Total No. of Questions : 8]

SEAT No. : ____

PC-1685

[Total No. of Pages : 2

[6353] - 1
T.E. (Civil)
Hydrology and Water Resources Engineering
(2019 Pattern) (Semester-I) (301001)

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 Q-GIS and its application in hydrology **[10]**

b) Explain Rational formula and its importance **[8]**

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 tube well **[8]**

Q7) a) Explain Piped Distribution Network (PDN) and state its advantages **[10]**

b) Explain Hortons curve with neat sketch. **[7]**

OR

Q8) a) State principle Indian crops and explain their planning and agricultural practices **[2+4+4]**

b) Differentiate between surface irrigation and subsurface irrigation and explain drip irrigation in detail **[7]**

Total No. of Questions : 8]

SEAT No. :

PC-1686

[Total No. of Pages :2

[6353]-2
T.E. (Civil)
Water Supply Engineering
(2019 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.***
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 scientific calculator is allowed.***

Q1) a) Draw a neat sketch of a rapid sand gravity filter and show the various components. Explain the mechanics of rapid sand gravity filter? **[6]**

b) A water treatment plant treats 200 m^3/hr of water. Design the circular Clariflocculator. Following parameters are expected to be designed

i) Dimension of flocculator unit. ii) Power input by paddles to water. iii) Size and number of paddles. iv) Opening below flocculator. **[6]**

c) State the classification of coagulants? and explain any one. **[6]**

OR

Q2) a) Design six units of slow sand filter for the following data: **[6]**

i) Population 60000

ii) Per capita demand 250 lit/cap/day

iii) Rate of filtration 180 lit/hr/sq. m.

iv) Length of each bed twice the breadth. Assume maximum demand of 1.8 the average daily demand, also assume that one unit is kept as a stand by.

b) Compare the slow sand filter and rapid sand filter? **[6]**

c) With neat sketch explain back washing of rapid sand gravity fliter? **[6]**

Q3) a) Alum dose of 30 mg/l is used to. treat 60MLD of water workout quantity of alum required per month by the water treatment plant, Also calculate the amount of CO_2 released per day? **[6]**

b) Define disinfection and list the different types of disinfection? **[6]**

c) Explain Zeolite process with neat sketch. **[6]**

P.T.O.

OR

Q4) a) A filtered water discharge of 2 MLD has a chlorine demand of 5.8 mg/l. it is required to maintain a chlorine residual of 0.2 mg/l. determine the quantity of bleaching powder necessary for six months (chlorine available 25 %)? **[6]**

b) Explain the lime-soda process? **[6]**

c) State the various methods of removing excess fluorides from water? Explain any one in detail? **[6]**

Q5) a) Explain the water harvesting system? **[4]**

b) Write the advantages of gravity and pumping system? **[4]**

c) A town with population of 2 lakh is to be supplied with water supply daily at 200 lit per head. The pumping is done from 6 am to 6 pm. The variation in demand is as follows: **[9]**

Time of the Day	6 am -9 am	9 am - 12 noon	12 noon - 3pm	3 pm - 6 pm	6 pm - 9 pm
Demand	40%	10%	10%	15%	25%

Determine the capacity of the service reservoir by mass curve method.

OR

Q6) a) Determine the balancing capacity of an ESR for a town having population 2 million and water supply rate of 280 lit/cap/1. the water is pumped continuously for 24 hr. breakup of demand is **[8]**

Time	Demand (lit-cap/1)
3 am - 9 am	80
9 am - 1 pm	50
1 pm - 7 pm	85
7 pm - 11 pm	30
11 pm - 3 am	35

b) State the various methods of distribution system? Explain any one **[4]**

c) What is the service reservoir? **[5]**

Q7) a) Draw with sketch WTP for swimming pool? **[5]**

b) Explain the smart city mission and ATAL mission for rejuvenation and urban transformation mission? **[7]**

c) State the various types of tools used for plumbing work? **[5]**

OR

Q8) a) What is Jal Jeevan mission? State its implication in rural India. **[6]**

b) Draw any four types of sanitary pipe fittings? **[5]**

c) ExpIain with sketches Sluice valve, presser valve, rdflux valve? **[6]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1687

[Total No. of Pages :2

[6353]-3
T.E. (CIVIL)
DESIGN OF STEEL STRUCTURES
(2019 Pattern) (Semester - I) (301003)

Time : 3 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. 7or Q.No. 8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***IS: 800-2007 & IS: 875 Part I to III are permitted.***

Q1) a) A column having effective length of 3.5m is subjected to factored axial load of 450 kN and factored moment 50 kNm.Design the column section. Check for section strength only. **[12]**

b) Differentiate between moment resisting base and gusseted base. **[5]**

OR

Q2) a) Design a gusseted base for built up column ISHB 350 @ 67.4 kg/m with plates 450 × 22 mm carrying on axial factored load of 300kN.The column is to be supported on concrete pedestal of M20 grade. Draw the design sketches. **[12]**

b) Explain the following cases with example. **[5]**

i) Axial force and uniaxial loading

ii) Axial load and biaxial bending

Q3) a) A simply supported steel joist of 4.0m effective span is laterally supported. It carries a total uniformly distributed load of 40 kN/m inclusive self-weight. Design an appropriate section using I-section. **[10]**

b) Determine the design bending strength of ISMB 400 @ 61.6 kg/m considering the beam to be laterally supported. The effective span of the beam is 3.0 m. Assume steel of grade Fe 410. **[8]**

OR

Q4) a) Calculate safe uniformly distributed load over a laterally unsupported beam ISMB 100@ 61.6 kg/m for an effective length of 6m. Also check for serviceability. **[13]**

b) Explain factors affecting plastic moment capacity. **[5]**

P.T.O.

Q5) a) Design a gantry supporting an electronically operated crane for following data: **[13]**

i) Capacity of crane l20kN

ii) Span between crane rails 20m Self weight crane girder l00kN

iii) Weight of crab electric motor hook l5kN

iv) Minimum hook approach 1 .2m

v) Wheelbase 2m

vi) Span of Gantry 5.5m

vii) Weight of rails 0.3kN/m

b) Explain Loading on Gantry girder. **[4]**

OR

Q6) a) Determine panel point dead load, imposed load and wind load for a truss. Assume design wind pressure as 1200 N/m^2, use A.C. Sheet and the centre spacing of truss as 6m. Assume 6 panels @5m and Rise 5m. Considered pratt truss. **[13]**

b) Define: **[4]**

i) Pitch ii) Central rise.

Q7) A simply supported welded plate girder of an effective span of 20 m subjected to factored uniformly distributed load 40 kN/m throughout the span including the self-weight of plate girder. Assume compression flange laterally supported throughout the span and yield stress of steel is 250 MPa Design cross section of plate girder, stiffeners, and connections. Draw sectional plan and elevation. **[18]**

OR

Q8) a) Design a welded plate girder for an effective span 28m and carrying a factored UDL of 35kN/m and factored concentrated loads of 140kN acting at 8m from both ends. Design flange and web section. Provided connection between webs and flange. **[12]**

b) Define plate Girder. Also state it's the element and function. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC-1688

[Total No. of Pages : 2

[6353] - 4
T.E. (Civil)
ENGINEERING ECONOMICS & FINANCIAL MANAGEMENT
(2019 Pattern) (Semester - I) (301004)

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) Discuss in detail about construction financial management and how it is different from others? **[5]**

b) Write down about the types of contract costing. **[5]**

c) Explain the contents of specimen of contact account and prepare template of contract account of work in progress and work completed. **[8]**

OR

Q2) a) Discuss the role of financial manager in construction financial management. **[5]**

b) Differentiate between Job costing and contract costing. **[5]**

c) Write down in detail about recording and reporting site accounts between site office and head office. **[8]**

Q3) a) Define Budget? Write down any four objectives of budget. **[5]**

b) What do you understand by master budget and functional budget. **[6]**

c) What do you understand by NPV and IRR method? Explain with the help of formulae's. **[6]**

P.T.O.

OR

Q4) a) What do you understated by concept of time value of money? **[5]**

b) List out objectives and benefits of capital budgeting for any company. **[6]**

c) What do you understand by depreciation? Explain any two methods with formulae used to find out depreciation of a building. **[6]**

Q5) a) Write down benefits of working capital to any business. **[5]**

b) What do you understand about procurement cost, inventory carrying costs? Explain with the help of examples. **[6]**

c) Write down step by step procedure to conduct ABC analysis, also draw ABC curve. **[6]**

OR

Q6) a) List out methods of estimation of working capital and explain any one method in detail. **[5]**

b) Explain the term EOQ with the help of figure. Derive expression for it. **[6]**

c) What are the objectives of inventory control? List out its benefits. **[6]**

Q7) a) Write a short note on types of direct tax. **[5]**

b) Write a short note on corporate tax planning. **[5]**

c) What are the methods of calculating property tax? Explain any two. **[8]**

OR

Q8) a) Differentiate between IRDA and SEBI. **[5]**

b) What are the key roles and functions of SEBI. **[5]**

c) Discuss in detail about ICRA and IRDA. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PC1689

[Total No. of Pages : 2

[6353]-5

T.E. (Civil)

ADVANCED FLUID MECHANICS AND HYDRAULIC MACHINES

(2019 Pattern) (Semester - I) (Elective - I) (301005 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) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) What is water hammer, what are the methods to reduce water hammer. **[6]**

b) Prove that for gradual closure of valve rise of pressure $h = \frac{LV}{gt}$. **[6]**

c) Fluid flows through an orifice of an area 0.3 m^2 with an actual discharge of 300 lps, determine the coefficient of discharge if the theoretical velocity of flow is 2.2 m/s. **[6]**

OR

Q2) a) Explain different types of surge tanks. **[6]**

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

c) A tank having constant cross- sectional area and sharp edged orifice at the bottom took 120 seconds to empty upper third part. How long it will take to empty the middle third part. **[6]**

Q3) a) Derive impulse momentum equation. **[6]**

b) A jet of water 7 cm in diameter having velocity 22 m/s strikes normally on flat plate. If the plate is moving with the velocity of 4 m/s determine the force on the plate. **[6]**

c) Derive an expression for force exerted by jet on flat stationary plate held perpendicular to the jet. **[6]**

OR

Q4) a) Derive an expression for force exerted by jet on flat moving plate held incline to the jet. **[6]**

b) Derive an expression for force exerted by jet on symmetrical moving curved vane at the centre. **[6]**

c) A jet of water 6 cm in diameter having velocity 20 m/s strikes normally on flat plate. If the plate is stationary determine the force on the plate. **[6]**

P.T.O.

Q5) a) Describe various types of draft tubes. **[6]**

b) State and explain various components of hydroelectric power plant. **[6]**

c) Explain various components of Pelton wheel turbine. **[6]**

OR

Q6) a) Calculate diameter of jet and mean diameter of pelton wheel turbine working under following conditions. **[6]**

i) Power 14000 kw

ii) Net head available 900 m

iii) Speed 600 rpm

iv) Cv for jet 0.98

v) Speed ratio 0.46

vi) Overall efficiency 90%

b) Explain various types of turbines. **[6]**

c) What is cavitation in turbine and what are measures to reduce it. **[6]**

Q7) a) Explain various types of centrifugal pumps. **[6]**

b) Describe multistage pump with impeller in series and parallel. **[6]**

c) Explain advantage and disadvantages of Submersible pump. **[4]**

OR

Q8) a) With neat sketch explain functions of each components of centrifugal pump. **[6]**

b) Explain various characteristic curves of pump. **[6]**

c) Explain cavitation in centrifugal pump. **[4]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1690

[Total No. of Pages : 2

[6353]-6
T.E. (Civil Engineering)
RESEARCH METHODOLOGY AND IPR
(2019 Pattern) (Semester - I) (Elective - I) (301005 b)

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.***

Q1) a) What are the statistical technique which are commonly used in educational research? **[9]**

b) State the characteristics of Quantitative data. **[8]**

OR

Q2) a) "Processing of data implies editing, coding, classification and tabulation". Describe in brief these four operations pointing out the significance of each in context of research study. **[9]**

b) Write a short notes on the following. **[8]**

i) Histogram

ii) Bar Chart

iii) Pie Chart

iv) Curve Fitting

Q3) a) What are the methods of constructing regression equation? Explain in details. **[9]**

b) Explain the technique and importance of oral presentation of research findings. Is only oral presentation sufficient? If not, why? **[9]**

OR

Q4) a) What are the different forms in which a research work may be reported. Describe. **[9]**

b) Describe the precautions that the researcher should take while interpreting his findings. **[9]**

P.T.O.

Q5) a) Write few lines about IPR? Do you think this is useful rights for us? Explain. **[8]**

b) State the criteria of copyright; also write short notes on copyright of author. **[9]**

OR

Q6) a) What is TRIPS Agreement? Outline the main three features of the TRIPS Agreement. **[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) What is valuation? Why is valuation of intellectual property important? **[9]**

b) What is the criterion for commercialization of patent? **[9]**

OR

Q8) a) What is a patent? Explain the elements of patentability? **[9]**

b) How has a software patent been defined? Briefly discuss some of the important issues concerning software patenting. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC1691

[Total No. of Pages : 2

[6353]-7
T.E. (Civil Engineering)
CONSTRUCTION MANAGEMENT
(2019 Pattern) (Semester - I) (Elective - I) (301005 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 diagram 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 labour laws in construction sector. **[6]**

b) Write note on Child Labour Act. **[6]**

c) What is liability? Explain with suitable example. **[6]**

OR

Q2) a) Explain in detail profit loss accounts statement. **[6]**

b) Explain Building and other construction work Act. **[6]**

c) Write a short note on 'Need of Working Capital'. **[6]**

Q3) a) What are the steps involved in mitigation of risk. **[6]**

b) Short note on sensitivity analysis and break-even analysis. **[6]**

c) Write a short note on value management. **[5]**

OR

Q4) a) Write note on break even analysis. **[6]**

b) Explain importance of value analysis and decision tree analysis in construction sector. **[6]**

c) Write note on simulation analysis. **[5]**

P.T.O.

Q5) a) What is performance appraisal State importance of it. **[6]**

b) What is supply chain management and state its importance in construction sector. **[6]**

c) The Zen scientific Equipment Company estimates its carrying cost at 15% and its ordering cost at Rs. 9 per order. The estimated annual requirement is 48,000 units at a price of Rs. 04 per unit. **[6]**

Find out:

i) What is the most economical number of units to order?

ii) How many orders should be placed in a year?

OR

Q6) a) Explain in detail role of ERP in material management. **[6]**

b) Write a short note on importance of HRM in construction industry. **[6]**

c) A Mauli Brick supply company places an annual order of 48,000 units at a price of Rs. 20 per unit. Its carrying cost is 15% and the order cost is Rs. 12 per order. **[6]**

Find out:

i) What is the most economical order quantity?

ii) How many orders need to be placed in year?

Q7) a) Explain in details importance of Artificial Intelligence in Real Estate RERA Projects. **[6]**

b) Explain list of various application using Python Programming and ANN, in Civil Engineering. **[6]**

c) What are the application of fuzzy logic in construction industry. **[5]**

OR

Q8) a) Discuss in detail importance of Python Programing and genetic algorithm tool use in construction industry. **[6]**

b) Explain in details characteristic of Artificial Neural Network (ANN). **[6]**

c) What do you mean by fuzzy logic. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC1692

[Total No. of Pages : 2

[6353]-8

T.E. (Civil)

ADVANCED CONCRETE TECHNOLOGY

(2019 Pattern) (Semester - I) (Elective -I) (301005 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 Q6, Q.7 or Q.8.***
2) ***Figures in bold to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) What role do corrosion-inhibiting admixtures play in concrete and how do they contribute to enhancing the durability of concrete structures? **[6]**

b) How do admixtures contribute to improving the workability of concrete mixes, and what are some common challenges associated with their use in concrete production? **[6]**

c) Explain the classification of admixtures. **[6]**

OR

Q2) a) What considerations should be taken into account when selecting and dosing admixtures to achieve desired concrete properties and performance characteristics? **[6]**

b) What are the key factors influencing the compatibility of different admixtures when used together in concrete mixes and how can potential issues be mitigated? **[6]**

c) In what ways do specialty admixtures, such as air-entraining agents and pumping aids, address specific challenges encountered in concrete construction projects? **[6]**

Q3) a) What are the primary types of fibers used in fiber-reinforced concrete, and how do they differ in terms of material composition and properties? **[5]**

b) Explain the role of the matrix in fiber-reinforced concrete and how it interacts with the fibers to enhance the mechanical performance of the composite material. **[6]**

c) What are the different types of steel fibers used in steel fiber-reinforced concrete and how do their geometrical characteristics influence the properties of the concrete? **[6]**

OR

P.T.O.

Q4) a) What is the balling effect observed during the mixing of steel fibers with concrete and how does it impact the distribution and orientation of fibers within the matrix? **[5]**

b) Describe the fresh properties of slurry infiltrated fiber concrete and how the slurry infiltration process enhances the bonding between fibers and matrix? **[6]**

c) What are the hardened properties of slurry infiltrated fiber concrete? **[6]**

Q5) a) What factors contribute to plastic shrinkage in concrete and how does it differ from other types of shrinkage? **[6]**

b) Explain the mechanisms behind autogenous shrinkage in concrete and the conditions under which it occurs. **[6]**

c) How does drying shrinkage in concrete occur and what are the primary factors influencing it? **[6]**

OR

Q6) a) What are the implications of transport-related deterioration on the service life and maintenance requirements of concrete structures? **[6]**

b) How do environmental factors affect the transport properties and durability of concrete over time? **[6]**

c) Explain how to mitigate acid-induced deterioration in concrete. **[6]**

Q7) a) Explain the concept behind the propagation of ultrasonic pulses through concrete and how does it relate to the material's elastic properties and internal conditions? **[6]**

b) Explain the half-cell potential measurement. **[6]**

c) Describe the procedures for conducting permeability test on concrete specimens in the laboratory. **[5]**

OR

Q8) a) Explain how the results of ultrasonic pulse velocity testing are interpreted to assess the quality, uniformity and integrity of concrete structures? **[6]**

b) How do concrete cores provide insights into the quality, strength and durability of in-place concrete? **[6]**

c) What precautions should be taken to ensure accurate and representative sampling of concrete cores? **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PC1693

[Total No. of Pages : 3

[6353]-9

T.E. (Civil Engineering)

MATRIX METHODS OF STRUCTURAL ANALYSIS

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

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 non-programmable electronic calculator is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Assessment will be based on complete solution and not on final answer.***

Q1) Using stiffness member approach, determine overall stiffness matrix for the given truss in Figure 1. Take AD = AB = 4m, BD = 3m, AB = BC = 5m. Take AE as constant. **[18]**

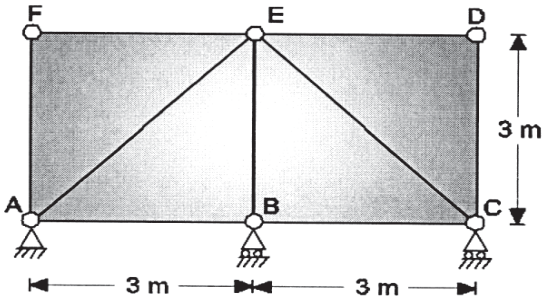


Figure 1

Q2) a) Derive the member stiffness matrix for a bar element subjected to axial forces. **[4]**

b) For the square bar with varying cross section, subjected to axial forces, determine the displacements at B. Consider end A and C as fixed. Also find the corresponding strains and stresses. Size of AB =30 × 30 mm and BC= 40 × 40 mm.
AB is steel bar having E = 200 GPa and BC is aluminum bar having E = 70 GPa. Take force P1 = 80 kN. **[14]**

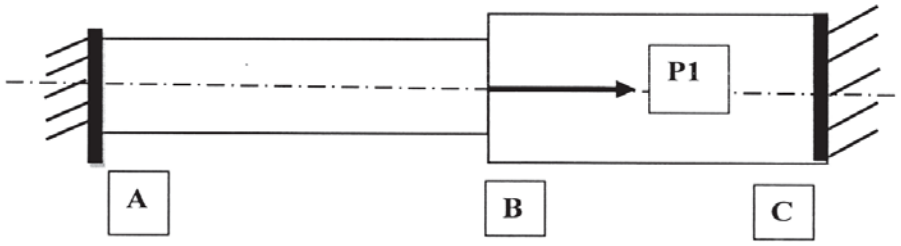


Figure 2

P.T.O.

Q3) Analyze the continuous beam shown in the figure. Use member stiffness matrix method. Find the rotational displacements and also find the reactions and draw the shear force and bending moment diagram. **[17]**

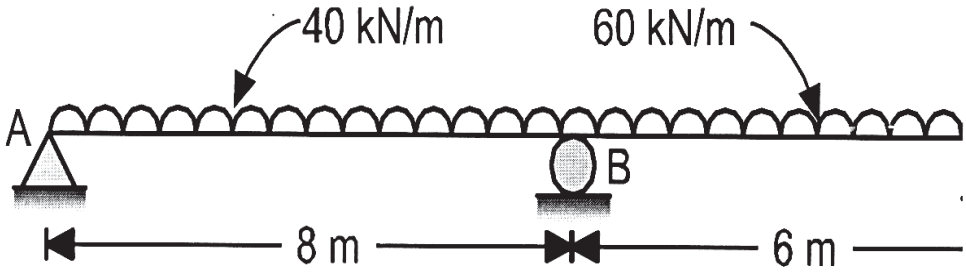
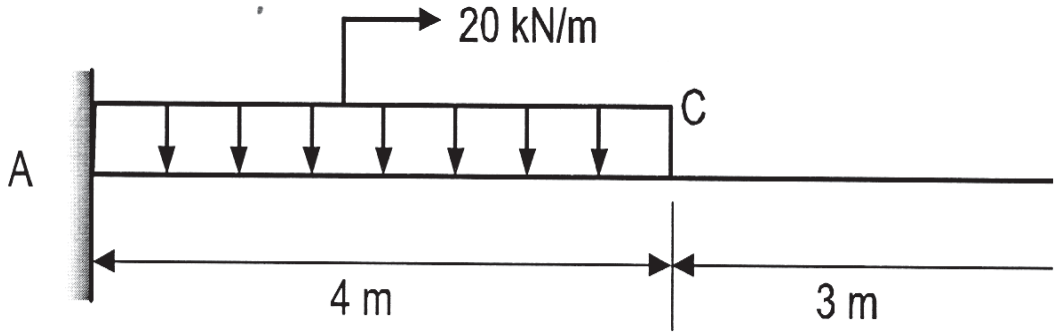


Figure 3

OR

Q4) a) Derive the stiffness matrix for plane frame member. **[8]**

b) A propped cantilever beam of length 7 m is subjected to a uniformly distributed load as shown in Figure. Determine the slope and deflection at C and slope at B using member stiffness method. **[9]**



Q5) a) State the necessity of transformation matrix. For a grid member, derive the transformation matrix. **[9]**

b) Derive the stiffness matrix for grid member. **[8]**

OR

Q6) Two members AB and BC of length 3 m and 4m respectively are perpendicular to each other and form a grid. The grid is fixed at A and C and rigidly connected at B. The grid is subjected to uniformly distributed load of 10 kN/m on both the members. Considering EI and GJ as constant, using structure approach, analyse the grid and find the vertical displacement at C. **[17]**

Q7) a) Drawing neat sketches for the unit displacements, derive the stiffness matrix for a space frame member. **[9]**

b) Derive the stiffness matrix for space truss element for local axis. Drawing neat sketches for direction cosines, write the global stiffness matrix for space truss element. **[9]**

OR

Q8) a) Write flowchart for solution of plane frame problem using stiffness member approach. **[9]**

b) Write flowchart for solution of beam problem using stiffness member approach. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1694

[Total No. of Pages : 2

[6353]-10

T.E. (Civil Engineering)

ADVANCED MECHANICS OF STRUCTURES

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

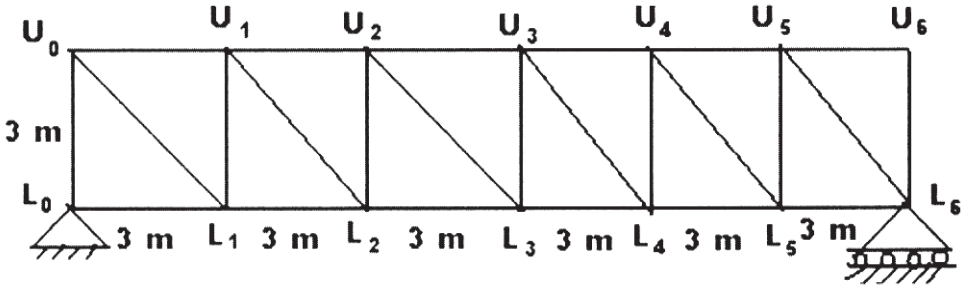
Time : 2½ Hours] ***[Max. Marks : 70***

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.***
5) ***Use of cell phone is prohibited in the examination hall.***
6) ***Use of electronic pocket calculator is allowed.***

Q1) a) A live load of 15 kN/m, 5 m long moves on a girder simply supported on a span of 13 m. Find the maximum positive shear force, maximum negative shear force and maximum bending moment that can occur at a section 6 m from the left end. **[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

Q2) a) State Muller Breslau's principle. **[6]**

b) A simply supported beam has a span of 16 m 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 4 m from the left end. Use these diagrams to determine the maximum shear force and bending moment at this section. **[12]**

P.T.O.

