING
(2012 Pattern) (Semester - II) (310252)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve question number 1 or 2, 3 or 4, 5 or 6 and 7 or 8.*
- 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 characteristics of SRS? [6]

b) What do you mean by CRC? Write the steps for identifying analysis classes using CRC modeling. [7]

c) Explain Component - Level Design for WebApp. [7]

OR

Q2) a) Describe the different box specification in Clean room engineering? Explain. [7]

b) For banking system make your assumptions about the scope of the system, identify four use cases and depict them in diagram. [7]

c) Explain data centered layered architectures with neat diagrams. [6]

Q3) a) What do you understand by the term integration testing? Which types of defects and uncovered during integration testing. [6]

b) Distinguish between: [6]

- i) Alpha testing and beta testing
- ii) Verification and Validation

c) Describe User Interface Testing, Positive testing and Negative testing. [5]

OR

P.T.O.

- Q4)** a) Explain Boundary value analysis testing and orthogonal Array testing. [5]
b) Explain the Testing Concepts for WebApps. [6]
c) What are the objectives of testing? What are Testing strategies for conventional and object oriented software? [6]

- Q5)** a) What is process decomposition? What are the work tasks for communication process using process decompositions? [5]
b) Explain metric for object oriented projects. [6]
c) Explain Process-Based Estimation. [6]

OR

- Q6)** a) What is the difference between Measure and Metric? What are attributes of effective Software Metric? [5]
b) What is software configuration management? Explain the change control mechanism is software configuration management. [5]
c) What is Risk identification? What are the different categories of risks? [7]

- Q7)** a) Explain Service - oriented architecture? [5]
b) What is OCL? Where it is used? [5]
c) Discuss architectural patterns in detail. [6]

OR

- Q8)** a) Discuss client server computing? Explain. [5]
b) What are the benefits and problems of reusing software when developing new systems. [5]
c) Explain Distributed software engineering? [6]



Total No. of Questions : 10]

SEAT No. :

P6523

[Total No. of Pages : 2

[5870]-2004

T.E. (Computer Engineering)

DIGITAL SIGNAL PROCESSING APPLICATIONS

(2012 Pattern) (Semester - II) (310253)

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, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data, if necessary.

Q1) a) Define mean, standard deviation, SNR, histogram and probability density function. [5]

b) State and explain sampling theorem and aliasing effect. [5]

OR

Q2) a) Find the circular convolution of $x(n) = \{1, 2, 2, 1\}$ and $h(n) = \{1, 2, 3, 1\}$ using any one method. [5]

b) State and define the periodic and non-periodic signal, even and odd signal also energy and power signal. [5]

Q3) a) Explain the Radix-2 DIT FFT algorithms. [5]

b) Obtain the Z Transform of sequence $x(n) = a^n u(n)$ and sketch the ROC. [5]

OR

Q4) a) State and explain any three properties in terms of Fourier transform. [5]

b) Describe the characteristic of filter and all pass filters. [5]

P.T.O.

- Q5)** a) Explain the Radix-2 DIF FFT algorithms and consider $N = 8$. [9]
b) State and explain causality, stability and initial value theorem in terms of z-transform. [9]

OR

- Q6)** a) What are filter structures? Explain the any application filters. [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) Explain important components of ADSP 21XXX family. [8]
b) Explain the application of DSP in telecommunication and biomedical. [8]

OR

- Q8)** a) Explain the features of SHARC DSP processor. List the number of DAGs with its capabilities and memory pointer registers supported by DAG. [8]
b) Write short note on OMAP multimedia applications. [8]

- Q9)** a) Explain in brief the digital image processing. Write short note on image enhancement. [8]
b) Explain the important components of DSPs. [8]

OR

- Q10)** a) Explain the high fedelity audio in brief and also explain limitation of DSP. [8]
b) Explain the brightness, contrast adjustment and gray scale transformation in brief. [8]



Total No. of Questions : 10]

SEAT No. :

P6524

[Total No. of Pages : 2

[5870]-2005

T.E. (Computer Engineering)

EMBEDDED OPERATING SYSTEMS

(2012 Pattern) (Semester - II) (310250)

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 the RISC architectural features of ARM. [6]

b) What are the qualities of Good RTOS? [4]

OR

Q2) a) What is deadlock? List the necessary conditions for a deadlock to occur. How it is resolved? [6]

b) What is Readers-Writers problem? [4]

Q3) a) What is Busy Box? How to configure it? Explain its usefulness in embedded systems. [6]

b) What is cross development environment for Linux? [4]

OR

Q4) a) Name and explain different components of bootstrap loader? [6]

b) What are the main categories of kernel releases? [4]

Q5) a) What is core dump? How to debug a core dump? [6]

b) What are the different types of device drivers? Explain depmod and rmmod. [6]

c) Name and explain a Linux utility used for partitioning the block devices. [5]

OR

P.T.O.

Q6) a) Explain the following Linux utilities used: [6]

i) fdisk ii) mount iii) mkfs

b) How to build device drivers in Embedded Linux? [6]

c) What are the types of file systems used for flash memory? [5]

Q7) a) How do modern processors and compilers make it difficult to debug Linux kernel? [6]

b) What are binutils? Name and explain three of them. [6]

c) What is JTAG probe debugging? [5]

OR

Q8) a) Why tracing and profiling tools are required? Name and explain 3 such tools. [6]

b) Explain in detail Embedded Graphics Processing. [5]

c) Discuss the challenges in debugging a Linux application code. [6]

Q9) a) What are real-time processes? Which latency periods affect their performance? [6]

b) What are the issues involved in preempting the Linux kernel? [6]

c) Give details of bootloader for embedded Android. [4]

OR

Q10) a) What are the scheduling policies used by Linux to schedule real time processes? [6]

b) Explain the role of Zygote, system server in embedded android. [6]

c) What are the types of real-time systems? [4]



Total No. of Questions : 8]

SEAT No. :

P6526

[Total No. of Pages : 3

[5870]-2007

T.E. (Mechanical)

HYDRAULICS AND PNEUMATICS

(2012 Pattern) (Semester - I) (302045)

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) 4×3 Solenoid tandem center operated DCV.
- ii) Pressure and temperature compensated flow control valve.
- iii) Gas charged accumulator.
- iv) Counter balance valve with bypass check valve.
- v) Hydraulic actuator with both end cushion.
- vi) Bi-directional fixed displacement hydraulic pump.

b) Classify pumps used in fluid power applications. [6]

c) A 6000 N weight is to be lifted upward in a vertical direction for the system shown in Figure 6b. Find the cylinder force required to [8]

- i) Move the weight at a constant velocity of 1.75 m/s.
- ii) Accelerate the weight from zero velocity to 1.75 m/s in 0.5 s.

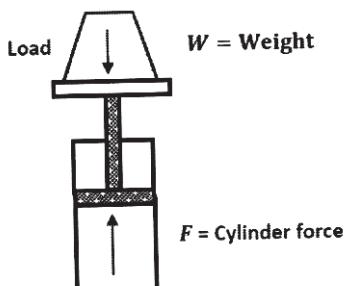


Fig. 1

OR

P.T.O.

- Q2)** a) Differentiate between hydraulics system and pneumatics system. [6]
- b) What are the functions of reservoirs? Draw a neat sketch of standard reservoir showing its Internal and external features. [6]
- c) Explain with neat sketch what is a double rod end and telescopic cylinder. State their applications. [8]

- Q3)** a) Explain with neat sketch working of pressure relief valve. Draw an ISO symbol of it. [6]
- b) Draw any two speed controlling methods and label the components. [6]
- c) Draw a neat sketch of punching press circuit and label the components. [6]

OR

- Q4)** a) Differentiate between ‘closed centre’ and ‘tandem centre’ valve position of directional control valve with their ISO symbols, it’s importance and their applications. [6]
- b) Draw and label any two methods of regenerative circuit with a neat sketch. State its advantages. [6]
- c) Draw a two methods of hydraulic cylinder synchronization circuit. State which one is the perfect synchronization method. [6]

- Q5)** a) Draw and explain circuit involving time delay valve used in pneumatics. [6]
- b) Draw and Explain any typical pneumatic circuit for a control of Double acting Cylinder. [6]
- c) Write in brief on applications of pneumatics in low cost Automation. [4]

OR

- Q6)** a) Draw a typical circuit showing the application of twin pressure valve. [6]
- b) Sketch compressed air generation and distribution system. [6]
- c) Write typical applications in industry requiring vacuum for their operation. [4]

Q7) Analyze and label the given hydraulic circuit. [16]