Q3) a) A truck with axle loads of 40 kN and 60 kN on a wheel base of 5 m rolls across a 10- m span. Compute the maximum bending moment and the maximum shearing force. **[9]**

b) Draw the influence line for M_B of the continuous beam ABC simply supported at A & C using Muller Breslau's principle. AB = 3 m, BC = 4 m. EI is constant. **[8]**

OR

Q4) a) A train of 5 wheel loads crosses a simply supported beam of span 22.5 m. 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) Two point loads of 100 kN and 200 kN spaced 3m apart cross a girder of span 15m from left to right with the 100 kN load loading. Draw the influence line for shear force and bending moment and find the value of maximum shear force and bending moment at a section, 6m from the left hand support. Also, find the absolute maximum moment due to the given load system. **[10]**

Q5) a) Explain stresses in curved beam. **[9]**

b) Write different cross section for curved beam. **[9]**

OR

Q6) a) Explain Winkler-Bach theory. **[8]**

b) What are the assumptions made in curved beam analysis. **[10]**

Q7) a) A circular (three hinged) arch of span 25 m with a central rise of 5m is hinged at the crown and the end supports. It carries a point load of 100 kN at 6 m from the left support. Calculate. The reaction at the supports and Moment at 5 m from the left support. **[9]**

b) Find the maximum bending moment at a section 30 m from the left end of the three hinged stiffening girder of span 100 m when a UDL of 10 kN/m, 5 m length crosses the girder. **[8]**

OR

Q8) a) A parabolic two hinged arch has a span of 40 m and a rise of 5m a concentrated load 10 kN act at 15 m from the left support. The second moment of area varies as the secant of the inclination of the arch axis. Calculate the horizontal thrust and reactions at the hinge. Also calculate maximum bending moment at the section. **[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. : ____

PC1695

[Total No. of Pages :3

[6353]-11

T.E. (Civil Engineering)

WASTE WATER ENGINEERING

(2019 Pattern) (Semester- II) (301012)

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) ***Figure to the right indicate full marks.***
4) ***Assume Suitable data if necessary.***
5) ***Use of scientific calculator is allowed.***

Q1) a) Define Sludge Volume Index (SVI). What is bulking of sludge. Enlist any two measure to control bulking of sludge. **[6]**

b) Explain: **[6]**

i) Mean cell residence time (MCRT),

ii) Hydraulic loading

iii) F/M ratio

c) An average operating data for activated sludge treatment plant is as follows: **[6]**

i) Waste water flow = 42000 m^3/day.

ii) Volume of aeration Tank = 15000 m^3.

iii) Influent BOD = 300 mg/l.

iv) Effluent BOD = 30 mg/l.

v) MLSS = 2700 mg/l.

vi) Effluent Suspended Solids = 30 mg/l.

vii) Waste sludge suspended solids = 9800 mg/l.

viii) Qty. of waste sludge = 230 m^3/day

Calculate:

1) Aeration Period
2) F/M ratio and
3) % BOD Removal Efficiency

OR

P.T.O.

Q2) a) Draw flow diagram of activated sludge process and explain its working. **[6]**

b) Explain the suspended growth process and attached growth process with two examples of each. **[6]**

c) An average operating data for conventional activated sludge treatment is as follows: **[6]**

i) Waste water flow 22600 m^3/day.

ii) Volume of aeration tank - 4800 m^3.

iii) Influent BOD - 300 mg/lit.

iv) BOD removal from primary sedimentation tank - 30%.

v) Effluent BOD - 15 mg/lit.

vi) Mixed liquor suspended solids - 2500 mg/lit.

Determine aeration period (hrs), food to microorganism ratio, percentage efficiency of BOD removal.

Q3) a) Explain - bacteria-algae symbiosis with the help of neat labelled sketch. **[5]**

b) Explain - oxidation pond with the help of neat labelled sketch, also write any two advantages & disadvantages. **[6]**

c) Design an oxidation pond for treating sewage from a small town with 7000 persons, contributing sewage @ 126 lit per capita per day. The 5-day BOD of sewage is 290mg/lit. **[6]**

OR

Q4) a) Explain the working principle of aerated lagoon with neat labelled sketch. **[5]**

b) Explain following: **[6]**

i) Phytoremediation

ii) Root zone technology

c) Determine the size of High-Rate Trickling Filter for the following data. **[6]**

i) Sewage flow = 6 MLD.

ii) Recirculation ratio (R/I) = 1.5

iii) BOD of raw sewage = 260 mg/lit.

iv) BOD removal in primary sedimentation tank = 30%

v) Final effluent BOD desired = 30 mg/lit.

Q5) a) Explain working of Sequential batch reactor (SBR). Explain Steps involved. **[6]**

b) Explain the working of Fluidized membrane bioreactor (FMBR) and Packed bed reactor (PBR). **[6]**

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. **[6]**

OR

Q6) a) Explain the construction and working of Septic Tank. **[6]**

b) Explain Up-flow anaerobic sludge blanket reactor UASB reactor with neat sketch. **[6]**

c) Explain following nutrients removal processes: **[6]**

i) Adsorption

ii) Ion exchange

iii) Membrane processes

Q7) a) Write a short note on recycling of grey water. **[5]**

b) Draw a neat sketch of single stage anaerobic digester and explain its working. **[6]**

c) State the challenges in sludge management. Explain any two. **[6]**

OR

Q8) a) Enlist the different techniques for dewatering of sludge? Explain any two. **[5]**

b) Explain reuse opportunities in each municipal, industrial & agricultural sector. **[6]**

c) Design the sludge digestion tank with the following data: **[6]**

i) Average flow of sewage = 65 MLD

ii) TSS in raw water sewage = 340 mg/l

iii) Volatile suspended solids (VSS) = 250 mg/l

iv) Moisture content in digested sludge = 88%

v) Removal of SS from PST = 65%

vi) Moisture content in fresh Sludge = 95%

vii) Digestion Period = 42 days

Total No. of Questions : 8]

SEAT No. :

PC1696

[6353]-12

[Total No. of Pages : 5

T.E. (Civil Engineering)
DESIGN OF RC STRUCTURES
(2019 Pattern) (Semester-II) (301013)

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) ***Figures to the right indicate full marks.***
3) ***Is 456 - 2000 and non programmable calculate are allowed in the exmination.***
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) Explain curtailment of reinforcement in a beam. Explain the procedure of finding APC and TPC for a simply supported beam. **[5]**

b) Design an intermediate flight of an open well staircase of residential building with the following data : **[13]**

i) Length of going = 2.0m.
ii) Rise= 175mm; Tread=250mm; Width of flight= 1.2m.
iii) Landing width on both side of going = 1.2m.
iv) Width of supporting beams on outer side of landing = 230mm.
v) Material – M20, Fe 415; Mild exposure condition.
vi) Draw details of reinforcement. Use LSM approach.

OR

Q2) a) Explain in detail zoning of shear reinforcement. **[5]**

b) Design a cantilever beam with following data : **[13]**

i) Clear Span of beam =3.0 m
ii) Depth of column supporting the beam = 450mm
iii) Beam width =230 mm
iv) The beam is subjected to working dead load of 18 kN/m (including its self-weight) and working live load of 12 kN/m.
v) Material- M25, Fe 500; Moderate exposure condition.
vi) Design longitudinal reinforcement and shear reinforcement.
vii) Show details of reinforcement. Use LSM

Q3) Design a continuous RC beam PQRS for flexure and shear using IS Code method. PQ=QR=RS=4.0m. The beam supports 125mm thick two way slab on either side of it. The beam is subjected to ultimate dead load of 24 kN/m (including its self-weight) and ultimate live load of 14 kN/m. Consider material M30, Fe 500 and severe exposure condition, Show the reinforcement detail in longitudinal section and cross-section at continuous supports and at mid spans. Use LSM. **[17]**

P.T.O.

OR

Q4) Continuous RC beam ABC of rectangular section is simply supported at A and C and continuous over support C. Span AB = 6.0m and BC = 4.5m. The beam carries working dead load of 20 kN/m (including its self-weight) and working live load of 13 kN/m. Calculate all span and support ultimate moments. Apply 20 % redistribution of moments. Design all spans and supports for flexure. Determine position of TPC and APC. Also design RHS portion of span AB for shear. Draw the reinforcement details. **[17]**

Material - M30, Fe 500; Severe exposure condition.

Q5) a) What are interaction curves? Explain the characteristics of a typical interaction curve. **[5]**

b) Design a uni-axial short column by limit state method to carry a working axial load of 1100 kN, Working axial moment of l00kN-m about major axis. The unsupported length of column is 3.6m. The column is fixed at both the ends. Show detailed design calculations and reinforcement details. Use M30 concrete and Fe 500 steel. Consider severe exposure condition. **[13]**

OR

Q6) Design a bi-axial short column by limit state method to carry a working axial load of 900 kN. Working moment of 60 kN-m about major axis bisecting the depth of column and 40 kN-m about minor axis bisecting the width of column. The unsupported length of column is 3.6m about major axis and 4.5m about minor axis. The column is fixed at one end and hinged at the other. Show details of reinforcement in plan and sectional elevation. Use M25 concrete and Fe 500 steel. Consider moderate exposure condition. **[18]**

Q7) Design an isolated pad footing for a column of size 380 × 450mm subjected to working axial load of 1200 kN. SBC of soil is 275 kN/m^2. (neglect check for one way shear about minor axis).

Show detailed design calculations and reinforcement details in plan and sectional elevation. Use M25 concrete and Fe 500 steel. Consider moderate exposure condition. **[17]**

OR

Q8) Design a slab type rectangular combined footing for two columns A and B subjected to ultimate axial load 1500 kN and 1300 kN, respectively. Center to center to distance between two columns is 2.8m. Size of both the columns is 450 × 450mm. Safe bearing capacity of soil is 180kN/m^2. Use M35 concrete and Fe500 steel. (Neglect check for one way shear). **[17]**

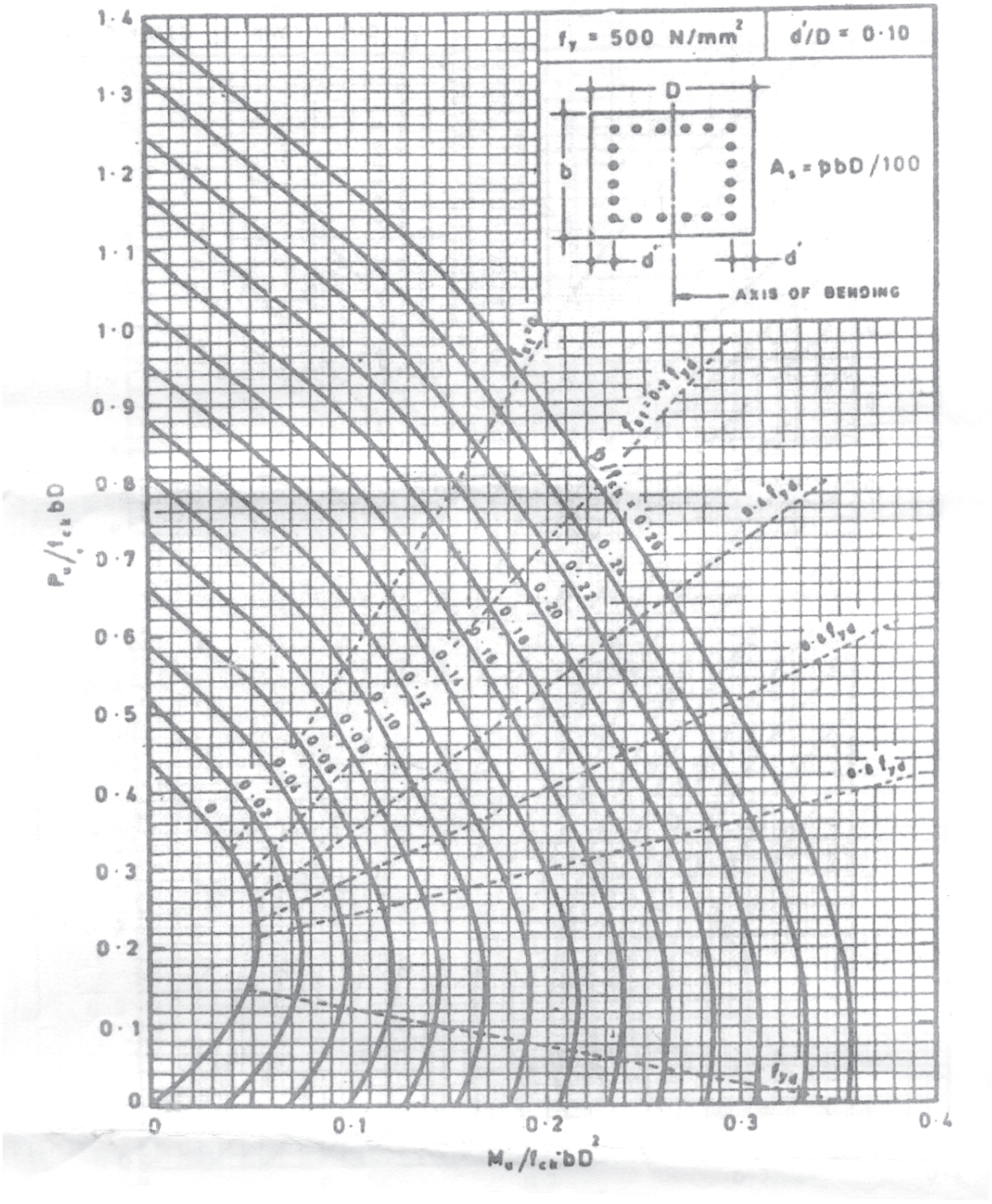


Chart No 1 : Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides.

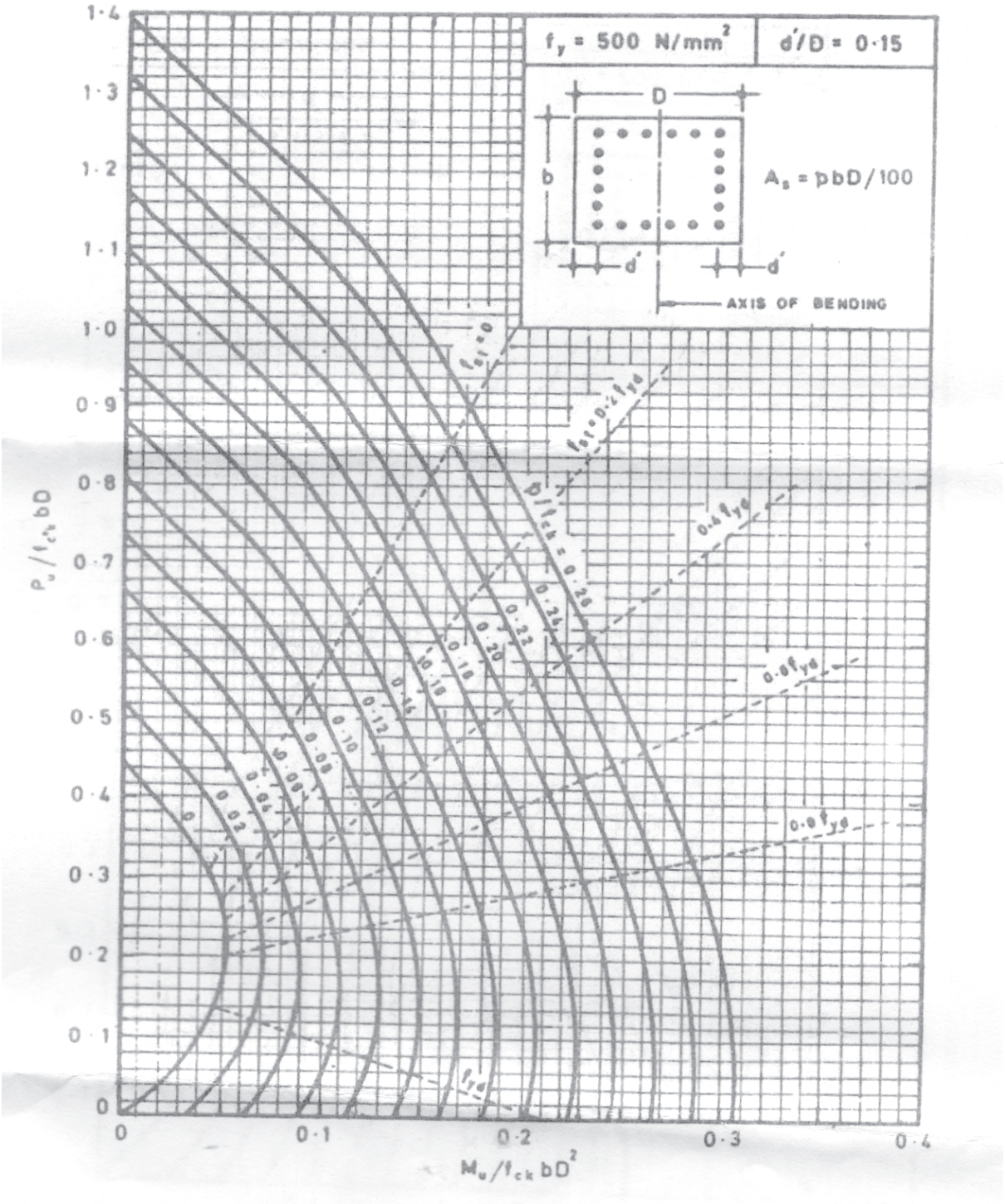


Chart No 2 : Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides.

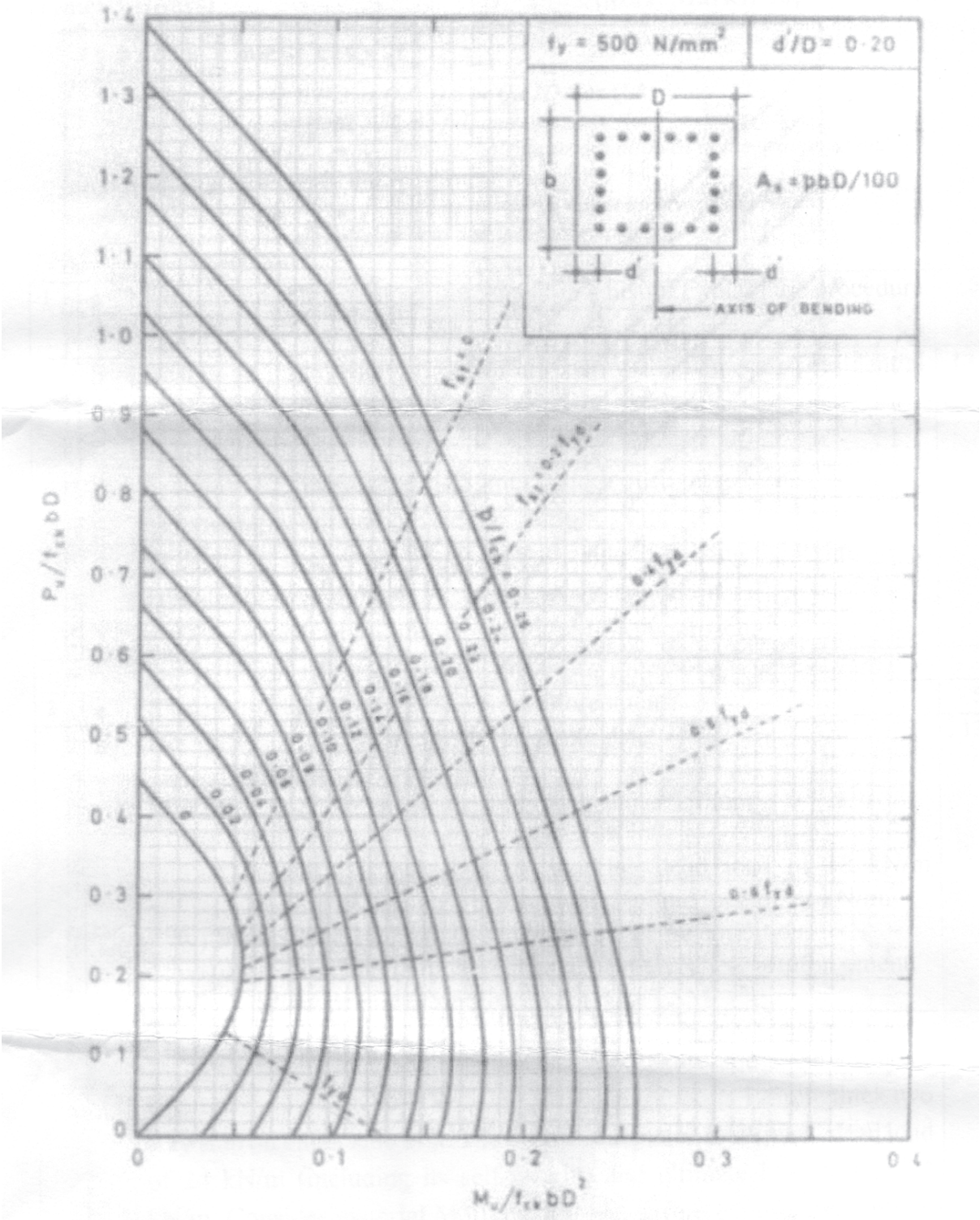


Chart No 3 : Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides.

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Total No. of Questions : 8]

SEAT No. :

PC-1697

[Total No. of Pages :2

[6353]-13
T.E. (CIVIL) (301014)
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, Q5 or Q6,Q7or Q8***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data jf necessary.***
5) ***Use of electronic pocket calculator is allowed in the examination.***

Q1) a) Give a brief account of Origin of Global positioning system. **[6]**

b) What are the three segments of GPS? Describe them briefly. **[6]**

c) Illustrate the advantages and disadvantages of GNSS. **[5]**

OR

Q2) a) Explain the concept of GNSS. **[6]**

b) Write a short note on following: i) GLONASS system ii)Galileo system. **[6]**

c) Describe the different sources of error in GPS. **[5]**

Q3) a) Differentiate between supervised and unsupervised image classification. **[6]**

b) State the application of DEM. **[6]**

c) Define Triangular Irregular Network Model (TIN) and its applications. **[6]**

OR

Q4) a) Write a note on digital image and analog image. **[6]**

b) Explain in detail the concept of post processing and pre possessing. **[6]**

c) Differentiate between Visual and Digital image interpretation. **[6]**

P.T.O.

Q5) a) Explain the functionalities of GIS? **[6]**

b) Write in detail about various components of GIS. **[6]**

c) List down the differences between drafting software's and GIS. **[5]**

OR

Q6) a) Illustrate the Geographical Information System and state Spatial Data types. **[6]**

b) Demonstrate the link between remote sensing & GIS. **[6]**

c) Compare the various definitions of GIS used globally. **[5]**

Q7) a) Classify the Raster and Vector Data types. Explain with neat diagram. **[6]**

b) Differentiate various Attribute Data models and explain any one of them. **[6]**

c) Explain the application of GIS in Urban Planning. **[6]**

OR

Q8) a) Outline the Geo-referencing of GIS data? And explain its importance in the field of GIS? **[6]**

b) Enlist the applications of GIS in Civil Engineering & Explain any one in detail. **[6]**

c) Categorize the different Database? Name the types of database. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC1698

[Total No. of Pages : 3

[6353]-14

T.E. (Civil Engg.)

ADVANCED ENGINEERING GEOLOGY WITH ROCK MECHANICS

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

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, and Q.3 or Q.4 and Q.5 or Q.6 and Q.7 or Q.8***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams should be drawn wherever necessary.***

Q1) a) Write a note on Compact basalt as construction material. **[6]**

b) Explain case studies of historical buildings constructed without consideration of geology and now facing serious problems. **[6]**

c) Write in detail on treatments given to fracture/fracture zone. **[6]**

OR

Q2) a) What are favorable conditions/characteristics of the rock for the purpose of construction material? **[6]**

b) What is R.I.S.? Explain R.I.S. with case study, in Deccan Trap area. **[6]**

c) Explain in detail the role of Geology in Urban development and planning. **[6]**

Q3) a) Define rock mechanics. Explain the importance of it in civil engineering. **[6]**

P.T.O.

b) Calculate RQD recovery and Core recovery from following table. **[6]**

Run in m	Piece No.	Length in cm	Nature of fracture
2-5 m	1	17	J
	2	14	J
	3	79	M
	4	40	M
	5	60	M
	6	12	J
	7	7	J
	8	6	J
	9	8	J
5-8 m	10	88	M
	11	66	M
	12	77	M

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

Sr. No.	R	A	$2\pi aR$
1	1.45	1	?
2	1.21	2	?
3	1.75	3	?
4	1.40	4	?
5	1.22	5	?
6	1.10	10	?

OR

Q4) a) What is Electrical Resistivity method of Geophysical Exploration? Explain Wenner method. **[6]**

b) What is R.Q.D.? Is this system useful for Deccan trap rocks? Explain. **[6]**

c) Describe Q-system of classification of rock masses. **[6]**

Q5) a) Discuss the strength and water tightness characters of Amygdaloidal Basalt from dam foundation point of view. **[6]**

b) Discuss relationship between local Geology and location of Spillway in Deccan Trap. **[6]**

c) What are the reasons of tail channel erosion in Deccan Trap area? **[5]**

OR

Q6) a) Write case study illustrating the failure of major projects owing to negligence of geological studies. **[6]**

b) Write a note on suitability of amygdaloidal basalt for percolation tank. **[6]**

c) Explain treatment to be given to a dyke crossing dam alignment. **[5]**

Q7) a) Explain in detail engineering geological investigations for tunneling. **[6]**

b) Discuss with suitable examples suitability of compact basalts from tunneling point of view. **[6]**

c) Explain in brief safe bearing capacity during bridge construction. **[5]**

OR

Q8) a) Describe various unfavorable field characters of rocks during tunneling. **[6]**

b) Can we locate a pier of bridge partly on weathered rock and on dyke? **[6]**

c) Whether the tunnels are suitable through limestone and quartzite. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC-4848

[Total No. of Pages : 3

[6353]-15
T.E. (Civil)
SOFT COMPUTING TECHNIQUES
(2019 Pattern) (Semester - II) (301015 B) (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 the following points with reference to FFBP Network : Data Division, Testing of network, Number of hidden neurons. **[9]**

b) Determine the functional value of the 3 × 2 × 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; –03 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) For feed forward back propagation neural network, how to fix number of Input neurons, Output neurons, Hidden layers, hidden neurons? Discuss data preprocessing. **[9]**

b) Determine the functional value of the 3 × 2 × 1 neural network in forward pass with the following data. Inputs [6, 4, 11], 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 Radial basis function networks with suitable example for each. **[8]**

b) Discuss working of self-organized feature maps with a suitable example. **[9]**

OR

Q4) a) Distinguish between Radial basis function networks and Generalized regression neural networks. Give suitable example for each. **[8]**

b) 28-day Compressive strength of concrete (in MPa) depends on the quantity (in Kg/m^3) of Cement, Fine aggregate, coarse aggregate and 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

Q5) a) Discuss in detail an application of Genetic Algorithm in Civil Engineering. **[9]**

b) Explain the basic working of support vector Machine. What are hard margin and soft margin SVMs? **[9]**

OR

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

b) What is a kernel in SVM? Why do we use kernels in SVM? Discuss any one kernel in detail. **[9]**

Q7) a) Discuss working of Random Forest regression. Explain M5 Algorithm in Model Tree. **[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 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/s

OR

Q8) a) Discuss working of Model Tree with M5 Algorithm. Explain Feature importance in a Random Forest. **[8]**

b) 28-day Compressive strength of concrete (in MPa) depends on the quanity (in kg/m^3) 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

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Total No. of Questions : 8]

SEAT No. : ____

PC4970

[Total No. of Pages : 2

[6353]-16R
T.E (Civil)
ADVANCED SURVEYING
(2019 Pattern) (Semester - II) (Elective-II) (301015C)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat figures wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain the Cartesian, local and projected coordinates for earth resources mapping. **[6]**

b) Explain the elements of spherical trigonometry. **[4]**

c) Explain the analytical method of determining the position of boat in hydrographic surveying. **[8]**

OR

Q2) a) Define spherical triangle and explain its properties. **[6]**

b) Explain the shore line survey. **[4]**

c) Write a short note on : **[8]**

i) MSL determination by GPS

ii) Sounding by GPS

Q3) a) Define vertical photograph, tilted photograph and oblique photograph. **[6]**

b) Define ground control points. Explain their role in Photogrammetry. **[4]**

c) The scale of aerial photograph is 1 : 10000, effective at an average elevation of terrain of 500 m. The size of aerial photograph is 230mm × 230mm. Focal length of camera lens is 20 cm. Speed of aircraft is 180 kmph, longitudinal overlap is 60% and side overlap is 30%. Determine the number of photographs required to cover an area of 30km×22.5 km. Also determine exposure interval and flying height. **[7]**

OR

Q4) a) Explain in detail flight planning with neat sketch. **[6]**

b) Write a short note on digital photogrammetry. **[4]**

c) A pair of photograph is taken with a camera having focal length 15 cm. The scale of photography is 1: 10000 and photo base is 5.65 cm. The measured parallax of a vertical control point having an elevation 140 m is 87.28 mm. Compute the elevation of another point P whose measured parallax is 84.18 mm. **[7]**

P.T.O.

Q5) a) Explain the components of ideal remote sensing system. **[6]**

b) Differentiate between LIDAR and GPR. **[6]**

c) Write a note on raster and vector model in GIS. **[6]**

OR

Q6) a) What is raster and vector data? How do you analyze the satellite image for civil engineering projects, draw sketches to support your answer? **[6]**

b) Explain Remote sensing applications in disaster management with suitable example. **[6]**

c) What is GIS? Explain the components of GIS. **[6]**

Q7) a) Explain the segments of GPS. **[6]**

b) Explain the basic principle of GPS and its applications in Civil Engineering. **[5]**

c) Differentiate between absolute positioning and relative positioning. **[6]**

OR

Q8) a) Explain the working principle of GPS. What are the differences between hand held GPS and differential GPS. **[8]**

b) Write a note on segments of GPS. **[4]**

c) Explain in detail the applications of GPS in watershed management analysis. **[5]**

ⓘⓘⓘⓘ

Total No. of Questions : 8]

SEAT No. : ____

PC1700

[Total No. of Pages : 2

[6353]-17
T.E. (Civil Engg.)
ADVANCED GEOTECHNICAL ENGINEERING
(2019 Pattern) (Semester - II) (Elective-II) (301015d)

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 whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary and mention it clearly.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Explain the principle of the direct shear test. What are the advantages of this test? What are its limitations? **[6]**

b) State and explain the factors affecting angle of shearing resistance. **[6]**

c) What is effect of pore pressure in strength of soil? **[6]**

OR

Q2) a) What are the three standard triaxial shear tests with respect to drainage conditions? Explain with reasons the situations for which each test is to be preferred. **[6]**

b) Write a note on **[6]**

i) Mohr's Circle

ii) Triaxial test and its merits

c) In a triaxial shear test conducted on a soil sample having a cohesion of 15 kN/m^2 and angle of shearing resistance of 32^0, the cell pressure was 150 kN/m^2. Determine the value of the deviator stress at failure. **[6]**

P.T.O.

Q3) a) Draw and explain stress path for triaxial drained and triaxial undrained test. **[6]**

b) 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)
420	400	200
470		265
490		300
498		324
500		432

c) Draw and explain stress path for embankment construction. **[5]**

OR

Q4) a) Differentiate between UU test, CU test and CD test. **[6]**

b) Write a short note on pore pressure parameters. **[6]**

c) What is stress path? State and explain factors influencing stress path. **[5]**

Q5) a) What are the objectives of soil Stabilization? **[9]**

b) Explain the Cement stabilization in detail. **[9]**

OR

Q6) a) Explain Mechanical soil stabilization. **[9]**

b) Explain lime stabilisation and soil bitumen stabilisation. **[9]**

Q7) a) Explain in detail in-situ ground improvement by compaction piles. **[9]**

b) Write a short note on In-situ ground improvement by Dynamic loads and explosion sand drains. **[8]**

OR

Q8) a) Explain Grouting & Deep mixing method of ground improvement. **[9]**

b) Explain Vibroflotation process in detail. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC1701

[Total No. of Pages : 2

[6353]-18

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 No. 1 or 2, Q.No.3 or 4, Q.No.5 or 6.. Q.No. 7 or 8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessaly.***

Q1) a) Explain importance of Neighbourhood planning and purpose of it. **[9]**

b) Elaborate Mechanism of preparation of DP according to MRTP Act 1966. **[9]**

OR

Q2) a) Explain the levels of town planning and its importance. Discuss the City Development plan. **[9]**

b) Write a brief note on T P Scheme (Sketch is essential). **[9]**

Q3) a) Explain Organization Structure and purpose of MHADA. **[8]**

b) State & explain the various types of civic surveys required to be conducted for preparation of DP. **[9]**

OR

Q4) a) Write an explanatory note on ITS with sketch. **[9]**

b) Explain Organization Structure and purpose of CIDCO. and its role in developing Navi Mumbai. **[8]**

P.T.O.

Q5) a) Discuss the short falls of LAR and explain in brief on Land Acquisition Rehabilitation and Resettlement Act 2013. **[9]**

b) Elaborate applications of URDPFI guidelines in town planning. **[9]**

OR

Q6) a) How AMRUT guidelines helpful to overall development of city? **[9]**

b) Explain the concept of RERA also discuss the additive points to the buyer and seller **[9]**

Q7) a) Write a note on SEZ and CRZ with sketch. **[9]**

b) Elaborate what you understand regarding Special Township: justify with examples. **[8]**

OR

Q8) a) Explain in detail application of remote sensing and GIS in Urban and Rural planning. **[9]**

b) Elaborate the need and strategies in relation with, "Rural development". **[8]**

Total No. of Questions : 8]

SEAT No. :

PC1702

[Total No. of Pages : 2

[6353]-19
T.E. (Civil Engg.)
SOLID WASTE MANAGEMENT
(2019 Pattern) (Semester - II) (Elective-II) (301015 f)

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 diagrams wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Use of scientific calculator is allowed.***

Q1) a) List the tools and equipment's used for storage and collection of Municipal Solid Waste. **[6]**

b) Suggest the measures to be adopted in execution of vermicomposting. **[6]**

c) State the terms related to Solid waste management. **[6]**

i) Segregation

ii) Recovery

iii) Recycling

iv) Reuse

OR

Q2) a) Explain the ill effects on the health of persons involved in solid waste collection. **[6]**

b) State the Classification of solid waste. **[6]**

c) Write a note on material recovery facility. **[6]**

Q3) a) What are the stages of Anaerobic digestion. **[6]**

b) Explain any four factors affecting the generation of solid waste. **[6]**

c) Suggest the relevant situations for the disposal of solid waste through incineration. **[5]**

OR

P.T.O.

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

i) Pyrolysis

ii) Refuse-derived fuel

b) How does energy recovery relate to renewable energy. **[5]**

c) State the products of incineration process with their use. **[6]**

Q5) a) Differentiate between Area method and Trench method of Landfill. **[6]**

b) Write principles of Bioreactor landfill. **[6]**

c) Draw and explain with neat labeled sketch of any one method of leachate control. **[6]**

OR

Q6) a) State the significance of legal aspects in solid waste management. **[6]**

b) Specify the role of Transfer station in Municipal Solid waste management. **[6]**

c) State any two advantages and disadvantages of Landfill method of solid waste disposal. **[6]**

Q7) a) Write objectives and major provision in construction and demolition (C&D) waste management rules -2016. **[6]**

b) Explain the importance of public participation in solid waste management. **[6]**

c) Define E-waste and its harmful effects on environment. **[5]**

OR

Q8) a) Explain any one case study of material recovered from e-waste. **[6]**

b) State classification of biomedical waste as per BMW (Management) Rules, 2016. **[6]**

c) State control measures taken for industrial waste. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC-1703

[Total No. of Pages : 3

[6353]-20
T.E. (Chemical)
MASS TRANSFER - I
(2019 Pattern) (Semester - I) (309341)

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 Gas Abosorption & Desorption? Explain wetted wall column? **[8]**

b) 5,000 kg/hr of a SO_2 - air mixture containing 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 relationship is given by Y=20X Where, Y =Mole

SO_2/Mole air & X = Mole SO_2/Mole water. If the packed height of the tower is 420 cm, estimate the height of transfer unit (HTU)? **[9]**

OR

Q2) a) What is Stripping factor? Explain minimum L/G ratio? **[8]**

b) A packed tower is designed to recover 98% CO_2 from a gas mixture containing 10% CO_2 & 90% air using water The equilibrium relation is given as Y= 14X.

Where Y= KgCO_2/Kg dry air & X= Kg CO_2/Kg water The water to gas rate is kept 30% more than the minimum value. Calculate the height of tower if(HTU) OG =1 m. **[9]**

P.T.O.

Q3) a) Explain Adiabatic Saturation temperature in Humidification operation? **[8]**

b) The air in a room is at 26.7 ° C & a pressure of 101.325KPa & contains water vapor with a partial pressure 2.76 KPa. Calculate i) Molal Humidity ii) Saturation humidity. iii) Percentage humidity iv) Percentage Relative humidity v) Relative humidity vi) Humid Heat vii) Humid Volume.

Data: Vapour pressure of water at 26.7°C is 3.5 KPa **[9]**

OR

Q4) a) Explain design of cooling tower-HTU, NTU concept? **[8]**

b) A gas (B) - Benzene (A) mixture is saturated at 1 std.atm 50°C. Calculate the absolute humidity if B is i) Helium and ii) Carbon dioxide. (Data: PA= 0.362 std.atm.) **[9]**

Q5) a) What are the various equipment's used for gas-liquid contact. With neat sketch explain Venturi Scrubber? **[9]**

b) What are the different types of Column? Explain? **[9]**

OR

Q6) a) Explain mechanically agitated vessels with different types of impellers? **[9]**

b) What is Tray efficiency? Explain Murphree Tray Efficiency? **[9]**

Q7) a) Explain the Rate of drying curve in detail? **[8]**

b) A porous dry solid was dried under constant drying conditions in a batch dryer. It took 6 hrs. to reduce the moisture from 50% to 10%. All the moisture content on dry basis .How long will it take to dry a sample of the above solid to dry from 56% to 6% under the same drying conditions? **[10]**

OR

Q8) a) Explain time required for Drying? Derive the equation to calculate time in constant rate period? **[8]**

b) A batch of solid for which the following table of data applies is to be dried from 20% to 5% (wet basis) moisture under conditions identical to those for which the data were tabulated. The initial weight of the wet solid is 300 kg & the drying surface is $1m^2$/8 kg dry weight. **[10]** Determine the time for drying?

X kgmoisture / Kg dry solid	0.35	0.25	0.2	0.18	0.16	0.14	0.12	0.10	0.08	0.06	0.04
R Kgmoisture / hr. m^2	0.3	0.3	0.3	0.266	0.239	0.208	0.18	0.15	0.097	0.07	0.025

Total No. of Questions : 8]

SEAT No. : ____

PC-1704

[Total No. of Pages : 2

[6353]-21

T.E. (Chemical Engineering)

CHEMICAL TECHNOLOGY-II

(2019 Pattern) (Semester - I) (309342)

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) ***Assume suitable data, if necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.***

Q1) a) Describe the process of manufacturing of Portland cement. Write the metal oxides composition necessary in the Portland cement. **[9]**

b) Explain construction and working of Blast furnace. **[8]**

OR

Q2) a) Explain types of steel in detail with their applications. **[8]**

b) What is destructive distillation? State Process for destructive distillation. **[9]**

Q3) a) Write the classification of dyes with their properties. **[9]**

b) Discuss production of producer gas with its major engineering problems. **[9]**

OR

Q4) a) Explain production of water gas and its applications. **[9]**

b) Describe different types of solvents used in paint manufacture? **[9]**

P.T.O.

Q5) a) Describe in detail about plant growth regulators and yield stimulators. **[8]**

b) Explain in detail manufacturing of penicillin with major engineering problems. **[9]**

OR

Q6) a) What are different types of agrochemicals and explain manufacturing process of pesticides. **[9]**

b) Enlist Antibiotics with their properties and applications. **[8]**

Q7) a) Explain production of methanol in brief with a neat process flow diagram. **[9]**

b) Describe the importance and production of ethylene dichioride (EDC) with suitable example. **[9]**

OR

Q8) a) Explain production of phenol by cumene process. **[9]**

b) Explain production of vinyl chloride production from ethylene dichloride. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PC-1705

[Total No. of Pages : 3

[6353]-22
T.E. (Chemical)
CHEMICAL ENGINEERING MATHEMATICS
(2019 Pattern) (Semester - I) (309343)

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 least square regression to fit a straight line to **[9]**

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 to evaluate f(2) on the basis of the data given : **[8]**

x	0	4	6
$f(x)$	0	1.3863	1.7917

OR

Q2) a) Fit the following data with the power model ($y = a\,x^b$). Use the resulting power equation predict y at $x = 9$. **[10]**

x	2.5	3.5	5	6	7.5	10	12.5	15	17.5	20
y	13	11	8.5	8.2	7	6.2	5.2	4.8	4.6	4.3

b) Evaluate the integral of the following data using trapezoidal rule. **[7]**

x	-2	0	2	4	6	8	10
$f(y)$	35	5	-10	2	5	3	20

Q3) a) Solve the following initial value problem over the interval from t = 0 to 2 where $y(0) = 1$ using Euler's method with h = 0.5 and 0.25. **[10]**

$$\frac{dy}{dt} = yt^3 - 1.5y$$

b) Using Picard's method, find an approximate value of y for $dy/dx = x + 2y$ for given boundary conditions, $x = 1, y = 1$, find y at $x = 1.4$. Take step size h = 0.1. **[8]**

OR

P.T.O.

Q4) a) In Chemical engineering one relation is commonly used for the concentration ratio C as $dc/dt = Kc^n$ for time t where K is a reaction rate constant and n is an order of reaction. If K = 0.08 and n = 1.5, find the concentration ratio at t = 2 for initial condition c(0)=1 1.23 for an accuracy of 0.1 using modified Euler's method. **[10]**

b) Derive formula for Euler's method and also give its graphical interpretation. **[8]**

Q5) Use the Liebmann method to determine temperature distribution on a square heated plate with 4 grids (2 × 2) and lower edge insulated. The temperature on the left edge of the plate is 75°C, top edge 100°C, right edge 50 °C and bottom edge 0 °C. Solve for three iterations. **[17]**

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0$$

OR

Q6) Use explicit method to solve for temperature distribution of a thin rod with length of 12 cm and the following values K'=0.49 cal/(s cm °C), Δx=3 cm and Δt=0. 1 sec. At t = 0, the temperature of the rod is zero and boundary conditions are fixed for all times at T(0) = 100 °C and T(10) = 50 °C. Note that the rod is of aluminum with C=0.2174 cal/g °C and density(ρ)=2.7 g/cm^3, K = 0.835 cm^2/sec. Find the temperature distribution in the thin rod using explicit method. Perform three iterations. The heat conduction equation is **[17]**

$$k\frac{\partial^2 T}{\partial x^2} = \frac{\partial T}{\partial t}$$

Q7) a) What is optimization? Explain. Enlist the applications of optimization in Chemical Engineering. **[8]**

b) Use Newton's method to find the maximum of $f(x) = 2\sin(x) - (x^2/10)$ with initial guess of $x_0 = 0.5$. Perform 4 iterations. **[10]**

OR

Q8) a) What are the six steps of optimization? **[6]**

b) Maximize $Z = 5\,x_1 + 3\,x_2$ **[12]**

Subject to $x_1 + x_2 <= 2$

$5x_1 + 2x_2 <= 10$

$3x_1 + 8x_2 <= 12$

$x_1, x_2 >= 0$

Use simplex Method.

Total No. of Questions : 8]

SEAT No. :

PC-1706

[Total No. of Pages : 3

[6353]-23

T.E. (Chemical)

CHEMICAL ENGINEERING THERMODYNAMICS

(2019 Pattern) (Semester - I) (309344)

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) Determine the number of degrees of freedom F for each of the following systems : **[6]**

i) A system of two miscible nonreacting species that exists as an azeotrope in vapor/liquid equilibrium.

ii) A system prepared by partially decomposing $CaCO_3$ into an evacuated space.

iii) A system prepared by partially decomposing NH_4Cl into an evacuated space.

b) Assuming the validity of Raoults law do the following calculations for benzene (i) toluene (ii) system. **[12]**

A) Given x1 = 0.33 and T =100° C, find y1 and P

B) Given y1 = 0.33 and T = 100°C, find x1 and P

C) Given x1 = 0.33 and P = 120 KPa, find y1 and T. The Antoine equation and parameters are given below :

The Antoine equation and parameters are given below:

$$\ln P^{sat}/KPa = A - \frac{B}{T+C} \ (T \text{ in } °C)$$

Compound	A	B	C
Benzene	13.8594	2773.78	220.07
Toluence	14.0098	3103.01	219.79

P.T.O.