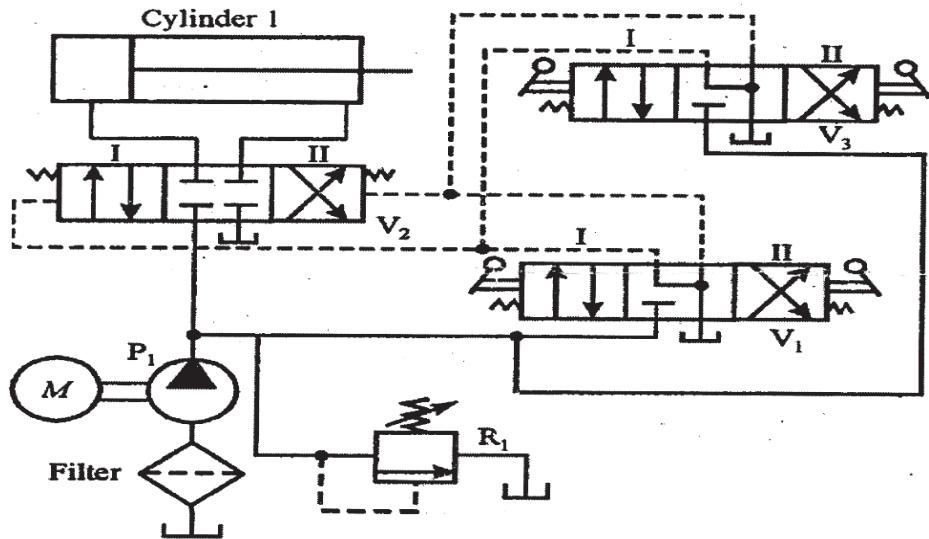


Fig.7

OR

- Q8)** a) A pneumatic cylinder is needed to press-fit a pin in a hole. Design a circuit diagram with a precondition that while actuating, both the hands of the operator should be engaged. [10]
 b) Analyze the circuit and label the components in given circuit as shown in Figure 8b. [6]

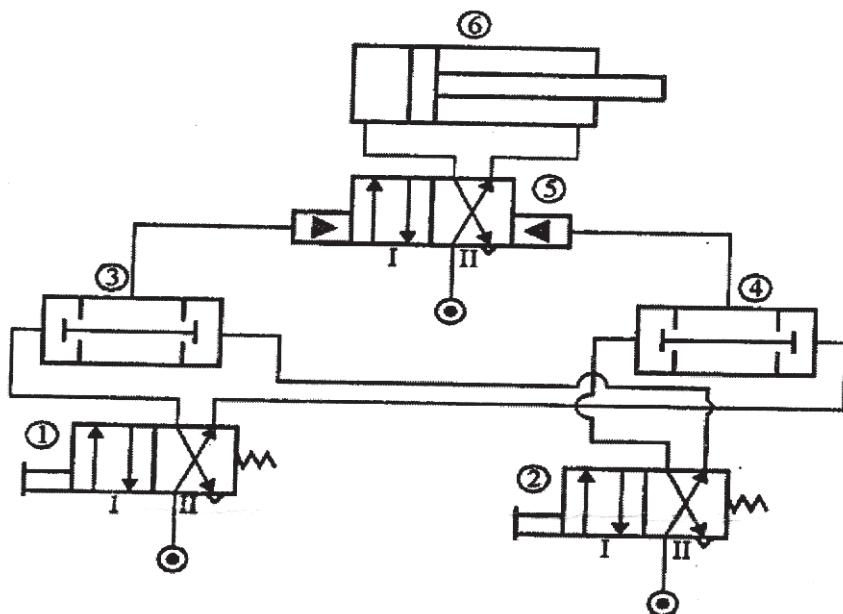


Fig. 8b



Total No. of Questions : 10]

SEAT No. :

P6527

[Total No. of Pages : 2

[5870]-2008

T.E. (Computer Engineering)
OPERATING SYSTEM DESIGN
(2012 Pattern) (Semester - I) (310242)

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) *Assume Suitable data, if necessary.*

- Q1)** a) What is Kernel? Explain Monolithic and Micro Kernel. [5]
b) Write a short note on OS booting process. [5]

OR

- Q2)** a) How hybrid system of Swapping and demand paging works? [6]
b) What is thread? How it is different than the process. [4]

- Q3)** a) A process references pages in the following order: 0, 1, 2, 3, 0, 1, 2, 3, 0, 1, 2, 3, 4, 5, 6, 7. Use LRU and FIFO page replacement algorithms to find out number of page faults for this reference string using 3 page frames. [6]
b) Explain Process State transitions with suitable diagram. [4]

OR

- Q4)** a) What is deadlock? What are the necessary conditions to occur deadlock? [5]
b) What is deadlock recovery? Explain *Resource Preemption* method to recover from deadlock. [5]

- Q5)** a) What is socket? What are different types of socket? Explain following system calls with parameters of socket mechanism. [8]
i) connect ii) listen iii) getsockname
b) Explain the problem of Multiprocessor Systems. How this problem is solved by using Master and Slave processors? [8]

OR

P.T.O.

Q6) a) What is Semaphore? How multiprocessor system is solved using Semaphore? [8]

b) Write a short note on Pipes. [4]

c) Write a short note on Tunis System. [4]

Q7) a) Write a short note on UEFI Boot and U-Boot. [8]

b) Explain Fedora-19 EFI files: *grubx64.efi*, *MokManager.efi*. [8]

OR

Q8) a) Write a note on Make Tools: make, nmake, cmake. [8]

b) Write a short note on AWK tool and Sorting tool. [8]

Q9) a) Write a short note on Google Android. [6]

b) What is Handheld operating system? How it is secured. [6]

c) Write a note on Linux Scheduling. [6]

OR

Q10) Write note on following: [18]

a) Palm OS.

b) Unix Free BSD Scheduling.

c) Microsoft Windows Mobile.