OR

Q2) a) Derive Clausius-Clapeyron equation and explain the terms involved. **[9]**

b) For the system n- pentane (i) n-heptane (ii) the vapor pressures are given by the Antoine equation ln P= A-(B/(T-C)) where P is in kPa and T is in K. the constants are as follows : **[9]**

System	A	B	C
n-pentane	13.8183	2477.07	40.00
n-heptane	13.8587	2911.32	56.56

Assuming that the solution formed is ideal, calculate the composition of the liquid and vapor in equilibrium at 95 kPa and 336.2 K

Q3) a) Explain in detail the triangular diagram for ternary liquid liquid phase equilibria. **[9]**

b) Explain the following methods to cheek the consistency of VLE data **[8]**

i) Redlich-Kister method

ii) Using co existence equation

OR

Q4) a) Write in details on maximum boiling azeotropes with the help of x-y diagram.Discuss the effect of Temperature on Azeotropic composition. **[9]**

b) Explain liquid - liquid equilibrium diagram on triangular co-ordinates for a system in which two pairs are partially soluble. **[8]**

Q5) a) Explain reactions coordinate. What are the criteria of chemical reaction equilibrium? **[9]**

b) What is the effect of temperature on equilibrium constant? Derive van't Hoff equation. **[9]**

OR

Q6) a) Estimate the standard free energy change and equilibrium constant at 700 K for the reaction

$$N_2\,(g) + 3H_2\,(g)\ 2NH_3\,(g)$$

Given that the standard heat of formation and standard free energy of formation of ammonia at 298 K to be –46,100 J/mol and –16,500 J/mol respectively. The specific heat (J/mol K) data are given below as function of temperature (K) : **[9]**

$C_p = 27.27 + 4.93 \times 10^{-3}T$ for N_2

$C_p = 27.01 + 3.51 \times 10^{-3}T$ for H_2

$C_p = 29.75 + 25.11 \times 10^{-3}T$ for NH_3

The standard heat of reaction and standard free energy of reaction at 298K ΔH^0 = –92, 200 J/mol; ΔG^0 = –33,000 J/mol

b) Derive the following expression for the chemical reaction equilibrium : **[9]**

$$\ln K = \frac{-\Delta G^\circ}{RT}$$

Where K is the equilibrium constant for the reaction.

ΔG° is called the standard Gibbs-energy change of reaction.

R is universal gas constant

T is the reaction temperature

Q7) a) 100 moles of gas mixture containing 60% H_2, 20% N_2 and 20% inerts 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 **[9]**

b) A gas mixture containing 3 mol CO_2, 5 mol H_2 and 1 mol water is undergoing the following reactions

$$CO_2 + 3H_2 \rightarrow CH_3OH + H_2O$$

$$CO_2 + 3H_2 \rightarrow CO + H_2O$$

Develop expressions for the mole fraction of the species in terms of the extent of reaction. **[8]**

OR

Q8) a) Derive the relationship between mole fraction of species in multiple reactions and the extent of reactions. **[9]**

b) Explain in details the working of Fuel Cell with the help of Diagram. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC1707

[Total No. of Pages : 2

[6353]-24
T.E. (Chemical)
CHEMICAL INDUSTRY MANAGEMENT
(2019 Pattern) (Semester - I) (Elective - I) (309345A)

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

Q1) a) Explain in detail the process of industrial purchasing. Include importance of quotation and comparative statement. **[8]**

b) Explain importance and role of store keeper. **[8]**

OR

Q2) Explain the following (any three) **[16]**

a) Principles of lending

b) FIFO

c) LIFO

d) Inventory Control

Q3) a) Explain advertising and its importance. **[8]**

b) What are the types of pricing strategies. Explain any one in detail. **[10]**

OR

Q4) a) Write a descriptive note on Marketing Mix. **[10]**

b) State the difference between marketing and selling. **[8]**

Q5) a) Explain in detail International trade. **[10]**

b) What do you mean by IPR? Explain patent and patent rights. **[8]**

OR

P.T.O.

Q6) a) Write a detailed note on Inflation, it's types, causes, effect, and it's control. **[10]**

b) Explain in detail TQM and role of ISO in TQM. **[8]**

Q7) a) Write short notes on: **[10]**

i) MRTP

ii) FERA

b) Explain the classification of types of contracts. **[8]**

OR

Q8) a) Write a brief note on concept of guarantee and warranty. **[10]**

b) Define work measurement. Explain the objectives and procedures of work measurement. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC1708

[Total No. of Pages : 2

[6353]-25
T.E. (Chemical)
FOOD TECHNOLOGY
(2019 Pattern) (Semester - I) (Elective - I) (309345B)

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.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) Write short notes on preservation of fruits and vegetables by **[16]**

a) Heat.

b) Sugar.

OR

Q2) a) Write Short note on preparation of syrups. **[8]**

b) Explain aseptic canning technology for canning of fruits and vegetables. **[8]**

Q3) a) Discuss about various unit operations involved in food engineering processing of food grains. **[9]**

b) Explain applications and effect on food materials for drying and freeze concentration. **[9]**

OR

Q4) Write Short Notes on. **[18]**

a) Hot oil flying theory and equipment's.

b) Roasting theory and equipment's.

Q5) Write short notes on food packaging techniques in: **[18]**

a) Textile and paper sacks.

b) Containers-wooden boxes.

OR

P.T.O.

Q6) Describe following. **[18]**

a) Various methods to extend shelf-life of foodstuff.

b) Food packaging materials and their properties.

Q7) a) Explain quality assessment of food materials in meat and poultry. **[9]**

b) Explain concept of Codex Almentarious and HACCP in food quality assurance. **[9]**

OR

Q8) a) Describe Objectives, importance, and functions of quality control of food. **[9]**

b) Write short note on Food regulations, grades, and standards. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1709

[Total No. of Pages : 2

[6353]-26
T.E. (Chemical Engineering)
POLYMER ENGINEERING
(2019 Pattern) (Semester - I) (Elective - I) (309345C)

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 the different methods of determination of the molecular weight. Give suitable examples for all. **[9]**

b) Give a detailed note on the effect of molecular weight on the engineering properties of the polymers. **[8]**

OR

Q2) A sample of polystyrene is composed of a series of fractions of different-sized molecules: **[17]**

Fraction	Weight Fraction	Molecular Weight
A	0.1	14,000
B	0.19	21,000
C	0.24	35,000
D	0.18	49,000
E	0.11	75,000
F	0.08	10.5,000
G	0.06	112,000
H	0.04	126,000

Calculate the number-average and weight-average molecular weights of this polymer sample.

Q3) Explain in detail the Kinetics of Coordination Polymerization along with examples. **[18]**

OR

P.T.O.

Q4) a) Write a note on Chain Transfer agents. **[9]**

b) What do you mean by Co-polymers? Explain along with example. **[9]**

Q5) a) With the different examples, explain the properties and use of the UV stabilizers utilized during polymerization. **[9]**

b) What do you mean by compounding in polymerization? Give examples of the same. **[8]**

OR

Q6) a) What is the need of the additives to be added in Polymerization. Give examples of the different additives sued along with their properties. **[9]**

b) Explain the use of the fire retardants utilized in the polymers. Give examples for the same. **[8]**

Q7) With a neat and labelled diagram and reactions involved, properties, explain the method of production of Polypropylene. **[18]**

OR

Q8) With a neat and labelled diagram and reactions involved, properties, explain the method of production of Neoprene. **[18]**

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Total No. of Questions : 8]

SEAT No. :

PC1710

[Total No. of Pages :2

[6353]-27

T.E. (Chemical)

DOWNSTREAM PROCESSING

(2019 Pattern) (Semester - I) (Elective -I) (309345 (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, 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 cryogenic distillation in detail. **[9]**

b) Explain gas-recovery-olefin in petrochemical industry. **[9]**

OR

Q2) a) Explain desulfurization process in detail. **[9]**

b) Explain downstream process for petrochemical off gases. **[9]**

Q3) a) Explain residue curve maps. **[9]**

b) Explain column sequences. **[9]**

OR

Q4) a) Explain azeotropic distillation in detail. **[9]**

b) Explain pressure swing distillation. **[9]**

P.T.O.

Q5) a) Give the industrial applications of molecular sieves. **[9]**

b) Explain the catalytic properties and manufacturing processes of zeolities. **[9]**

OR

Q6) a) Explain hydrogel process. **[9]**

b) Explain the new trends in industry for energy conservation. **[9]**

Q7) a) Explain the manufacturing process of resins used in the ion exchange. **[8]**

b) Explain the ion exchange-physical and chemical properties, and its selectivity. **[8]**

OR

Q8) a) Explain separation process for non azeotropic mixtures. **[8]**

b) Explain the non-ideal liquid mixtures separations. **[8]**

■■■■

Total No. of Questions : 8]

SEAT No. : ____

PC1711

[6353]-28

[Total No. of Pages :2

T.E. (Chemical Engineering)

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 and 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) a) Explain plug flow operation and derive the performance equation for Plug Flow Reactor. With help of graphical representation show the constant density system PFR. **[12]**

b) Explain space time and space velocity along with their units. **[6]**

OR

Q2) a) In an isothermal batch reactor 70% of liquid reactant is converted in 13 min. What space time and space velocity are needed to effect this conversion in a plug flow reactor and mixed flow reactor considering 1^{st} order kinetics. **[12]**

b) With help of suitable example explain auto-catalytic reactions. **[6]**

Q3) In CSTR, reactant A produces product R and S by parallel reaction, rate of formation of R = $0.7C_A^2$ and rate of formation of S = 2.2 C_A. A feed with C_{A0} = 40 enters a CSTR and mixture of A, R and S leaves the reactor. Find C_R, C_S and τ for 80% conversion in CSTR. **[17]**

OR

Q4) a) Derive the relationship for C_{Rf} in terms of ψ for PFR in case of parallel reactions. **[5]**

b) Explain the series, parallel and independent reactions along with appropriate examples. **[12]**

P.T.O.

Q5) Calculate the heat of reaction at 500°C for following reaction: **[18]**

$$A + B \rightarrow M + N$$

Heat capacities of reacting species may be expressed as

$C_p = \alpha + \beta T + \gamma T^2$

Component	α	$\beta \times 10^2$	$\gamma \times 10^5$
A	–1.32	4.45	–6.32
B	–2.67	1.35	–6.53
M	–1.79	0.88	–2.32
N	3.28	0.67	–1.89

The heat of reaction at standard state (25°C) of the reaction is 45.56 kCal.

OR

Q6) a) A 1100 K n-nonane thermally crack (breaks down into smaller molecules) 20 times as rapidly as at 1000 K. Find the activation energy for this decomposition. **[8]**

b) Explain in detail the effect of temperature on equilibrium conversion of reactant at constant pressure. **[10]**

Q7) What are E, F and C curves? Discuss the relationship between E, F and C curves and provide neat representative diagrams. **[17]**

OR

Q8) A sample of the tracer was injected as pulse to a reactor and the effluent concentration was measured as function of time, resulting in data represented below:

t (min)	0	2	6	14	25	37	49	52
C (g/m^3)	0	10	18	30	14	6	2.2	0.6

a) Draw figures showing $C(t)$ and $E(t)$ as functions of time. **[10]**

b) Determine fraction of material leaving the reactor that has spent between 10 to 12 minutes in the reactor. **[4]**

c) Determine the fraction of material leaving the reactor having spent 15 minutes of less in the reactor. **[3]**

Total No. of Questions : 8]

SEAT No. : [ ]

PC1712

[Total No. of Pages : 3

[6353]-29

T.E. (Chemical Engineering)

MASS TRANSFER - II

(2019 Pattern) (Semester - II) (309349)

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 indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Classify various solvent Extraction equipment's. **[9]**

b) Write a material balance for single stage solvent Extraction with immiscible solvents. **[9]**

OR

Q2) 1000 kg of a nicotine-water feed solution containing 1% nicotine is to be extracted with kerosene at 20 ºC. Water and kerosene are immiscible solvents. **[18]**

a) Determine the percentage of extraction of nicotine once with 150 kg solvent.

b) Repeat for three theoretical extraction using 50 kg solvent each

The equilibrium data are as follows,

X kg of nicotine/kg of water	0	0.00101	0.00246	0.00502	0.00998	0.0204
Y kg of nicotine/kg of kerosene	0	0.00807	0.00196	0.00456	0.00913	0.01870

Q3) a) Explain the constant and variable underflow in leaching operation. **[9]**

b) Discuss on the graphical representation of equilibrium characteristics of Leaching operation with diagram and proper notations. **[8]**

OR

P.T.O.

Q4) Halibut oil is to be extracted from granulated Halibut livers in a countercurrent Extraction using Ether as solvent. The mass flow rate of Halibut livers to the unit is 350 kg/hr. the fresh livers contain 20% oil and are to be extracted to 1% oil (On solvent free basis). Ether containing 2% oil to be used as a solvent is fed to the unit at the rate of 250kg/hr. **[17]**

a) Determine the number of theoretical stages required.

b) Determine % recovery of the oil.

The entrainment data are as follows;

Concentration, kg of oil/kg solution	0	0.1	0.2	0.3	0.4	0.5	0.6
kg solution/kg exhausted livers	0.28	0.34	0.40	0.47	0.55	0.66	0.80

Q5) a) Explain different Adsorption Isotherms. **[9]**

b) Explain Breakthrough curve. **[9]**

OR

Q6) 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; **[18]**

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

Q7) a) Classify crystallizers and give the significance of vacuum Crystallizer. **[9]**

b) Give the classification of membrane processes. What are different membrane modules? **[8]**

OR

Q8) Calculate the yield of $MgSO_4 . 7H_2O$ 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. **[17]**

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 $MgSO_4 . 7H_2O$ = 246

ⓘⓘⓘⓘ

Total No. of Questions : 8]

SEAT No. : ____

PC-1713

[Total No. of Pages : 2

[6353] - 30
T.E. (Chemical)
TRANSPORT PHENOMENA
(2019 Pattern) (Semester - II) (309350)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q. No. 1or 2,3 or 4, 5 or 6,7 or 8***
2) ***Figures to right indicate full marks***
3) ***Neat diagram must be drawn whenever necessary***
4) ***Assume suitable data, if necessary***

Q1) a) Derive the expression of molar flux and concentration profile for heterogeneous instantaneous chemical reaction. **[12]**

b) Calculate the mass flux of benzene through a layer of air 10 mm thickness at 25 °C and 200 KN/m^2 (total pressure), partial pressure of benzene is 6×10^3 N/m^2 at the left side of the layer and 1 KN/m^2 at the right side. The mass diffusivity at this temperature and pressure is 4.4×10^{-6} m^2/s? **[6]**

OR

Q2) a) Derive expression of molar flux, concentration profile and average concentration for diffusion through stagnant gas film. **[12]**

b) What is Fick's law of diffusion, discuss the effect of temperature and pressure on diffusivity for liquids and gases? **[6]**

Q3) a) Use Navier-Stokes equation of motion to determine velocity distribution for laminar flow of Newtonian fluid through vertical pipe. **[12]**

b) Explain macroscopic energy balance equation. **[5]**

P.T.O.

OR

Q4) a) Derive Newtons second law of motion and extend it to derive Eulers equation of motion. **[12]**

b) Explain different types of derivatives used in deriving equation of change. **[5]**

Q5) a) An incompressible fluid flows turbulently in a circular tube of cross - sectional area S_1 which empties into a large tube of cross- sectional area S_2. Use macroscopic balances and derive expression for pressure rise and friction loss due to sudden expansion. **[12]**

b) Derive the expression of fanning friction factor for flow of fluid in a tube. **[6]**

OR

Q6) a) Derive Blake Kozeny equation for laminar flow of fluid through packed bed. **[10]**

b) Pressure drop is 10 psi over 100 ft of small pipe 1.5 in I.D. having viscosity of 5 cp and density is 960 kg/m^3 Calculate velocity and flow region. **[8]**

Q7) a) Derive an expression for binary mass transfer coefficient in one phase **[9]**

b) Explain Reynold's analogy. **[8]**

OR

Q8) a) Explain Martinelli's analogy. **[9]**

b) Explain transfer coefficient at high transfer rates by film theory? **[8]**

Total No. of Questions : 8]

SEAT No. :

PC1714

[Total No. of Pages : 2

[6353]-31

T.E. (Chemical)

ENERGY CONSERVATION IN CHEMICAL PROCESS INDUSTRIES

(2019 Pattern) (Semester-II) (Elective-II) (309351A)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, and Q.3 or Q.4 and Q.5 or Q.6 and 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) a) Explain Demand supply of Energy Systems. **[10]**

b) Write down safety codes to save the Energy in industries. **[7]**

OR

Q2) Which are different Best practices should be follow in chemical industry for conversation of energy. (Explain any one industry in details) **[17]**

Q3) a) Explain Duties of Top Management Commitment and Support? **[8]**

b) Which are different parameters to Assess Energy Performances? **[10]**

OR

Q4) Which are different organization energy conservation programs? Explain Plant, corporate, level organization detailed. **[18]**

Q5) a) Explain different Guidelines for Improving Process Operations for Energy Conservation. **[10]**

b) How will you save energy in conservation in boilers, chilled water plant? **[8]**

OR

P.T.O.

Q6) Which are different safety guidelines for Compressors, fans, heat pumps and cooling systems to save energy. **[18]**

Q7) a) Make detail study report for dairy industry. **[10]**

b) Make detailed study of sugar industry. **[7]**

OR

Q8) Explain waste minimization and its classification in detailed. **[17]**

Total No. of Questions : 8]

SEAT No. :

PC1715

[Total No. of Pages : 2

[6353]-32

T.E. (Chemical Engg.)

PROCESS INSTRUMENTATION AND CONTROL

(2019 Pattern) (Semester-II) (Elective-II) (309351B)

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 diagram must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide ride, Mollier charts, electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable data, jf necessary.***

Q1) a) Explain with diagram, construction and working of Bourdon pressure gauge. **[8]**

b) Explain with diagram, construction and working of Bellows. **[8]**

OR

Q2) a) Explain with diagram, construction, working and calibration of pressure sensor using dead weight tester. **[8]**

b) What are different types of Manometers? With neat sketch explain U tube Manometer. **[8]**

Q3) a) Explain with diagram, construction and working of Rota meter with its industrial application. **[10]**

b) Explain classification of flow measuring instruments. **[8]**

OR

P.T.O.

Q4) a) How level can be measured using radioactive transducers? Draw neat sketch and explain in detail. **[9]**

b) Explain with diagram, construction and working of Sight glass level measurement method. **[9]**

Q5) Describe with neat diagram the following techniques of composition analysis. **[18]**

a) IR absorption Spectroscopy

b) Mass Spectroscopy

OR

Q6) a) Write short notes on: **[10]**

i) Liquid chromatography

ii) Refractometry

b) Explain principle with diagram, construction, working of HPLC. **[8]**

Q7) a) Explain with diagram different control actions **[9]**

b) Describe the characteristics of step response of second order under damped system. **[9]**

OR

Q8) a) With the help of block diagram explain working of feedback control system. **[9]**

b) Describe the types of ideal forcing function. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC1716

[Total No. of Pages : 2

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T.E. (Chemical)

CORROSION ENGINEERING

(2019 Pattern) (Semester-II) (Elective-II) (309351C)

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 wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain in detail about uniform attack. **[5]**

b) Explain in detail about fretting corrosion in Steel and its Remedial Measure. **[8]**

c) What is stress corrosion cracking? Explain in detail. **[5]**

OR

Q2) a) What is intergranular Corrosion, Explain in detail? **[5]**

b) Explain in detail about dezincification. **[5]**

c) Discuss Remedial Measure for cavitation, erosion. **[8]**

Q3) a) Write a short note on. **[15]**

i) Mechanisms of Oxidation

ii) Corrosion of iron and steel

iii) High temperature oxidation

b) What is Corrosion? **[2]**

OR

P.T.O.

Q4) a) Explain different theories of corrosion with suitable example. **[8]**

b) What is Pilling Bedworth ratio and Explain the mechanism of Oxidation. **[9]**

Q5) a) Explain in detail the role of Zink in Galvanizing. **[6]**

b) What is High temperature oxidation? Explain with Example. **[6]**

c) Write a short note on Alloying. **[5]**

OR

Q6) a) Explain the Modification required in Material to prevent Corrosion. **[9]**

b) Explain in detail about reaction occurred in Corrosion, with Example. **[8]**

Q7) a) Explain Different types of Corrosion and Preventive Method for it. **[10]**

b) What is Coating? Explain with Example. **[8]**

OR

Q8) Write a short note on. **[18]**

a) Heat treatment

b) Anodic protection

c) Passivity

Total No. of Questions : 8]

SEAT No. :

PC1717

[Total No. of Pages : 2

[6353]-34

T.E. (Chemical Engg.)

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

(2019 Pattern) (Elective-II) (Semester-II) (309351 D)

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

Q1) a) With help of suitable example explain how can artificial intelligence can help to develop knowledge based process control system-Provide neat diagram. **[8]**

b) What are the key characteristics of Genetic Algorithm? What are the applications of GA? **[10]**

OR

Q2) With help of neat diagram explain ANN architecture and discuss the error back propagation strategy. **[18]**

Q3) "Expert systems are used very frequently for controlling complex Chemical and Biochemical processes" - Explain and elaborate with help of relevant examples. **[17]**

OR

Q4) a) Discuss expert system in detail and its relative advantages over other AI methodologies. **[9]**

b) Highlight the challenges faced during implementation of expert system in practical operation and the ways to mitigate them. **[8]**

P.T.O.

Q5) Write short notes on following points: **[18]**

a) Forward Chaining

b) Backward Chaining

c) Deductive Retrieval

OR

Q6) a) What are First order logic? List the Inference rules along with suitable examples for first order logic. **[9]**

b) Explain what is meant by Knowledge Based Reasoning and its application to Engineering and Technology. **[9]**

Q7) a) Discuss forward and backward state space planning with help of relevant examples. Discuss their advantages. **[10]**

b) Discuss the operations of Rule based Expert System with justification. **[7]**

OR

Q8) a) Explain the concept of problem decomposition with help of goal trees. **[9]**

b) With help of relevant examples explain how Goal Stack Planning is practically implemented. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1718

[Total No. of Pages : 2

[6353]-35
T.E. (Computer Engg) (AI & DS)
DATABASE MANAGEMENT SYSTEM
(2019 Course) (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) What is the impact of insert, update & delete anomaly on overall design of 8 M database? How is normalization used to remove these anomalies? Explain with suitable example. **[8]**

b) What is functional dependency? Explain its use in database design. Consider the instance of the relation Market (MarketName, Product, Stock): **[9]**

Market Name	Product	Stock
S1	Toothpaste	14
S1	Biscuits	8
S1	Shampoo	8
S2	Toothpaste	30
M1	Chocolates	50
M2	Cakes	14

Identify the functional dependencies that can be found in the given instance.

OR

Q2) a) Elaborate the significance of CODD's rule. Explain 12 rules proposed by CODD's. **[8]**

P.T.O.

b) What is decomposition? Explain the desirable properties of decomposition? Consider the relation F (FN, PN, C, D) with the following Functional Dependencies: **[9]**

FD1: FN, PN –> C

FD2: C –> D

FD3:D –> F

If Fig is decomposed into F1(FN, PN, C) and F2(C, D). Check decomposition is lossless or lossy?

Q3) a) How to ensure the atomicity using Recovery Methods? Explain the log based recovery method in detail. **[9]**

b) What is need of lock in DBMS? Explain shared lock and exclusive lock with the help of example. **[9]**

OR

Q4) a) When do deadlocks happen, how to prevent them, and how to recover if deadlock takes place? **[9]**

b) What is R-timestamp(Q) and W-timestamp(Q). Explain the necessary condition used by time stamp ordering protocol to execute for a read/ write operation. **[9]**

Q5) a) Explain the CAP theorem referred during the development of any distributed application. **[8]**

b) Explain how NOSQL databases are different than relational databases? Describe in detail the column NOSQL data model with example. **[9]**

OR

Q6) a) Draw and explain architecture of Distributed database system. State the reasons for building distributed database systems. **[8]**

b) Explain structured, Semi-structured and Unstructured data types with examples. **[9]**

Q7) a) What is the significance of XML databases? Explain with example the use of XML databases. **[9]**

b) What is object relational database? What are its advantages and disadvantages? **[9]**

OR

Q8) a) What are spatial data? Explain Geographic and Geometric data. **[9]**

b) Explain how encoding and decoding of JSON object is done in JAVA with example. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1719

[Total No. of Pages : 3

[6353]-36

T.E. (Computer Engg.)

THEORY OF COMPUTATION

(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) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Give Context Free Grammars for the following languages **[9]**

i) L={ w ∈ {a,b}*|w is string of staring with ‘a’ and ending with ‘b’}

ii) RE = 0(0+1)*01(0+1)*1

iii) RE = (011+1)* (01)*

b) Simplify the following grammar as **[8]**

i) Eliminate Useless production

S -> abS | abA | abB

A -> cd

B -> aB

C -> dc

ii) Eliminate Unit Production

S -> Aa | B

A -> b | B

B -> A | a

iii) Eliminate the ∈ Production

$S \rightarrow XYX$

$X \rightarrow 0X \mid \varepsilon$

$Y \rightarrow 1Y \mid \varepsilon$

OR

P.T.O.

Q2) a) **$S \rightarrow aB \mid bA$**

$A \rightarrow a \mid aS \mid bAA$

$B \rightarrow b \mid bS \mid aBB$

Derive using Leftmost Derivation and Rightmost Derivation : i) bbaaba ii) aaabbb. Draw parse tree for the same. **[9]**

b) Find context Free Grammar generating each of these languages. **[8]**

i) L1 = { $a^i b^j c^k$ such that i = j + k where I, j, k>=1}

ii) L2 ={ $a^i b^j c^k$ such that j = i + k where I, j, k>=1}

Q3) a) i) Construct PDA for the given CFG, and test whether 010^4 is acceptable by this PDA.

$S \rightarrow 0BB$

$B \rightarrow 0S \mid 1S \mid 0$

ii) Construct PDA for the given CFG, and test whether 'aaabb' is acceptable by this PDA.

$S \rightarrow aSb$

$S \rightarrow a \mid b \mid \varepsilon$

[10]

b) What is NPDA? Construct a NPDA for the set of all strings over {a, b} with odd length palindrome. **[8]**

OR

Q4) a) Construct a PDA accepting the language L ={$a^n b^m a^n$|n,m >=0}by null store. **[6]**

b) Design a PDA for a language L={XcX^r | X € {a,b}* and string X^r is the reverse of string X} **[6]**

c) Obtain a PDA to accept the language - **[6]**

L = {w | w € Σ*, Σ = {a, b} and $n_a(w) = n_b(w)$}by final state

Q5) a) Design the Turing for the function *f*(n) = 2n is computable. **[9]**

b) What are the different ways for extension of TM? Explain. Design TM for language L={$a^m b^n$ | m < n} **[9]**

OR

Q6) a) Construct a TM to accept the language over {0,1} containing the substring 001. **[6]**

b) Design a TM to multiply a unary number by 2. **[8]**

c) Design Turing Machine for l's Complement. **[4]**

Q7) a) What Traveling salesman problem? How to prove that Traveling salesman problem is NP Complete? **[5]**

b) What is post correspondence problem? Why is post correspondence problem undecidable? Explain PCP with following instance of the set of the strings A and B **[12]**

	A	B
1.	1	111
2.	10111	10
3.	10	0

OR

Q8) a) What is reducibility in Computability Theory ? Explain in detail, the polynomial time reduction approach for proving that a problem is NP-Complete. **[8]**

b) State and explain with suitable example : **[9]**

i) Decidable Problem

ii) Undecidable Problem

iii) Church-Turing Thesis.

Total No. of Questions : 8]

SEAT No. : ____

PC-1720

[Total No. of Pages : 2

[6353] - 37
T.E. (Computer Engineering)
System Programming & Operating System
(2019 Pattern) (Semester - I) (310243)

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 diagram must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain Static and Dynamic Linking with suitable diagram and example? **[9]**

b) Explain complete design of Absolute Loader? Also explain its advantages and disadvantages? **[9]**

OR

Q2) a) What is Direct Linking Loader? Explain design of Direct Linking Loader with suitable example? **[9]**

b) What is self-relocating programs? Explain with the help of loader schemes with neat diagram? **[9]**

Q3) a) Explain Short term, Medium term and Long term scheduler? Discuss their role in seven state process model. **[9]**

b) Explain seven state process model with diagram? **[8]**

OR

P.T.O.

Q4) a) Draw Gantt chart and calculate Avg. turnaround time, Avg. waiting time for the following processes using SJF (Non preemption) and round robin with time quantum 2 Units? **[9]**

Process	Burst Time	Arrival Time
P1	3	0
P2	5	1
P3	2	3
P4	5	9
P5	5	12

b) What is Process control block? Explain with diagram in detail? **[8]**

Q5) a) Write a short note on following with example? **[9]**

i) Semaphore ii) Monitor iii) Mutex

b) Explain Bankers algorithm for deadlock avoidance in detail with suitable example? **[9]**

OR

Q6) a) Explain producer Consumer problem & Dining Philosopher problem with solution? **[10]**

b) What is deadlock prevention? State and explain the conditions for deadlock occurrence? **[8]**

Q7) a) Consider page sequence 2,3,2, 1,5,2,4,5,3,2,5,2 and discuss working of following page replacement policies. Also count page faults.(use no. of Frames = 3) **[8]**

i) OPT (Optimal)

ii) LRU (Last Recently Used)

b) Why page size and frame size in paging should be same?What is translation look aside buffer?Describe its importance. **[9]**

OR

Q8) a) Write a short note on following with diagram **[8]**

i) Fixed Partitioning

ii) Dynamic Partitioning

b) Explain Placement Strategies: First Fit, Best Fit, Next Fit and Worst Fit. In detail with example? **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1721

[Total No. of Pages : 2

[6353]-38
T.E. (Computer Engineering)
COMPUTER NETWORKS AND SECURITY
(2019 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.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Give short note on i) ARP ii) RARP **[6]**

b) Explain Distance vector routing **[6]**

c) Differentiate between Circuit Switching, Message Switching and Packet Switching. **[6]**

OR

Q2) a) Give short note on i) ICMP ii) IGMP **[6]**

b) Explain Link state routing. **[6]**

c) 192.168.5.51/27 for given address find out the i) subnet mask?, ii) what is first ip address for given series?, iii) what is last ip address for given series? **[6]**

Q3) a) Draw and explain TCP header format. **[6]**

b) List and explain transport layer services. **[6]**

c) e2 a7 00 0D 00 20 74 9e Oe ff 00 00 00 01 00 00 00 using this UDP hexadecimal dump find out in decimal numbers i) Source port no., ii) Destination port no., iii) Total length of user datagram. **[6]**

OR

Q4) a) Draw and explain UDP header format. **[6]**

b) What is socket? What are different types of socket? Explain socket functions used in connection oriented services with diagram. **[6]**

c) Explain SCTP protocol in detail. **[6]**

P.T.O.

Q5) a) What is DNS? Explain DNS working. **[9]**

b) Write short notes on FTP and TELNET. **[8]**

OR

Q6) a) What is SNMP? Explain SNMP working. **[9]**

b) What is HTTP? Explain HTTP request and reply messages. **[8]**

Q7) a) Draw and explain ITU-T X.800 Security Architecture for OSI. **[6]**

b) Give short note on HTTPS. **[6]**

c) Give short note on IDS. **[5]**

OR

Q8) a) Differentiate between Symmetric and Asymmetric Key Cryptography. **[6]**

b) Explain SSL in detail. **[6]**

c) Give short note on Firewalls. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC1722

[Total No. of Pages : 2

[6353]-39

T.E. (Computer Engineering)

INTERNET OF THINGS AND EMBEDDED SYSTEMS

(2019 Pattern) (Semester - I) (310245 (A)) (Elective -I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Illustrate the working of any 03 Communication models with suitable application. **[6]**

b) Demonstrate SCADA pillar of IoT with Suitable IoT System. **[6]**

c) Illustrate connectivity technologies used in IoT with proper example. **[6]**

OR

Q2) a) Illustrate step wise IoT design methodology. **[6]**

b) Demonstrate the typical RFID system with the help of suitable IoT Application. **[6]**

c) Categorize different IoT design methodologies for Smart Irrigation system. **[6]**

Q3) a) Illustrate the use of MQTT protocol with suitable IoT Application. **[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

Q4) a) Categorize between SCADA and WSN protocols. **[6]**

b) Illustrate the various IoT applications developed using IP based protocols. **[6]**

c) Illustrate use of Zigbee in the smart home system. **[5]**

P.T.O.

Q5) a) Demonstrate Amazon Cloud platform usage for IoT applications. **[8]**

b) Use the knowledge of Cloud Computing to demonstrate. **[10]**

i) Autobahn for IoT

ii) Xively Cloud

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 Weather forecasting system with proper explanation. **[10]**

Q7) a) Predict the possible security challenges in designing secure IoT applications. **[8]**

b) Illustrate the how the classic pillars of information assurance useful in securing the IoT application. **[9]**

OR

Q8) a) Illustrate the threat model is playing role in securing IoT applications. **[8]**

b) Demonstrate the security requirements of IoT Applications. **[9]**

■■■■

Total No. of Questions : 8]

SEAT No. : [ ]

PC1723

[Total No. of Pages : 2

[6353]-40

T.E. (Computer Engineering) (Artificial Intelligence and Data Science)
HUMAN COMPUTER INTERFACE
(2019 Pattern) (Semester - I) (Elective - I) (310245B)

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 indicates full marks.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Make suitable assumption whenever necessary.***

Q1) a) What is mean by interaction styles? Explain different types of interaction styles such as: **[8]**

i) Command-line interface

ii) Menus

iii) Form-Fills-In

iv) Direct Manipulation

b) Write down about iterative design and prototyping using suitable example. **[5]**

c) Elaborate characteristics of web using Merging of Graphical Business Systems and Web Characteristics of Intranet Versus Internet. **[5]**

OR

Q2) a) What is mean by design? Which are the important things required to consider for designing? Explain with example. **[8]**

b) Explain advantages, disadvantages and characteristics of Graphical User Interface. **[5]**

c) Write short note on: Popularity of the Web. **[5]**

Q3) a) Write short note on: **[6]**

i) Usability Testing in Laboratory

ii) Controlled Experiments

iii) Heuristic Evaluation

b) Elaborate Evaluation Framework using following point: **[6]**

i) Paradigms and Techniques

ii) DECIDE: a Framework to Guide Evaluation

c) What is significance of multi-modal interaction in HCI System? Explain with example. **[5]**

OR

P.T.O.

Q4) a) Elaborate universal design principles in detail. **[6]**

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

i) Empirical Methods: Experimental Evaluation

ii) Field Studies

c) Explain formative and summative evaluation. **[5]**

Q5) a) Discuss about interface design, pattern recognition phases, system architecture using suitable example of HCI system. **[6]**

b) Explain vision-based Hand Gesture Recognition System using HCI paradigms. **[6]**

c) What is mean by ubiquitous computing? Which are the applications of it? Explain with suitable example. **[6]**

OR

Q6) a) Explain the term "data entry and usability using appropriate case study. **[6]**

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

i) Retrieval in Physical World

ii) Retrieval in Digital world

iii) Constrained Natural Language output

c) Compare data integrity and data immunity. **[6]**

Q7) a) Elaborate designing for Mobile and other devices. **[6]**

b) Explain Mobile Navigation, Content, and Control Idioms using appropriate Example. **[6]**

c) What is the significance of "navigation and toolbars" in HCI? Explain. **[5]**

OR

Q8) a) What is use of "multi-touch gestures". Explain various multi-touch gestures used in mobile device. **[6]**

b) Describe Tap-to-Reveal and Direct Manipulation. **[6]**

c) Explain Norman's Principles of Design in software. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC1724

[Total No. of Pages :2

[6353]-41

T.E. (Computer Engineering)

DISTRIBUTED SYSTEMS

(2019 Pattern) (Semester - I) (310245 (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, 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 is Gossip-Based overlay construction? How it is achieved? **[6]**

b) Give difference between centralised algorithm and distributed algorithm in mutual exclusion. **[6]**

c) Explain in short **[6]**

i) Bully algorithm

ii) Token-Ring algorithm

OR

Q2) a) Explain in brief, logical positioning of nodes in GPS System. **[6]**

b) Explain in short **[6]**

i) Logical clock synchronization

ii) Physical clock synchronization

c) Explain distributed event matching in detail. **[6]**

Q3) a) Explain the following naming in DFS. **[6]**

i) Flat naming

ii) Attribute based naming

b) Explain in detail with diagram file service architecture . **[6]**

c) Explain in detail sun network file system. **[5]**

OR

Q4) a) Explain **[6]**

i) Names

ii) Identifiers

iii) Addresses in distributed Systems.

b) Explain the need and requirement of distributed file system. **[6]**

c) Explain in detail Andrew file system. **[5]**

P.T.O.

Q5) a) Explain **[6]**

i) Data-Centric Consistency Model

ii) Client-Centric Consistency Model

b) What is replication? What are the reasons for data replication? **[6]**

c) Describe Client-Centric Consistency model, with respect to **[6]**

i) Eventual Consistency

ii) Monotonic reads

iii) Monotonic writes

OR

Q6) a) Write a short note on. **[6]**

i) Cache coherence protocol

ii) Sequential Consistency protocol.

b) What is Replica Management? Explain how to manage replicated data. **[6]**

c) Describe data consistency model with respect to **[6]**

i) Objective of data Centric model

ii) Fundamental Concept

iii) Example of data Centric Consistency model

Q7) a) Explain the following terms with respect to recovery techniques. **[6]**

i) Message logging and

ii) Check-point

b) What do you mean by process resilence? Explain resilence by process groups. **[6]**

c) Describe the distributed commit in reliable group communication. **[5]**

OR

Q8) a) Elaborate Reliable point to point client-server Communication. **[6]**

b) Explain Paxos concensus algorithm in the distributed systems. **[6]**

c) What is atomic multicast in reliable group communication? **[5]**

Total No. of Questions : 8]

SEAT No. :

PC1725

[Total No. of Pages :2

[6353]-42

T.E. (Computer Engineering)

SOFTWARE PROJECT MANAGEMENT

(2019 Pattern) (Semester - I) (Elective -I) (310245 (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, 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) Compare forward pass and Backward pass Techniques. **[8]**

b) Enlist various objectives of Activities planning with an example. **[9]**

OR

Q2) a) How to Analyze Critical path in any network? What are the remedies? Draw a suitable diagram. **[8]**

b) Explain Rules for Network formulation in detail. Draw a suitable diagram. **[9]**

Q3) a) Explain earned value analysis with a suitable example. **[8]**

b) Compare Predictive Vs Empirical Management. **[9]**

OR

Q4) a) Explain four fundamental sources of change control **[8]**

b) Describe various layers of software Configuration Management (SCM) process. **[9]**

P.T.O.

Q5) a) Explain any two Agile estimation methods. **[9]**

b) Demonstrate Three (3) Stages of Agile Projects with suitable example. **[9]**

OR

Q6) a) List out various Roles and Responsibilities for Agile Project manager. **[9]**

b) Differentiate Agile technology and waterfall technology. **[9]**

Q7) a) List out various ways by which software Professional can manage the teams with an example. **[9]**

b) Describe the Oldham Hackman job characteristic Model. **[9]**

OR

Q8) a) What are the various standard Ethical approaches required for any software professional. **[9]**

b) Explain decision making process with suitable example. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC1726

[Total No. of Pages : 2

[6353]-43

T.E. (Computer Engineering)

DATA SCIENCE AND BIG DATA ANALYTICS

(2019 Pattern) (Semester-II) (310251)

Time : 2 ½Hours] *[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) Draw data analytics life cycle diagram and briefly explain its phases. **[6]**

b) Explain the various key roles for a successful analytics project. **[6]**

c) What are various sources of Big data. **[6]**

OR

Q2) a) Describe few applications of Big Data Analytics. **[6]**

b) Explain Data preparation phase of data analytics lifecycle. **[6]**

c) List common tools used for model building phase of data analytic. **[6]**

Q3) a) Define and explain Entropy and Information gain. Calculate the entropy of the following distribution **[9]**

Fruit Color	Taste	Count
Yellow	Sweet	10
Red	Sweet	5
Green	sour	15
Orange	sour	5

b) Explain Naïve Bayes Classifier. **[8]**

OR

P.T.O.

Q4) a) Explain Apriori algorithm with suitable example. **[9]**

b) Describe different categories of analytics **[8]**

Q5) a) What is Hierarchical clustering? Explain hierarchical clustering algorithms. **[9]**

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

i) Holdout method

ii) k-Fold Cross-Validation

OR

Q6) a) What is Text analysis? Explain the different steps involved in the text analysis. **[9]**

b) Write a note on Social network analysis. What are the applications of Social network analysis? **[8]**

Q7) a) Explain Hive architecture with suitable diagram. Describe characteristics and features of hive. **[9]**

b) Describe the data visualization tool Tableau. **[9]**

OR

Q8) a) What is data visualization and objectives of data visualization? Why it is difficult visualize Big Data? **[9]**

b) Write a note on Microsoft Power BI and Qlik **[9]**

Total No. of Questions : 8]

SEAT No. :

PC1727

[Total No. of Pages :2

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T.E. (Computer Engg.)

WEB TECHNOLOGY

(2019 Pattern) (Semester - II) (310252)

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, 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 Http Servlet class with example. Explain the servlet Life cycle method. **[10]**

b) Explain XML using DTDS & XML using XML Schema with example.**[8]**

OR

Q2) a) Explain servlet session management & tracking methods. **[9]**

b) Write note on :

i) AJAX **[5]**

ii) do Get Vs dopost **[4]**

Q3) a) Explain JavaBeans classes & JSP. **[8]**

b) Explain the concept of Web Services. Explain WSDL & SOAP. **[9]**

OR

Q4) a) Explain JSP Vs Servlets (Min.04). Explain how JSPS are translated to Servlets. **[8]**

b) Write note on struts. Explain struts with example code block. **[9]**

P.T.O.

Q5) a) Explain the MySQL & PHP for inserting the students data into the students table. (Assume suitable data) **[8]**

b) Write note on :

i) ASP. NET **[5]**

ii) NodeJS **[5]**

OR

Q6) a) Explain PHP functions and arrays in PHP. **[10]**

b) Explain the concept of NET framework and C# **[8]**

Q7) a) Explain the Ruby with respect to scalar types & their operations, control statements & arrays. **[12]**

b) Write note on EJB. **[5]**

OR

Q8) a) Explain the Rails Applications & databases. Also explain Rails with AJAX. **[12]**

b) Explain the advatages & Ruby & Rails. **[5]**

Total No. of Questions : 5]

SEAT No. :

PC-1728

[Total No. of Pages : 2

[6353] - 45
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 diagram must be drawn whenever necessary***
3) ***Assume suitable data, if necessary***

Q1) a) Define Game Theory. What are the components, defining game as a Search Problem? Draw a Game Tree for tic-tac-toe. **[9]**

b) What do you understand by Constraint Propagation? Write short notes on Node Consistency and Arc Consistency. **[8]**

OR

Q2) a) Explain how Minimax and alpha-beta algorithms change for two-players, non zero-sum games in which each player has his or her own utility function. **[9]**

b) Define Constraint Satisfaction Problem. Explain Map Coloring Example Problem. . Formulate the Map Coloring Problem as CSP. **[8]**

Q3) a) Define Knowledge base and Sentence. Describe in detail about Wumpus World Environment along with brief description to find out the agent. Explain Task Environment. **[8]**

b) Represent the followings into First Order Logic form: **[10]**

i) All employees earning Rs.45000 or more pay tax.

ii) Sita is a marine engineer and she is also an artist.

iii) Children love icecream.

iv) If Humidity is high,temperature is high then a person cannot feel comfortable.

v) Puppies are cute.

If AB and AC are equal, then angle B and C are equal.

ABC is an equilateral triangle.

Represent these facts in predicate logic.

P.T.O.

OR

Q4) a) Write Short notes on followings: **[9]**

i) Syntax and Semantics

ii) Proposition Logic Vs First Order Logic

iii) Knowledge Engineering Process in First Order Logic

b) Show the following Sentences are valid or not. **[9]**

a) $(P \wedge Q) \rightarrow (P \vee Q)$ b) $(\neg A \vee B) \wedge (\neg B \vee C) \rightarrow (\neg A \vee C)$

Q5) a) Prove that Universal Instantiation is sound and that Existential Instantiation produces an inferentially equivalent knowledge base. **[8]**

b) Write Short notes on : **[9]**

i) Forward Chaning

ii) Categories and Objects

iii) Back ward Chaining

OR

Q6) a) What do you understand by Resolution? Describe the Procedure to convert into CNF? Find the clause of the expression: $(\neg P \vee Q) \rightarrow R$ **[9]**

b) What are the reasoning systems for Catgories? Explain Semantic Network and Description Logic . **[8]**

Q7) a) Describe the differences and similarities between problem solving and planning. **[5]**

b) Explain AI components and AI architecture **[5]**

c) What are the different types of planning? How planning algorithm can be represented as state space search? **[8]**

OR

Q8) a) Explain What are Planning approaches? **[6]**

b) Explain The Blocks World in detail. **[6]**

c) What are the limitations of AI? Explain What are the Future Scopes with AI? **[6]**

Total No. of Questions : 8]

SEAT No. :

PC1729

[Total No. of Pages : 2

[6353]-46

T.E. (Computer Engineering)

INFORMATION SECURITY

(2019 Pattern) (Semester - II) (310254 A) (Elective - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Differentiate between Asymmetric key cryptography and symmetric key cryptography? **[8]**

b) What are the different types of attacks possible on RSA? Explain in brief ? **[8]**

c) Discuss elliptic curve cryptography in detail? **[6]**

OR

Q2) a) Explain Diffie-Hellman key exchange algorithm? **[8]**

b) Perform encryption and decryption using RSA algorithm for the following : **[8]**

P = 3; q = 11; d = 7; M = 5

c) Explain El-Gemmal Algorithm in detail. **[6]**

Q3) a) What is a message authentication code? What is the difference between a message authentication code and a one-way hash function? **[8]**

b) Explain the steps to create the digital certificate with diagram? **[8]**

OR

Q4) a) What is Message Digest? Compare MD-5 with SHA-I? **[8]**

b) Explain the contents of X.509 format of certificate with diagram? **[8]**

P.T.O.