Total No. of Questions : 10]

SEAT No. :

P6528

[Total No. of Pages : 2

[5870]-2009

T.E. (Computer Engineering)

DATABASE MANAGEMENT SYSTEM APPLICATIONS

(2012 Pattern) (Semester - I) (310244)

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) Compare SQL and NOSQL Databases with suitable examples of each? [5]
b) Define the term Normalization. Explain how 3NF treats the functional dependencies? [5]

OR

- Q2)** a) Elaborate query optimization with suitable example? [5]
b) Explain 1NF and 2NF in normalization. Give suitable example of each? [5]

- Q3)** a) Create the University Database having following specifications: [5]

- i) Department table (dept_no, dept_name, building_name)
Apply Unique constraint on name field.
- ii) Instructor table (ins_id, ins_name, dept_no, salary, mob_no)
Apply NOT NULL constraint on name field.
- iii) Course table (course_id, title, dept_no, credits)
- iv) Teaches table (teacher_id, course_id, semester, year)

Create tables as per requirements (Mandatory)

Write the following queries with respect to above relations. (any 2)

- i) Increase the size of the title field of course relation.
- ii) Create a view by showing a instructor name with a department name and its salary.
- iii) Update salary of particular instructor using update view.
- iv) Display details of employee having second highest salary.

- b) Describe crowd sourcing with respect to database? [5]

OR

P.T.O.

- Q4)** a) What are the advantages of allowing multiple transaction to run concurrently? [5]
b) BASE Transactions ensures the properties like Basically Available, Soft State, Eventual Consistency. What is soft state of any system, how it is depend on Eventual consistency property? [5]

- Q5)** a) Explain concept of distributed Database. How distributed Transaction Works? [8]
b) What is the concept of Parallel databases and Distributed databases? Explain in detail? [8]

OR

- Q6)** a) Write a program in java/php/python to demonstrate the database connectivity for MySQL/oracle database? [8]
b) Explain Speedup and Scale up in Parallel Databases. Explain with respect to Parallel Databases Operations. [8]

- Q7)** a) Write a short note on XML and its uses. Explain Querying in XML? [8]
b) Explain different components of Hadoop in detail? [9]

OR

- Q8)** a) Write XML Document for Book Data (Category, Title, Author, and Price). Write XQuery to retrieve all book information with price > 30. [8]
b) Write short note on:
i) JSON
ii) R programming

- Q9)** a) Explain supervised and unsupervised techniques in Machine Learning? Also state and explain different supervised and unsupervised ML algorithms? [8]
b) Write a short note on following? [9]
i) Operational Database and Data warehouse.
ii) Map Reduce in Hadoop.

OR

- Q10)** a) Write a short note clustering applications in Data mining? Explain K-means clustering algorithm? [8]
b) Explain the need of ETL Process (Extract-Transform-Load) in data warehouse building? [9]



Total No. of Questions : 8]

SEAT No. :

P6997

[Total No. of Pages : 2

[5870]-2010

T.E. (Computer Engineering)

COMPUTER FORENSIC AND CYBER APPLICATIONS

(2012 Pattern) (Semester - I) (310245)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 ro Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Draw suitable diagrams wherever necessary.

Q1) a) Draw OSI reference model and write function of each layer. [8]

b) What are different types of topology? Explain any one. [6]

c) Write short note on cyber attacks. [6]

OR

Q2) a) Explain following network hardware components : [8]

i) Repeater

ii) Hub

iii) Bridge

iv) Switch

b) Explain guided transmission media with example. [6]

c) Write short note on digital evidence as Alibi. [6]

Q3) a) Explain different types of cyber stalker with example cases? [8]

b) How will you apply forensic science to computer? [8]

OR

Q4) a) Explain in brief Indian IT Act. [8]

b) Write a short note on Email Encryption. [8]

P.T.O.

Q5) a) Compare digital evidence on window system & Unix system. [8]

b) Explain patents, trademark & copyrights in details. [8]

OR

Q6) a) Describe Unix file system. [8]

b) Explain in detail types of evidences on mobile devices. [8]

Q7) a) Explain role of sniffer in evidence collection at physical layer. [9]

b) Write short note on fraud detection in mobile and wireless network. [9]

OR

Q8) a) Write short note on : [9]

i) Ethernet

ii) ATM network

b) Enlist the steps applied in forensic science to the network. [9]