Q5) a) Write a short note on. **[8]**

i) Honeypot

ii) Distributed DOS attack

b) What are the capabilities and limitations of Firewall? **[8]**

OR

Q6) a) Explain following of Intrusion detection systems in detail? **[8]**

i) Network based IDS

ii) Host based IDS

b) Explain access control and its types in detail? **[8]**

Q7) a) Write short note on. **[8]**

i) Cyber Terrorism

ii) Social Engineering

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

i) Keyloggers and spywares

ii) Password Cracking

OR

Q8) a) Write short note on. **[8]**

i) Phishing attack

ii) Cyber Stalking.

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

i) Indian IT act Information.

ii) Security Life Cycle.

■■■■

Total No. of Questions : 8]

SEAT No. :

PC1730

[Total No. of Pages : 2

[6353]-47

T.E. (Computer Engineering)

AUGMENTED & VIRTUAL REALITY

(2019 Pattern) (Semester - II) (310254 B) (Elective - II)

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 indicate full marks.***

Q1) a) Differentiate between aural and Haptic representation in Virtual reality? **[6]**

b) What is rendering system? **[6]**

c) How to render complex haptic scenes with force displays? **[6]**

OR

Q2) a) Describe visual representation in Virtual Reality? **[6]**

b) Explain geometric based rendering system in detail? **[6]**

c) Describe visual rendering methods. **[6]**

Q3) a) Explain the different properties of manipulation? **[5]**

b) What are the different ways to navigate in virtual world? **[6]**

c) What is collaborative interaction? **[6]**

OR

Q4) a) Explain how to interact with VR system. **[5]**

b) Explain the substance of the virtual world. **[6]**

c) What is Immersion? **[6]**

P.T.O.

Q5) a) Explain working of Augmented reality in detail. **[12]**

b) What is dimensionality? **[6]**

OR

Q6) a) Explain all hardware used in Augmented reality. **[12]**

b) What is registration and latency in AR? **[6]**

Q7) a) Explain software tools used for content creation in AR? **[12]**

b) What is Marker based tracking? **[5]**

OR

Q8) a) Explain Augmented reality used in mobile? **[12]**

b) What are different software components of AR? **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC1731

[Total No. of Pages : 2

[6353]-48

T.E (Computer Engg./Artificial Intelligence and Data Science Engg.)

CLOUD COMPUTING

(2019 Pattern) (Semester - II) (Elective-II) (310254(C))

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Define Virtualization? Describe different types of Virtualizations? **[9]**

b) Differentiate between Virtualization in Grid and Virtualization in Cloud? **[8]**

OR

Q2) a) Describe CPU, Network and Storage Virtualization? **[9]**

b) Draw and Explain the Virtualization Architecture in detail? **[8]**

Q3) a) Describe the Amazon Database Services? **[9]**

b) Explain Google Cloud Application in detail? **[8]**

OR

Q4) a) Identify the different components of Microsoft Azure? explain Briefly? **[8]**

b) How cloud computing can be used for business and consumer applications like ERP or CRM? **[9]**

Q5) a) What are the security issues of cloud computing identified by cloud security alliance (CSA)? explain any three in detail? **[9]**

b) How Trusted Cloud Computing can be used to manage the risk and security in a cloud? **[9]**

OR

Q6) a) Describe the six step risk management processes? **[9]**

b) Describe how to perform Secure Cloud Software Testing? **[9]**

P.T.O.

Q7) a) What do you mean by IoT Cloud? How IoT cloud can be used in home automation? **[9]**

b) Draw & Explain architecture of Kubernetes. **[9]**

OR

Q8) a) Identify the future trends in cloud computing? Explain in brief? **[9]**

b) Differentiate between Distributed Cloud Computing Vs Edge Computing? **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC1732

[Total No. of Pages : 2

[6353]-49
T.E (Computer Engg.)/(AI&DS)
SOFTWARE MODELING & ARCHITECTURE
(2019 Pattern) (Semester - II) (Elective-II) (310254(D))

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 and Q.7 or Q.8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Draw State machine diagram for ATM system. **[8]**

b) Draw activity diagram for the library case study shown below. List all activities used in the diagram. **[9]**

Library Case study: Following is a process to issue a book:

Every book has a barcode sticker pasted on it. Every employee has Icard on which also barcode sticker is pasted. Employee has to select a book and has to approach librarian. Librarian scans the barcode of the book with barcode scanner. Then employee has to scan barcode on I card with barcode scanner. Librarian has to ensure book details, employee details and finalize the issue transaction of the book. Librarian tells return date to an employee.

Following is the process to return the book:

Employee has to carry the book to the librarian and librarian has to initiate the return transaction. Employee has to scan barcode sticker of I-card and book with barcode scanner. System calculates fine by using fine calculation rules. Librarian asks for fine amount to employee if any. Employees pay the fine. Librarian finalizes the return transaction. Note that, in above system, if barcode scanner does not work, librarian should be able to enter data using keyboard. There should be provision of providing rules of fine calculation. Even if employee doesn't have barcode sticker on I - card, librarian should be able to input employee id manually.

OR

P.T.O.

Q2) a) Explain the significance of timing diagram with a suitable example. **[8]**

b) Draw the sequence diagram (s) for the following case study. **[9]**

Online Course Reservation System:

The requirement form the customer is got and the requirements about the course registration are defined. The requirements are analyzed and defined so that is enables the student to efficiency select a course through registration system. Whenever the student comes to join the course he/she should be provided with the list of course available in the college. The system should maintain a list of professor who is teaching the course. At the end of the course the student must be provided with the certificate for the completion of the course.

Q3) a) What is an Architectural Patterns? Explain different types of Common software architecture structures. **[8]**

b) What is the software architecture? What are the three different views of an architecture? Explain the component of 4+1 architectural view model. **[9]**

OR

Q4) a) Explain the different Quality Attributes and Considerations required for in software development. **[8]**

b) Explain the importance of Object oriented software architecture and its applicability in software development? **[9]**

Q5) a) Explain Software Architecture Documentation and its Quality Attributes. **[9]**

b) Explain the real time software architecture with a suitable example. **[9]**

OR

Q6) a) Illustrate how Software Architecture used in Agile Projects with example. **[9]**

b) Explain synchronous communication pattern in Client server architecture with example. **[9]**

Q7) a) What is Behavioral Pattern? In which situation you use the Behavioral pattern? What is observer Behavioral pattern? Explain observer Behavioral in detail with the applicability of singleton creational pattern. **[9]**

b) IIlustrate different approaches to select appropriate Design Patterns. **[9]**

OR

Q8) a) Draw the structure of observer pattern with suitable class diagram including subject and observer. **[9]**

b) Explain types of Structural Pattern in detail with examples. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC-1733

[Total No. of Pages : 2

[6353]-50
T.E. (AI & DS)
COMPUTER NETWORKS
(2019 Pattern) (Semester - I) (317521)

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 diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain various Switching Techniques in Network Layer. **[9]**

b) Describe ICMP with header format using neat diagram. **[9]**

OR

Q2) a) Compare routing protocols RIP, OSPF, BGP. **[9]**

b) Describe link state routing algorithm with example. **[9]**

Q3) a) Draw TCP header and explain TCP connection 3-way handshake. **[9]**

b) Differentiate between TCP and UDP Protocol. **[8]**

OR

Q4) a) Explain Stream Control Transmission Protocol (SCTP). What are its advantages over TCP and UDP, and where is it commonly used. **[9]**

b) Discuss the Quality-of-Service Parameter in Computer Network. **[8]**

P.T.O.

Q5) a) Explain Simple mail Transfer Protocol. **[9]**

b) Discuss the Simple Network Management Protocol (SNMP) and its role in network management and monitoring. **[9]**

OR

Q6) a) Why we need DHCP? Explain header format in detail? **[9]**

b) Differentiated between Persistant and Nonpersistant HTTP? **[9]**

Q7) a) Explain IEEE 802.3 Standards and Frame Format. **[9]**

b) Differentiate between Pure ALOHA and Slotted ALOHA. **[8]**

OR

Q8) a) Write Short note on IEEE 802.15 and IEEE 802.16. **[9]**

b) Explain the concept of CSMA/CD. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC-1734

[Total No. of Pages : 2

[6353]-51
T.E. (AI & DS)
WEB TECHNOLOGY
(2019 Pattern) (Semester - I) (310252)

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 life cycle of servlet. **[6]**

b) What are DTDs? Explain internal DTD with example? **[6]**

c) What is AJAX? Explain with suitable example. **[6]**

OR

Q2) a) Differentiate between Generic Servlet and HTTP Servlet. Write code snippet for Generic Servlet to display Hello World. **[6]**

b) Explain the differences between HTML and XML. **[6]**

c) Write code snippet to design a form to search employee by name using ajax. **[6]**

Q3) a) Write advantages of JSP over Servlets? Also explain life cycle of a JSP. **[9]**

b) Explain the architecture of struts. **[8]**

OR

Q4) a) Create a JSP page to search a student details from database by studentid. (Assume suitable table structure). **[9]**

b) Write a note on SOAP and UDDI. **[8]**

P.T.O.

Q5) a) Write a program in PHP to calculate Square Root of a number? **[6]**

b) Explain all possible types of scope of variable in PHP. **[6]**

c) What is .NET Framework? Explain Architecture. **[6]**

OR

Q6) a) Write a note on WAP and WML. **[6]**

b) Write the PHP code for fetching the data from a database to a webpage? **[6]**

c) What is Node.js? What are the features of Node.js? **[6]**

Q7) a) Explain classes and objects in Ruby with appropriate examples. **[9]**

b) How code blocks are used in Ruby? Explain with appropriate code snippet. **[8]**

OR

Q8) a) Explain array in Ruby with example. **[9]**

b) What is EJB? Explain Types of Enterprise Java Bean. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-1735

[Total No. of Pages : 3

[6353]-52

T.E. (Artificial Intelligence and Data Science)

ARTIFICIAL INTELLIGENCE

(2019 Pattern) (Semester - I) (310253)

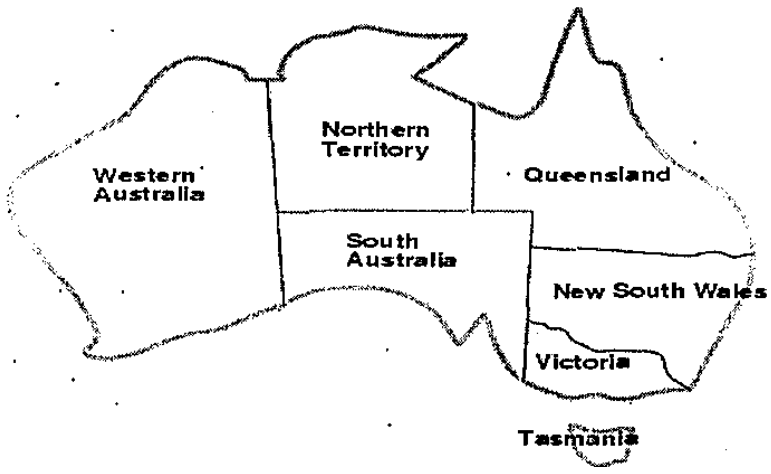
Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer four questions 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.***

Q1) a) Define Game theory,, Differentiate between stochastic and partial games with examples. **[8]**

b) What is Constraint satisfaction problem, State Types of consistencies Solve the following coloring problem using constraints satisfaction problem.



Variables WA, NT, Q, NSW, V,SA, T **[9]**

Domains Di = {red, green, blue}

Constraints: adjacent regions must have different colors

e.g., WA ≠ NT

P.T.O.

OR

Q2) a) List All the strategies of problem solving. What is backtracking, explain with n queen problem with Branch and Bound or Backtracking strategy. **[9]**

b) How to make Optimal decision in Games, Explain Monte Carlo Tree search algorithm with all steps and one example. **[8]**

Q3) a) Explain Knowledge based agent with Wumpus World. **[9]**

b) What is Knowledge Engineering, Explain in short semantic Network with example? And Draw Semantic Network for below example **[9]**

Tom is Cat

Tom is Grey in Color

Tom is Mammal

Tom is owned by Sam

OR

Q4) a) Explain inference in Propositional Logic Write the following sentences in FOL (using types of quantifiers) (any 2) : **[9]**

i) No one has climbed every mountain in the Himalayas

ii) Someone has visited every country in the world except Libya

iii) Not all cars have carburetors

iv) Some numbers are not real

b) i) Differentiate between Propositional logic and First Order Logic. Any 4 points

ii) Explain Syntax and Semantics of FOL

[9]

Q5) a) Explain Forward Chaining and Backward Chaining.

"The law says that it is crime for an American to sell weapons to hostile nations. The country Nono, an enemy of America, has some missiles, and all of its missiles were sold to it by colonel West, who is American"

Now prove that West is a Criminal. With forward Chaining OR Backward Chaining. **[9]**

b) Explain: Unification Algorithm in FOL

Solve stepwise with proper comments if p(x,g(x)) is equal to or not equal to p(z,y). **[8]**

OR

Q6) a) Explain FOL inference for following Quantifiers : **[8]**

- Universal Generalization
- Uhiversal Instantiation
- Existential Instantiation
- Existential introduction

b) Define and Explain Ontological Engineering indetails, with Definition Categories and Objects Models. **[9]**

Q7) a) Explain : **[5]**

i) Classical planning

ii) Hierarchal planning

b) Explain with example, how planning is different from problem solving. **[5]**

c) Explain AI components and AI architecture. **[8]**

OR

Q8) a) Explain Planning in non-deterministic domain. **[5]**

b) Explain **[8]**

i) Importance of planning

ii) Algorithm for classical planning

c) What is AI Explain Scope of AI in all walks of Life also explain Future opportunities with AI. **[5]**

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Total No. of Questions : 8]

SEAT No. : [ ]

PC1736

[Total No. of Pages : 2

[6353]-53

T.E. (Artificial Intelligence and Data Science Engg.)
EMBEDDED SYSTEMS AND SECURITY
(2019 Pattern) (Semester - I) (Elective - I) (317522A)

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

Q1) a) Explain the firmware embedding process for OS based embedded products. **[9]**

b) Draw and Explain High Level Language to Machine Language conversion process along with its limitations. **[9]**

OR

Q2) a) What are the different types of preprocessor directives available in embedded C? Explain them in detail. **[9]**

b) Draw and Explain typical embedded system and development environment. **[9]**

Q3) a) Explain ucos-II along with its features and applications. **[9]**

b) Explain the concept of Multithreading. What are the advantages of Multithreading? **[9]**

OR

Q4) a) Explain the dynamic memory management under MicroC/OS-II Kernel. **[9]**

b) What is Process? Explain process structure and process life cycle with suitable diagram. **[9]**

Q5) a) Explain the Linux Kernel Architecture with suitable diagram. **[8]**

b) Discuss Embedded Linux development environment. **[9]**

OR

P.T.O.

Q6) a) What are the characteristics of Device Driver? **[8]**

b) Explain Embedded Linux hardware and software components. **[9]**

Q7) a) What are security threats? Explain challenges of security threats in ES. **[10]**

b) Explain the counter measures to be used for prevention of attacks on ES. **[7]**

OR

Q8) a) What are the effects of attack on Embedded system. **[10]**

b) Explain various attacks in Embedded system devices. **[7]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1737

[Total No. of Pages : 2

[6353]-54

T.E. (Artificial Intelligence & Data Science)/(I.T.)
DESIGN THINKING
(2019 Pattern) (Semester - I) (Elective - I) (314445(C))

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) ***Assume suitable data, if necessary.***
3) ***Neat sketches must be drawn whenever necessary.***

Q1) a) What is brainstorming? What are the rules to be followed for productive and better ideas while Brainstorming? **[6]**

b) Briefly explain various techniques of idea generation. **[6]**

c) How to use story telling in design process? What are the elements of good story telling? How to reach the users through story? **[6]**

OR

Q2) a) Explain user experience journey with example. **[6]**

b) Describe "How Might We statements"? Explain with example. **[6]**

c) What is SCAMPER? How could it be used for ideation? **[6]**

Q3) a) Define critical experience prototype and critical function prototype? Explain with example. **[5]**

b) What is a prototype phase? Explain various tools used in designing a prototype. **[6]**

c) Write short notes on funky prototype. **[6]**

OR

Q4) a) Compare digital and paper prototype. Which one of these is better? **[5]**

b) What is a darkhouse prototype? Explain with example. **[6]**

c) Define the term story boarding? Why it is important? How to create a story board? **[6]**

P.T.O.

Q5) a) What is testing? How to conduct usability testing? **[5]**

b) Explain reflect in design thinking? How could it be used in process of solving the problem? **[6]**

c) Describe the term road map with a suitable example. **[6]**

OR

Q6) a) What is a testing sheet? How to use customer's feedback in product development? **[6]**

b) Explain various factors involved in choosing a design testing methodology. **[6]**

c) How to pitch your ideas with lean canvas using a suitable example. **[5]**

Q7) a) How design thinking helped Uber Eats to developed their business. **[6]**

b) What are the various design thinking strategy followed by IBM? **[6]**

c) Explain design thinking process used in health care industry changed lives with example. **[6]**

OR

Q8) a) Write short note on transformation of Airbnb through design thinking. **[6]**

b) Explain how design thinking improve user's experience? Explain how Toyota applied design thinking process for their customer care. **[6]**

c) How social problems could be identified and solved using design thinking process. Explain with example. **[6]**

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Total No. of Questions : 8]

SEAT No. : [ ]

PC1738

[Total No. of Pages : 2

[6353]-55

T.E. (Artificial Intelligence & Data Science)

PATTERN RECOGNITION

(2019 Pattern) (Semester - I) (Elective - I) (317522B)

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) Explain Blocks Word Description String Generation example as Pattern Description. **[9]**

b) Describe an Abstract View of Parsing Problem? **[8]**

OR

Q2) a) Describe the Chomsky Normal form with suitable example. **[9]**

b) Identify the different Elements of Formal Grammars. **[8]**

Q3) a) Describe the Design and Selection of Similarity Measures. **[9]**

b) Explain Clique finding algorithm with suitable example. **[8]**

OR

Q4) a) Distinguish between Homomorphism and Isomorphism. **[8]**

b) Draw and Explain Grammatical Interface Model and its objective. **[9]**

Q5) a) Describe with neat diagram Artificial Neuron Activation and Output Characteristics. **[9]**

b) Describe the different reasons to adopt a Neural Computational Architecture. **[9]**

OR

P.T.O.

Q6) a) Explain different Characteristics of Neural Computing Applications. **[9]**

b) Describe CAM & other Neural Memory Structure. **[9]**

Q7) a) Explain how the character classification is done with Pattern Associator? **[9]**

b) Explain Summary of the Back Propagation learning Procedure with suitable diagram. **[9]**

OR

Q8) a) Draw & explain how to train the feedforward network using Generalized delta Rule? **[9]**

b) Draw & Explain structure of a Multiple Layer Feedforward Network.**[9]**

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Total No. of Questions : 8]

SEAT No. :

PC1739

[Total No. of Pages : 2

[6353]-56

T.E. (Artificial Intelligence & Data Science)

DATA SCIENCE

(2019 Pattern) (Semester-II) (317529)

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) Explain in Detail Discovery Phase of Data Analytics lifecycle. **[7]**

b) Explain in Detail Data Preparation Phase of Data Analytics lifecycle. **[4]**

c) Explain in Detail Model Building Phase of Data Analytics lifecycle. **[7]**

OR

Q2) a) Explain in Detail Communication Result Phase of Data Analytics lifecycle. **[8]**

b) Write a Short Notes on Global Innovation Social Network and Analysis (GINA). **[10]**

Q3) a) What are different python libraries used for data analysis? **[3]**

b) Explain data preprocessing in detail. **[10]**

c) Differentiate between Predictive, Descriptive, and Prescriptive data analysis. **[4]**

OR

Q4) a) What are association rules? Explain Apriori Algorithm in brief. **[5]**

b) Write python program to apply the logistic regression model and check for goodness of fit. **[7]**

c) What is the decisiontree? Explain with an example. **[5]**

P.T.O.

Q5) a) What do you mean by text analysis? Why text analysis needs to be done? Explain the following text analysis steps with suitable example. **[12]**

i) Part of speech (POS) tagging

ii) Lemmatization

iii) Stemming

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

i) Time series Analysis

ii) TF - IDF.

OR

Q6) a) What is clustering? With suitable example explain the steps involved in k - means algorithm. **[8]**

b) Discuss Holdout method and Random Sampling methods. **[6]**

c) Write short note on: **[4]**

i) Confusion matrix

ii) AUC - ROC curve

Q7) a) Write a short note on the following **[6]**

i) Map reduce

ii) Pig

iii) Hive

b) Describe the Data visualization tool "Tableau". Explain its applications in brief. **[6]**

c) With a suitable example explain Histogram and explain its usages. **[5]**

OR

Q8) a) Explain in detail the Hadoop Ecosystem with suitable diagram. **[11]**

b) With a suitable example explain and draw a Box plot and explain its usages. **[6]**

Total No. of Questions : 8]

SEAT No. : ____

PC1740

[Total No. of Pages : 2

[6353]-57

T.E. (AI&DS)

CYBER SECURITY

(2019 Pattern) (Semester - II) (317530)

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) ***Draw neat figures wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume suitable data if necessary.***

Q1) a) Evaluate encryption and decryption using RSA algorithm p=7, q=11, e=17 and M=8. **[8]**

b) What is authentication? Explain various methods for authentication. **[9]**

OR

Q2) a) User A and B use the Diffie-Hellman Key exchange techniques with common prime q=71 and primitive root α=7. **[8]**

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?

b) Distinguish between Kerberos and X.509 authentication service. **[9]**

Q3) a) Describe IPsec protocol with its components & security services. **[9]**

b) What is PGP? Explain operation of PGP. **[9]**

OR

P.T.O.

Q4) a) Explain Secure Socket Layer Protocol? **[9]**

b) Explain VPN architecture with its component. **[9]**

Q5) a) List and explain any two password management practices. **[9]**

b) What is IDS? Explain types of Intrusion detection systems (IDS). **[8]**

OR

Q6) a) Explain methods for intrusion detection system (IDS). **[8]**

b) Explain countermeasures that can be implemented in Cyber security. **[9]**

Q7) a) Define cybercrime? Explain it with its type? **[8]**

b) Write short note on following: **[10]**

i) Cyber stalking.

ii) Hacking.

OR

Q8) a) Define Hacking? Explain different types of hacking. **[8]**

b) Write short note on following: **[10]**

i) Information Protection Law.

ii) PII.

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Total No. of Questions : 8]

SEAT No. :

PC-1741

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[6353] - 58

T.E. (Artificial Intelligence and Data Science)

ARTIFICIAL NEURAL NETWORK

(2019 Pattern) (Semester - II) (317531)

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) Draw the state transition diagram for the three types of Boltzmann Machine neural network and comment on the nodes and their connections. **[9]**

b) Train the hetero-associative memory network using outer products rule to store input row vectors *s = (s1, s2, s3, s4)*, to the output row vectors *t = (t1, t2)*. Use the vector pairs as given in Table 2. **[9]**

TABLE 2

Input and targets	S_1	S_2	S_3	S_4	t_1	t_2
1st	1	0	1	0	1	0
2nd	1	0	0	1	1	0
3rd	1	1	0	0	0	1
4th	0	0	1	1	0	1

OR

Q2) a) Discuss the False Minima problem, Stochastic Update and Simulated Annealing concepts with reference to the Boltzmann machines. **[9]**

b) How do you define associative memory? What are the types of associative memories? Explain with 2 real applications of associative memories. **[9]**

P.T.O.

Q3) a) How Hebbian learning is different from competitive learning? What is winner- takes-it-all? Draw basic architecture of ART and discuss its principle of working. **[9]**

b) Discuss the following features of ART: **[9]**

1) self-scaling computational unit
2) self-adjusting memory search
3) Pre-learned pattern access and
4) Attention vigilance

OR

Q4) a) Construct and test an LVQ net with five vectors assigned to two classes. The given vectors along with the classes are as shown in Table given below: **[10]**

Vector	Class
[0 0 1 1]	1
[1 0 0 0]	2
[0 0 0 1]	2
[1 1 0 0]	1
[0 1 1 0]	1

b) Draw the architecture of Kohonen Network. Discuss the feature mapping concept. Explain the training algorithm of KSOFM. **[8]**

Q5) a) Draw comparative architecture of ANN and CNN. What is the need for CNN? Will the overfitting be less in CNN than ANN? And if yes, why does this happen? **[9]**

b) Illustrate (with diagram) the bias-variance dilemma? How the trade-off is achieved? Comment on: **[8]**

Bias Low with Variance High

Bias High with Variance Low

OR

Q6) a) Discuss the relevance and significance of **[9]**

1) pooling layer
2) padding
3) strided convolutions
4) dropout.

b) Compare and contrast: LeNet – 5, AlexNet, VGG –16 **[8]**

Q7) a) How neo-congnitron is different from MNIST handwritten recognition? Discuss in your own words with reference to the algorithmic steps. **[9]**

b) How would you solve the problem of texture classification and segmentation? Develop your own block schematic for this task. **[8]**

OR

Q8) a) Develop your own NN model (algorithm) for Recognition of Olympic games symbols. Draw the architecture of your proposed system. Will you use backpropagation? Why? **[9]**

b) How do we recognize consonant vowel (CV) segments? Is this signal different from Image classification project? Which NN algorithm would you use? **[8]**

Total No. of Questions : 8]

SEAT No. :

PC1742

[Total No. of Pages : 2

[6353]-59

T.E. (Artificial Intelligence & Data Science)
ROBOTICS & AUTOMATION
(2019 Pattern) (Semester - II) (Elective-II) (317532A)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Use of Scientific Calculator allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Differentiate between Forward and Inverse kinematics. **[9]**

b) Explain D-H matrix and its significance in robot kinematics. **[9]**

OR

Q2) a) A planer RR manupulator has first link of 1000 mm length and second link of 750 mm, state whether the manipulator can reach points P, Q and R separately where P is (750, 750), Q is (1500, 1700) and R is at (150, 1700). **[9]**

b) What is D-H convention? What are the dynamics considerations in robotic applications? **[9]**

Q3) a) What is the requirement of actuators used in robotics. Explain with suitable examples. **[8]**

b) Classify grippers with suitable examples. **[9]**

OR

Q4) a) A part weighing 8 kg is to be held by a gripper using friction against two opposing fingures. The coefficient of friction between the fingures and the part surface is 0.25, Assume appropriate 'g' factor for the gripper. Compute required gripper force. **[10]**

b) Differentiate between hydraulic, pneumatic and electric actuators. **[7]**

P.T.O.

Q5) a) What is the significance of trajectory planning in robotics. **[8]**

b) Define ARTIFICIAL INTELLIGENCE in Robotics. Speculate role of AI techniques in Robotic Applications. **[9]**

OR

Q6) a) Write short note on Robot Controller with required features in controllers. **[8]**

b) Explain Servo and non-Servo control systems used in Robotics. **[9]**

Q7) a) Explain following terms in Robotics: **[10]**

i) Resolution

ii) Repeatability

iii) Accuracy

iv) Dexterity

v) Compliance

b) Explain, in brief structure of various programming langauges in robotics. **[8]**

OR

Q8) a) Explain lead through programming in robotics. **[6]**

b) Explain features of VAL programming langauge. **[6]**

c) Write short note on Remote Center Compliance. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PC1743

[Total No. of Pages : 2

[6353]-60

T.E. (Artificial Intelligence and Data Science)

NATURAL LANGUAGE PROCESSING

(2019 Pattern) (Semester - II) (Elective - II) (317532 B)

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) ***Make suitable assumptions whenever necessary.***

Q1) a) Explain the concept of partial parsing in the context of constituency parsing. How does partial parsing differ from full parsing, and what applications benefit from partial parsing techniques? **[9]**

b) Explain Combinatory Categorical Grammar. List and explain grammar rules for English. **[9]**

OR

Q2) a) Consider following grammar rules. **[9]**

$S \rightarrow NP\ VP$

$S \rightarrow VP$

$NP \rightarrow DET\ N$

$NP \rightarrow N$

$VP \rightarrow V$

$VP \rightarrow V\ NP$

$Det \rightarrow this \mid that \mid a \mid the$

$Noun \rightarrow book \mid flight \mid John \mid ball \mid meal$

$Verb \rightarrow book \mid include \mid read$

Generate the Top-Down and Bottom-up Parse Trees for the sentence.

"Book that flight". Is the Top-Down parsing approach better than Bottom up approach? Justify your answer.

b) What is Constituency Parsing? Explain CCG parsing with an example.**[9]**

P.T.O.

Q3) a) Define connotation frames and explain their significance in understanding the nuanced meaning of words and phrases. Discuss how connotation frames can be utilized in various natural language processing tasks, such as affect recognition and sentiment analysis. **[9]**

b) Examine the challenges associated with thematic roles in semantic role labeling. Discuss how issues such as selection restrictions and decomposing predicates influence the accuracy of semantic role labeling systems. **[8]**

OR

Q4) a) Explore the use of lexicons for sentiment recognition in natural language processing. Discuss how sentiment lexicons are utilized to classify' the sentiment of words and phrases in text data, highlighting their effectiveness and limitations. **[8]**

b) Define word senses and explain the importance of disambiguating word senses in natural language processing tasks. Discuss the challenges associated with word sense disambiguation (WSD) and how it relates to the ambiguity of language. **[9]**

Q5) a) Why is Machine Translation needed? Explain various problems of machine translation. **[9]**

b) Explain in detail Rule based Machine Translation, Knowledge based Machine Translation and Statistical Machine Translation. **[9]**

OR

Q6) a) Draw a neat diagram of Encoder-decoder architecture. Explain the working of Neural Machine Translation. **[9]**

b) Explain the stages of a Direct Machine Translation System with example. **[9]**

Q7) a) Write short note on. **[9]**

i) Named Entity Recognition

ii) Question Answer System

iii) Chatbot using Dialogflow

b) Draw the architecture of an ad hoc Information Retrieval system. Explain the working of vector space model of information retrieval. **[8]**

OR

Q8) a) Describe the following approaches used in information retrievel. **[9]**

i) Term weighting and document scoring.

ii) Stop word Elimination

iii) Inverted Index

b) Explain the stages and working of Question Answering System. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC-1744

[Total No. of Pages : 2

[6353] - 61
T.E. (Electrical Engineering)
INDUSTRIAL AND TECHNOLOGY MANAGEMENT
(2019 Pattern) (Semester - I) (303141)

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 additional data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Explain in detail Human Resource Management. **[4]**

b) Write a short note on i) Copy rights and ii) Trademark **[6]**

c) What is patent? How the Patent is secure? **[8]**

OR

Q2) a) Explain Intellectual Property Rights (IPR) in details. **[4]**

b) What are the different forms of IPR? Explain. **[6]**

c) What are the importance and scope of Human Resource Management? **[8]**

Q3) a) What is Kaizen? Explain in detail. **[3]**

b) Write a short note on Poka Yoke(Mistake Proofing). **[6]**

c) Explain The ISO 9001:2000 Quality Management System Standard in Detail. **[8]**

OR

P.T.O.

Q4) a) What are Environmental Management System Standard? **[3]**

b) Write a short note on continuous improvement related to Quality Management. **[6]**

c) Write a short note on ISO 9001:2016 **[8]**

Q5) a) What is financial management? Explain in brief. **[4]**

b) What do you understand Balance sheet and Depreciation Analysis related to Marketing Management? **[6]**

c) Explain Online Marketing (Digital Marketing) in detail. **[8]**

OR

Q6) a) What are different methods of calculation of depreciation? **[4]**

b) What are methods of selling and marketing planning. **[6]**

c) What are the methods of costing? Explain price, capital, debit, credit, profit and loss statement in detail. **[8]**

Q7) a) What are the qualities of good Leader? **[3]**

b) Explain Hierarchy of Needs, Herzberg's Two factor theory. **[6]**

c) Write Case study on Small scale industries in India. **[8]**

OR

Q8) a) Explain the Importance of Leadership in brief. **[3]**

b) Explain Taylor's Motivation Theory in detail. **[6]**

c) Explain Incentives for small business development. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-1745

[Total No. of Pages : 3

[6353]-62

T.E. (Electrical Engineering)

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, Q7or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable additional data, jf necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Explain the operation of single phase fully controlled bridge converter with RL load. Derive the equation for average and rms output voltage. Draw waveforms of output voltage and current for $\alpha = 60°$ with continuous conduction. **[9]**

b) Describe working of circulating current type single phase dual converter with waveforms. **[8]**

OR

Q2) a) With neat circuit diagram explain operation of single phase semi controlled converter connected to R Load. Derive the equation for average and rms output voltage. Draw output voltage and output current waveforms for $\alpha = 45°$ **[9]**

b) A single phase fully controlled bridge converter is connected to R Load of 10Ω. The input voltage to the bridge is 230 V. Calculate. **[8]**

i) Average and RMS load voltage

ii) Average and RMS load current

Firing angle is 60 degrees.

P.T.O.

Q3) a) Explain working of three phase full controlled converter with RL Load. Draw output voltage and current waveforms for α =30°. Derive the expression for average and RMS output voltage. **[9]**

b) Explain operation of two stage ac voltage regulator with an output waveform for RL load. **[9]**

OR

Q4) a) Explain operation AC voltage regulator with an output waveform for RL load. Derive the expression for average and RMS output voltage. Daw the waveform for α = 60° **[9]**

b) Explain working of three phase Semi controlled converter with R Load and firing angle of 30 degrees. Draw output voltage waveforms. **[9]**

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. **[9]**

b) Explain sinusoidal PWM technique for inverters. How voltage and freq. control is achieved? **[8]**

OR

Q6) a) State different voltage control techniques used in single phase inverter. Elaborate any two methods in detail. **[9]**

b) Explain with circuit diagram and waveforms operation of single-phase current source inverter. **[8]**

Q7) a) Explain working of three phase six step voltage source inverter in 180° mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in each step. **[10]**

b) What are different harmonic elimination techniques in inverter? Explain any two methods in details. **[8]**

OR

Q8) 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) Compare multi-pulse and multilevel inverters. **[8]**

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Total No. of Questions : 8]

SEAT No. : ____

PC-1746

[Total No. of Pages : 3

[6353] - 63
T.E. (Electrical Engineering)
ELECTRICAL MACHINES - II
(2019 Pattern) (Semester - I) (303143)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, QS 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.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Draw V curve of synchronous motor. Show under excited, overexcited and critical excitation regions on it. **[4]**

b) State different methods to start 3 phase synchronous motor. Explain damper winding method with neat diagram. **[6]**

c) Explain with relevant phasor diagrams the operation of synchronous motor at constant load and variable excitation condition. **[8]**

OR

Q2) a) Draw and explain torque angle characteristics of 3 phase synchronous motor. **[4]**

b) Explain the following terms related to loading of 3 phase synchronous motor - i) load angle or torque angle ii) Internal angle iii) power factor angle. Show these angles by drawing relevant phasor diagram for leading power factor. **[6]**

c) The input to an 11000V, 3 phase, star connected synchronous motor is 60 A. The effective resistance and synchronous reactance per phase are respectively 1 ohm and 30 ohms. Calculate the power supplied to motor at 0.8 pf lagging and induced emf for a power factor of 0.8 leading. Determine the angle of retardation at 0.8 pf leading. **[8]**

P.T.O.

Q3) a) Draw speed vs torque characteristics of 3 phase induction motor for three frequencies such that f1>f2>f3. **[3]**

b) Calculate the stepping angle for a 3 phase 24 pole PM stepper motor. If its stepping frequency is 300 steps per second, calculate the motor speed. **[6]**

c) Explain operation three phase induction motor as an induction generator. State its advantages and applications. **[8]**

OR

Q4) a) State important features of energy efficient induction motor. **[3]**

b) Explain with suitable diagram speed control of three phase induction motor by cascade control. **[6]**

c) Describe with suitable diagram construction & working of permanent magnet DC motor. State its advantages and applications. **[8]**

Q5) a) What do you mean by universal motor? Draw its torque vs speed characteristics on A C and D C operation. **[3]**

b) With suitable diagram, explain conductively compensated A C series motor. **[6]**

c) Discuss the 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. **[8]**

OR

Q6) a) How unidirectional torque is produced when a D C series motor is operated on A C supply? **[3]**

b) Compare compensated A C series motor with non-compensated A C series motor. **[6]**

c) A universal motor having resistance of 30 ohms and inductance of 0.5 H. When connected to 250 V D C supply, it takes 0.8 A and runs at 2200 rpm. Determine its speed, torque and power factor when connected to a 250 V, 50 Hz A C supply and taking same current of 0.8 A. **[8]**

Q7) a) If S_f is forward slip and S_b is the backward slip, then prove that $S_f+S_b = 2$ **[4]**

b) With suitable diagram explain blocked rotor test performed on single phase capacitor start induction motor. **[6]**

c) A 2 pole 230 V 50 Hz single phase induction motor has the following constants referred to the stator :

R1 = 2.2 ohms; Xl = 3 ohms ; R'2 = 3.8 ohm ; X'2 = 2.1 ohms; Xm = 86 ohms Calculate the stator current, power factor and input power, when the motor is operating at a full load of 2820 rpm. **[8]**

OR

Q8) a) A 0.25 HP 110 V split phase single phase induction motor takes a current of 4 A lagging the supply voltage by 15 degrees for the starting winding and a current of 6 A lagging the voltage by 40 degrees for its main winding. Calculate **[4]**

i) the total current and

ii) the power factor

b) Explain double field revolving theory for single phase induction motor with suitable phasor diagrams. **[6]**

c) With neat diagram explain construction and working of capacitor start capacitor run induction motor. State applications of this motor. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-1747

[Total No. of Pages : 2

[6353] - 64
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) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right in dicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain Motor Current Signature Analysis(MCSA) with suitable diagrams. **[8]**

b) Compare breakdown maintenance & preventive maintenance. **[4]**

c) List and explain the various advance tools and techniques of condition monitoring. **[6]**

OR

Q2) a) What are different types of maintenance strategies? Explain anyone. **[4]**

b) Explain following Terms: **[6]**

i) Role of thermography in electric field

ii) State the basic causes of insulation degradation

c) Explain Preventive maintenance of transformer. **[8]**

Q3) a) Compare quotation & tender. **[3]**

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

i) Schedule of rates

ii) Labour rates

P.T.O.

c) What are the qualities of good estimator? **[8]**

OR

Q4) a) Write short notes on Price catalogue. **[3]**

b) What are the essentials of estimating and costing? **[6]**

c) Which data is required by estimator for preparing estimation of LT electrical wiring project of a 2 floor bunglow. **[8]**

Q5) 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]**

OR

Q6) a) Explain the procedure of installation of underground LT service line. **[8]**

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

i) Current carrying capacity

ii) Voltage drop

c) Write down all rules for residential wiring work. **[4]**

Q7) a) Explain four CAT ratings with respect to information, examples & measurements involved. **[8]**

b) List the different methods for earth testing. Explain any one method in detail with suitable diagram. **[9]**

OR

Q8) a) How electrical accidents can be avoided? **[8]**

b) Enumerate the danger arising out of faulty equipment with appropriate examples. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC1748

[Total No. of Pages : 2

[6353]-65

T.E. (Electrical Engineering)

ADVANCED MICROCONTROLLER AND EMBEDDED SYSTEM

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

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
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) Describe programming steps of Capture mode. **[4]**

b) Explain bit configuration of CCP1CON. **[6]**

c) How DC Motor speed control is achieved using PWM mode of CCP module of PIC18F458. **[8]**

OR

Q2) a) Describe programming steps of PWM mode. **[4]**

b) Explain with proper block diagram operation of capture mode. **[6]**

c) Write a program to generate a square wave with frequency 10kHz and 50% duty Cycle on the CCP1 pin, use Timer 1. **[8]**

Q3) a) Differentiate between Interrupt method and polling method. **[3]**

b) Describe Interrupt structure of PIC18F458. **[6]**

c) Write a program to generate a square wave of 2kHz with timer 0 on pin PORTB.5 with interrupts. **[8]**

OR

Q4) a) Explain use of INT0IF in INTCON. **[3]**

b) Explain steps in enabling and disabling interrupts. **[6]**

c) Write a program to generate a square wave that is half the frequency of signal applied at INT0 on PORTB.5 **[8]**

P.T.O.

Q5) a) Explain ADC? Also explain its features. **[4]**

b) Explain bit configuration of ADCON0. **[6]**

c) Explain AC voltage measurement using PIC18F458. **[8]**

OR

Q6) a) Explain in brief ADIF & ADFM. **[4]**

b) Explain bit configuration ofADCON1. **[6]**

c) With the help of interfacing diagram explain how PC microcontroller can be used to measure temperature using LM35. **[8]**

Q7) a) Explain importance of TSR in serial communication. **[3]**

b) Explain bit configuration of TXSTA. **[6]**

c) Write PIC 18 program to transfer the letter "A" serially at 9600 baud rate continuously, Let XTAL = 10MHz. **[8]**

OR

Q8) a) Explain how 8 and 9 bit data is transmitted in serial communication? **[3]**

b) Write down programming steps to transfer data serially. **[6]**

c) Draw and explain block diagram of USART transmitter in PIC18. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC1749

[Total No. of Pages : 3

[6353]-66

T.E. (Electrical)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - I) (Elective - I) (303145 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) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of Calculator is allowed.***

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

i) Linearity

ii) Time Reversal

b) For the sequence given below find the frequency response, plot magnitude and phase response for $\omega = -\pi$ to π with step size of $\frac{\pi}{3}$. **[9]**

$h(n) = 1$ *for* $n = -2, -1, 0, 1, 2$

$h(n) = 0$ Otherwise

OR

Q2) a) Define DTFT. What is the criteria for existence of DTFT. State whether DTFT is exists for following cases or not. **[8]**

i) $x(n) = 2^n u(n)$ and ii) $x(n) = \left(\frac{1}{2}\right)^n u(n)$

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

i) $x(n) = \begin{cases} 1 \\ 0 \end{cases}$ *for* $n = -1, 0, 1$

Otherwise

ii) $x(n) = \delta(n-2) - \delta(n+2)$

P.T.O.

Q3) a) Prove the relation between. **[8]**

i) DTFT and Z-transform

ii) Z-transform and DFT

b) Find the DFT of the sequence $x(n) = \{1, 1, 1, 1\}$ **[9]**

OR

Q4) a) State and prove following properties of DFT **[8]**

i) Time reversal

ii) Periodicity

b) Find linear and circular convolution of following two sequences. $x_1(n) = \{1, 2, 2, 1\}$ and $x_2(n) = \{2, 1, 1, 2\}$ **[9]**

Q5) a) Explain the process of conversion of analog signal into digital signal.**[6]**

b) For the analog transfer function $H(s) = \dfrac{2}{s^2 + 7s + 12}$. Determine $H(z)$ using bilinear transformation method. Assume T= 0.5 sec. **[6]**

c) Explain realization of IIR digital filters using direct form -II structure.**[6]**

OR

Q6) a) Obtain direct form - I realization after Z-transforms 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) Differentiate between FIR and IIR filter. **[6]**

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

$$H_d(e^{j\omega}) = \begin{cases} 1 \\ 0 \end{cases} for \ \frac{\pi}{2} \leq |\omega| \leq \pi$$

Otherwise

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

b) Explain any one method used to determine frequency of a signal using DSP. **[6]**

OR

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

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

b) Compare analog and digital filters. **6]**

c) Write short note on "Application of DSP for harmonic measurement". **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1750

[6353]-68

[Total No. of Pages :3

T.E. (Electrical Engineering)

POWER SYSTEM-II

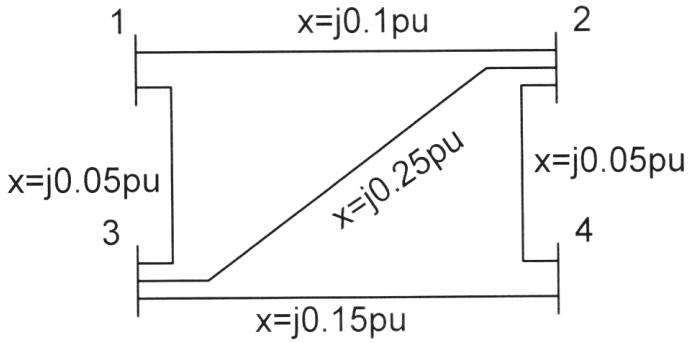
(2019 Pattern) (Semester- II) (303148)

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

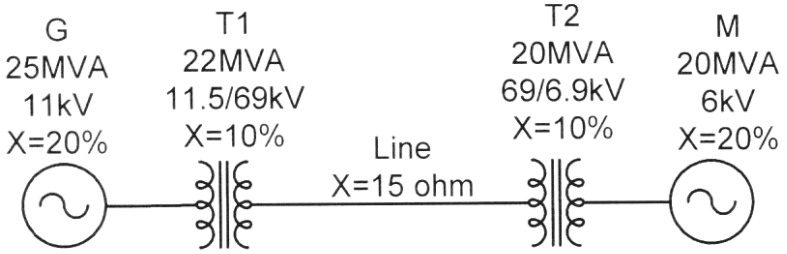
Q1) a) Find the Y-BUS of the following system. **[10]**



b) Prove that per unit impedance of a transformer referred to primary and secondary is same. **[7]**

OR

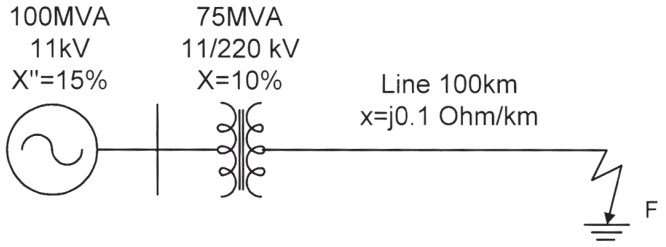
Q2) a) Take base MVA = 25MVA and base kV = 11kV on the generator and draw per unit reactance diagram to these base values. **[10]**



b) Give a detail classification of the buses used in load flow analysis. **[7]**

P.T.O.

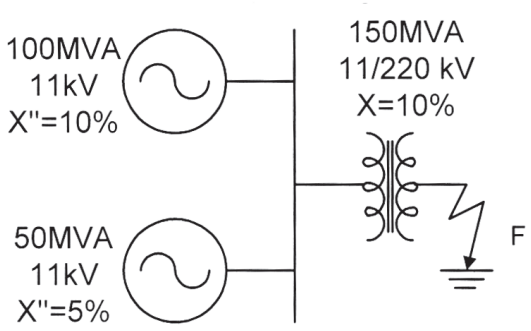
Q3) a) Calculate fault current (in kA) supplied by the alternator and terminal voltage of the alternator, if the three-phase bolted fault occurs at point F. Take base at 100MVA, 11kV on alternator. **[10]**



b) Write short note on "Tie Bar Current Limiting Reactors." **[7]**

OR

Q4) a) If three-phase fault occurs at point F, find the fault current supplied by each generator in kA. Take base of 100MVA, 11kV on generator side.**[10]**



b) State whether the following statements are true or false with justification**[7]**

i) In case of a phase fault at the terminal of an unloaded alternator, the subtransient state current is greater than the transient and steady state current.

ii) The current limiting reactor is used to increase the fault level..

Q5) a) Three phase voltages are given by $V_a = 100\angle 0°V/ph$, $V_b = 95\angle -120°V/ph$, $V_c = 105\angle 115°V/ph$ and currents are given by $I_a = 10\angle -30°A$, $I_b = 9.5\angle -150°A/ph$, $I_c = 10.5\angle 85°A/ph$. Calculate three phase sequence voltage and current of phase A and apparent power using symmetrical components. **[10]**

b) Derive the equation of fault current in line to ground fault. **[8]**

OR

Q6) a) A 50MVA, 11kV, three phase synchronous generator was subjected to different types of faults without fault impedance. The generator neutral is solidly grounded. Find the per unit values of three phase sequence reactance of the generator if the fault currents are as follows: **[10]**

LGfault = 4200*A*, *LLfault* = 2600*A*, *LLLfault* = 2000*A*.

b) In three phase transmission line, show that positive, negative and zero sequence impedance $Z_1 = Z_2 = Z_s - Z_m$ and $Z_0 = Z_s + 2Z_m$ **[8]**

Where Z_s is self impedance and Z_m is mutual impedance of lines.

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

i) Bipolar HVDC link

ii) Back to back HVDC station

b) Compare HVDC and EHVAC transmission systems. **[8]**

OR

Q8) a) Draw the complete single line diagram of HVDC system showing all components and elaborate on any three components in detail. **[10]**

b) Explain constant current control used in HVDC transmission. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC1751

[Total No. of Pages : 2

[6353]-69

T.E. (Electrical Engineering)

COMPUTER AIDED DESIGN OF ELECTRICAL MACHINES

(2019 Pattern) (Semester - II) (303149)

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 indicate full marks.***
4) ***Use of Calculator is allowed.***

Q1) a) Derive the equation for radial force developed in the transformer under short circuit fault conditions. Explain the options to control the radial force developed in the transformer. **[8]**

b) A 220/110, 1 kVA, 50 Hz single phase transformer has a core with uniform cross section area of 2500 mm^2, an effective core length of 0.4 m and core weight of 8kg. If the core is worked at maximum flux density of 1.2 Wb/m^2 and the corresponding magnetizing force is 200 A/m and the specific core loss is 1.0 Watt/kg. Determine i) transformer no load current when the HV is fed at 220 V and ii) the corresponding magnetizing reactance and the equivalent shunt resistance to represent the core loss. **[9]**

OR

Q2) a) State the assumptions made while deriving the equation for the leakage reactance of transformer, from the same, derive the equation for the leakage reactance of the transformer referred to the primary side. **[10]**

b) Define voltage regulation and explain the significance of voltage regulation. Why voltage regulation increases with increase of load for lagging power factor loads. **[7]**

Q3) a) Explain the factors considering while selecting the specific magnetic loading for the design of three phase induction motor. Also explain the effect of selecting B_{av} higher than the normal value on the design of three phase induction motor. **[9]**

b) Explain the various guidelines for selecting the stator slots. **[9]**

OR

P.T.O.

Q4) a) Determine the main dimensions, number of ventilating radial ducts, number of stator slots and number of turns perphase of a 3.7 kW, 400 V, 3 phase, 4 pole, 50 Hz squirrel cage induction motor to be started by a star delta starter. Workout the winding details. Assume B_{av} = 0.45 Wb/m^2, ac=23000 A/m, efficiency = 0.85 and power factor = 0.84. L/τ ratio 1.5. **[9]**

b) What are the factors those affect the size of rotating machine? Explain in detail. **[9]**

Q5) a) Explain the procedure to calculate the no load current of the three phase induction motor. **[9]**

b) Derive the equation for the end ring current. From the same how the size of end rings can be determined. **[9]**

OR

Q6) a) Give layout of a lap winding for stator of three phase induction motor stator for 24 slots, 4 poles. There are two coil sides per slot. Draw winding diagram for R-phase only. **[9]**

b) A 7.5 HP, 3 phase, 6 pole, 50 Hz, 415 V, star connected induction motor has 54 stator slots each containing 9 conductors. Calculate the values of bar and end ring current . No of rotor bars is 64 and the machine has an efficiency of 0.86 and p.f of 0.85. The rotor mmf may be assume as 85% of stator mmf, also find the bar and the end ring sections if the current density is 5 A/mm^2. **[9]**

Q7) a) Explain the procedure for the calculating the mmf for the magnetic circuit of three phase induction motor. **[8]**

b) 15 kW, 400 V, 3 phase, 50 Hz, 6 pole induction motor has a diameter of 0.3 m and the length of core 0.12 m. The no. of stator slots is 72 with 20 conductors/slot. The stator is delta connected. Calculate the value of magnetizing current/phase if the length of air gap is 0.55 mm. The gap contraction factor is 1.2. Assume mmf required for the iron parts to be 35% of the air gap mmf. Assume winding factor 0.95 **[9]**

OR

Q8) a) Write step by step procedure to calculate the loss component of no load current of three phase induction motor. **[8]**

b) Explain in detail the various losses produced in induction motor. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PC-1752

[Total No. of Pages : 2

[6353]-70
T.E. (Electrical Engineering)
CONTROL SYSTEM ENGINEERING
(2019 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.***
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 Routh-Hurwitz criteria for stability analysis along with special cases. **[8]**

b) By applying Routh's criteria, determine stability of a system with characteristic equation given by **[9]**

$$1 + G(S)H(S) = S^4 + 2S^3 + 6S^2 + 4S + 1 = 0$$

OR

Q2) a) Explain related to root locus : **[4]**

i) Centroid

ii) Breakaway point

b) Sketch complete root locus for following system and comment on stability. **[13]**

$$G(S)H(S) = \frac{K(S^2 + 2S + 2)}{S(S \mid 4)}$$

Q3) a) State various steps to determine stability using polar plot. **[4]**

b) Sketch the polar plot for following system clearly indicating intersection with negative real axis. Comment on system stability. **[13]**

$$G(S)H(S) = \frac{10}{S^3 + 4S^2 + 6S + 8}$$

OR

P.T.O.

Q4) a) Describe co-relation between time and frequency domain. **[7]**

b) Sketch Nyquist plot for the following system and comment on system stability. **[10]**

$$G(S)H(S) = \frac{90}{(S+3)(S+6)}$$

Q5) a) Explain various steps to sketch magnitude and phase plot in Bode plot.**[6]**

b) Draw Bode plot for following unity feedback system. Determine gain margin, phase margin, gain cross-over frequency and phase cross-over frequency. **[12]**

$$G(S)H(S) = \frac{800\,(S+2)}{S^2(S+10)\,(S+40)}$$

OR

Q6) a) Draw Bode plot for the unity feedback system with following equation:**[10]**

$$G(S)H(S) = \frac{40}{S(S+2)\,(S+20)}$$

b) State and explain gain cross over frequency, phase cross over frequency, gain margin and phase margin and how to determine stability from them.**[8]**

Q7) a) Define PID tuning. Explain Ziegler Nicholas method for designing PID controller. **[9]**

b) Explain Lag network using circuit diagram, pole-zero plot and Bode diagram. **[9]**

OR

Q8) a) Explain basic components of dc servo motor, draw block diagram and state its transfer function. **[9]**

b) Explain Lead network using circuit diagram, pole-zero plot and Bode diagram. **[9]**

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC1753

[Total No. of Pages : 2

[6353]-71

T.E. (Electrical Engineering)

IOT AND ITS APPLICATIONS IN ELECTRICAL ENGINEERING

(2019 Pattern) (Semester - II) (Elective - II) (303151 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.*

Q1) a) Two LEDs are connected to pin nos. 5 and 6 of Arduino UNO board. Write a program in C to blink these LEDs 20 times with a delay of 5 seconds. **[9]**

b) Explain with syntax and example, following functions from Arduino IDE. **[9]**

a) pinMode()

b) digitalWrite()

c) analogWrite()

d) analogRead()

OR

Q2) a) What is a Serial Monitor in Arduino IDE? Explain with syntax, any 3 functions associated with serial monitor. **[9]**

b) Write a program in python to accept lower and upper limit of a range of numbers from user and print all the add numbers in that range. **[9]**

Q3) 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) Write a short note on IR sensors. **[8]**

OR

Q4) a) Explain in detail LM35 sensor. Also, with a neat diagram, show interfacing of LM35 sensor with NodeMCU. **[9]**

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

P.T.O.

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

b) Write a short note on RFID. **[9]**

OR

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

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

Q7) a) Explain in detail Data Analysis in loT system. **[9]**

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

OR

Q8) a) Write a short note on ThingsBoard cloud platform. **[9]**

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

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Total No. of Questions : 8]

SEAT No. : ____

PC1754

[Total No. of Pages : 2

[6353]-72
T.E. (Electrical Engineering)
ELECTRICAL MOBILITY
(2019 Pattern) (Semester - II) (Elective-II) (303151B)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicates full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Why Balancing of cells is required in battery? Explain any two Active cell balancing method with neat diagram. **[9]**

b) Explain Constant current charging algorithm used in battery charging. **[8]**

OR

Q2) a) State various SOC estimation methods used in batteries, Explain any two methods. **[9]**

b) Draw block diagram of Battery Management System and explain it. **[8]**

Q3) a) Draw and Explain Antilock Brake System In Electric vehicle. **[9]**

b) Draw Control Architecture of HEV and all electronic control systems. **[9]**

OR

Q4) a) Explain energy consumption of Electric Vehicle in braking. **[9]**

b) Draw schematic diagram of series HEV drive train and explain its working. **[9]**

Q5) a) Write a note on sizing the motor for electric hybrid vehicles. **[9]**

b) Write KW rating of Charging levels 1, 2 and 3 (A.C, D.C.) and state applications. **[8]**

OR

Q6) a) Explain BLDC drives for HEV and list advantages of it. **[9]**

b) Write note on battery swapping. **[8]**

P.T.O.

Q7) a) Compare V2H, V2V and V2G (any 3 points). **[9]**

b) Explain V2G concept and state advantages of V2G. **[9]**

OR

Q8) a) Draw Flowchart for EV Charging Infrastructure and explain it. **[9]**

b) Draw and Explain Diagram for modeling of V2G ancillary services. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PC-1755

[Total No. of Pages : 2

[6353]-73

T.E. (Electrical Engineering)

CYBERNETIC ENGINEERING

(2019 Course) (Elective-II)(Semester - II) (303151C)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer any one from each pair of questions: 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) Compare optimal control and adaptive control systems. Draw their block diagrams. **[8]**

b) List out differentiating points for linear and nonlinear control system. **[9]**

OR

Q2) a) Draw the block diagram of the adaptive control system and explain it. **[8]**

b) Explain the concept of a multivariable control system. Give example. **[9]**

Q3) a) List the components of the electrical system used in the mathematical modeling of the electrical system. Explain them. **[8]**

b) Describe the use of an ODE solver for getting the solution of an ordinary differential equation. **[9]**

OR

Q4) a) Explain the use of software tools in system modeling and simulation. **[8]**

b) Describe how the linearization of the nonlinear system is carried out in a step-by-step manner. **[9]**

P.T.O.

Q5) a) What are the different system components needed for embedded and industrial applications? Explain them. **[9]**

b) What are various analog and digital interfaces used for control system realization? **[9]**

OR

Q6) a) Sketch computer architecture and explain it adequately. **[9]**

b) How data communication is carried out in the industrial environmental. **[9]**

Q7) a) Define optimization. List out at least five applications of optimization. **[9]**

b) Explain the Genetic Algorithm optimization technique using examples. **[9]**

OR

Q8) a) Write a statement about an optimization problem using mathematical terms and equations. **[9]**

b) Explain the particle swarm optimization method using the example. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1756

[Total No. of Pages : 3

[6353]-74
T.E. (Electrical)
ENERGY MANAGEMENT
(2019 Pattern) (Elective - II)(Semester - VI) (303151 D)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q.1 or Q2, 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 indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculate and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Discuss the advantages of Demand 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) Discuss implementation of demand side management for commercial consumers. **[9]**

Q3) a) What is 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 650 kCal/T, Fixed consumption of the plant is 2500kCal. **[8]**

P.T.O.

Month	Production (MT)	Actual Energy Consumption (kwh)
1	1200	750000
2	1000	720000
3	1100	800000
4	1300	900000
5	1000	800000
6	1150	850000

OR

Q4) a) Discuss use of various instruments for energy audit. **[9]**

b) Classical data analysis in energy audit. How import this step in audit? **[8]**

Q5) a) Following investment is done for a company

Investment envisaged Rs.30 lakhs ,annual return is Rs . 6 lakhs, life of the project is 8 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) The energy manager of company wants to replace 75 kW induction motor with energy efficient motor for energy saving. On the basis on following data calculate payback period for replacement of old motor with energy efficient motor. Take cost of electricity as Rs. 8/kWh. The demand charges Rs. 450/kVA per month. **[9]**

Description	Old motor	Energy Efficiency Motors
Rating of machine	75kw	75kw
Loading percentage	86%	86%
Operating hours per annum	6500	6500
Efficiency near full load	89%	93.5%
Power factor near full load	0.85%	0.91 lag
Capital cost	--	Rs. 250000/-
Salvage value	Rs. 50000/-	--

b) Explain energy conservation options in sugar industry. **[9]**

Q7) a) Explain energy conservation measures in refrigeration and air condition systems. **[8]**

b) Discuss energy management options in T & D sectors. **[9]**

OR

Q8) a) Discuss energy saving options in DG systems. **[8]**

b) Discuss different cogeneration systems. **[9]**

Total No. of Questions : 8] **SEAT No. :**

PC1757 **[Total No. of Pages : 2**

[6353]-75
T.E. (Electronics Engineering)
POWER AND INDUSTRIAL ELECTRONICS
(2019 Pattern) (Semester - I) (304201)

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) Compare semiconverter & full converter. **[8]**

b) Explain 1ϕ full converter with R load. **[9]**

OR

Q2) a) Difference between SCR based conventional rectifier and IGBT based rectifiers. **[8]**

b) Draw and Explain 3ϕ fully controlled bridge converter for R load with o/p voltage waveform **[9]**

Q3) a) What are the merits & Demerits of DC to DC converter. **[8]**

b) What is chopper? Explain step-down chopper. **[9]**

OR

Q4) a) Explain with block diagram SMPS. **[8]**

b) Explain performance parameter of chopper. **[9]**

Q5) a) Explain AC voltage controller for R load. **[9]**

b) What is inverter? Explain with circuit diagram and wave form 1ϕ full bridge inverter with R load. **[9]**

OR

P.T.O.

Q6) a) What is need of PWM inverter? Explain control ckt. for 1ϕ inverter using PWM ICLM3524 **[9]**

b) Explain with circuit diagram & waveform 3ϕ voltage source inverter for balanced star R load. **[9]**

Q7) a) Explain Electrical vehicles with necessary block diagram. **[9]**

b) Explain HVDC transmission system. **[9]**

OR

Q8) a) Explain any two **[9]**

i) Battery charging Application

ii) Traction application

iii) Induction heating application

b) Compare ON-line UPS & OFF-line UPS. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PC-1758

[Total No. of Pages : 2

[6353] - 76
T.E. (Electronics)
ELECTROMAGNETIC WAVES & 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) ***Figures to the right indicate full marks.***
3) ***Assume & mention the suitable data.***

Q1) a) Write Maxwell's equations for static field. **[8]**

b) Write Maxwell's equations for time varying field. **[8]**

c) Define Displacement current density **[2]**

OR

Q2) a) Write Maxwell’s equations for pure conductor **[8]**

b) Write Maxwell’s equations for pure dielectric medium. **[8]**

c) State Faraday’s law of e.m.f. **[2]**

Q3) a) Derive expressions of wave (uniform plane wave) in free space. **[8]**

b) Define skin depth **[3]**

c) Explain Linear, Circular and elliptical polarization of wave. **[6]**

OR

P.T.O.

Q4) a) Derive uniform plane wave equation using Maxwell's equations. **[10]**

b) Explain modes of wave propagation. **[7]**

Q5) a) Derive expression of characteristic impedance of transmission line. **[7]**

b) Explain impedance transformation in low loss transmission line. **[8]**

c) Define transmission line. **[2]**

OR

Q6) a) Define propagation constant, characteristic impedance, reflection coefficient & write their equations. **[9]**

b) Describe primary constants in transmission line. **[8]**

Q7) a) What is waveguide. Explain its types. **[8]**

b) Explain cut off wavelength, guided wavelength, phase velocity, wave impedance and group velocity. **[10]**

OR

Q8) a) Explain TE and TM modes of waveguides. **[8]**

b) Explain rectangular waveguides in detail. **[4]**

c) What is cavity resonator. Give structural details of striplines. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC-1759

[Total No. of Pages : 2

[6353]-77

T.E. (Electronics / E & TC)

DATABASE MANAGEMENT

(2019 Pattern) (Semester - I) (304183)

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) ***Make Suitable assumptions wherever necessary.***
5) ***Use of Calculator is allowed.***

Q1) a) Explain with example : Aggregate functions (any 3), String functions (any 3) **[6]**

b) Explain any two transaction control commands. **[6]**

c) What are the different types of joins in SQL? Explain one join with suitable example. **[6]**

OR

Q2) a) With the help of block diagram, describe PL / SQL block structure. **[6]**

b) Explain the following operations with suitable queries. **[6]**

i) Set operations (any two) ii) Date functions (any two)

c) Explain what do you mean by DDL, DML and DCL in SQL. **[6]**

Q3) a) What is database transaction management? Write transaction states.**[6]**

b) Explain how deadlock occurs? Which are the actions required for the deadlock recovery process? **[6]**

c) What are ACID properties of a transaction? **[5]**

OR

Q4) a) Explain need and role of Time-Stamp based protocols in database management control. **[6]**

P.T.O.

b) Explain serializability with respect to conflict and view. **[6]**

c) Define the following terms. **[5]**

i) Concurrency

ii) Timestamp

iii) Timestamp ordering

iv) Schedule

v) Transaction.

Q5) a) Explain the terms speed up and scale up in parallel database. **[6]**

b) What are different parallel database architectures? Explain its advantages. **[6]**

c) Draw and explain memory structure of instance in oracle architecture. **[5]**

OR

Q6) a) Write short note on centralized database system. **[6]**

b) Explain the intra query parallelism query evaluation technique with one example. **[6]**

c) Explain Virtualization in multi core processor. **[5]**

Q7) a) Draw and explain client-server architecture for DDBMS. **[6]**

b) Compare homogeneous and heterogeneous distributed database. **[6]**

c) Explain data replication in distributed data storage. **[6]**

OR

Q8) a) Explain the distributed database system failure modes (any two). **[6]**

b) Discuss in detail about single -lock-manager approach in concurrency control. **[6]**

c) Write the types of data fragmentation and explain horizontal fragmentation with one example. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC-1760

[Total No. of Pages : 2

[6353] - 78
T.E. (Electronics Engineering)
MICROCONTROLLERS AND APPLICATIONS
(2019 Pattern) (Semester - I) (304204)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, QS or Q6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain in detail data transmission and reception process in 8051 microcontroller. **[6]**

b) Write an Embedded C program to rotate stepper motor continuously, in anti- clockwise direction along with its interfacing diagram. **[6]**

c) Draw interfacing diagram of Temperature sensor (LM35) with 8051 microcontroller using ADC 0808/0809. Write an Embedded C program for the same. **[8]**

OR

Q2) a) Explain the term opto-isolators. What are advantages of opto-isolators. Draw interfacing diagram of opto-isolator with 8051 microcontrollers.**[6]**

b) Draw interfacing diagram of motion detector with 8051 microcontrollers. Write Embedded C program to switch on led when motion is detected.**[6]**

c) Draw interfacing diagram of DAC to 8051 microcontrollers and write an embedded C program to generate ramp wave form. Also draw its flowchart. **[8]**

Q3) a) Draw and explain PIC18FXXX microcontroller architecture. **[8]**

b) Draw and explain the block diagram of Timer 0 of PIC18Fxx microcontroller in 8-bit mode. Also write the steps to program it in 8-bit mode. **[8]**

P.T.O.

OR

Q4) a) Explain different registers of PIC 18FXXX microcontroller. **[8]**

b) With neat diagram explain ROM memory organization of PIC18FXXX microcontroller. **[8]**

Q5) a) Draw interfacing diagram of 4x4 matrix keypad with PIC18FXXX. Draw and explain the flow chart to detect and display key pressed. **[8]**

b) Explain the capture mode of CCP module with neat diagram for PIC18Fxx microcontroller. Also write the algorithm for the same. **[8]**

OR

Q6) a) Draw the neat block diagram of port structure of PIC18Fxx and explain it in detail. **[8]**

b) Draw interfacing diagram of LED to Port B of PIC18Fxx microcontroller. Also write an Embedded C program to alternately blink led with same delay. **[8]**

Q7) a) Draw the neat block diagram of DAS using 8051 microcontrollers and explain it in detail. **[9]**

b) Design environment Monitoring System using PIC18FXXX microcontroller and explain in detail. **[9]**

OR

Q8) a) What is need of digital multimeter. Draw and explain the block diagram of digital multimeter using 8051 microcontroller. **[9]**

b) Design and explain water level monitoring and control system using PIC18Fxx microcontroller and write the algorithm for the same. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC1761

[Total No. of Pages : 2

[6353]-79

T.E. (Electronics Engineering)

INSTRUMENTATION SYSTEMS

(2019 Pattern) (Semester - I) (Elective - I) (304205A)

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.7or Q.8.***
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) Explain with neat sketches the working principle of **[8]**

i) Doppler type ultrasonic flow meter and

ii) Transit time ultrasonic flow meter

b) Describe with neat sketch electromagnetic flow meter. **[9]**

OR

Q2) a) Explain working principle of hydrostatic pressure type of level measurement technique. **[8]**

b) Explain with a neat sketch working principle of rotameter. Can a rotameter be used in a horizontal pipe line? If not, explain why? **[9]**

Q3) a) Explain with neat sketch working principle of thermal accelerometer. State applications of accelerometers. **[8]**

b) Explain working principle of Geiger Muller counter used for detection of nuclear radiation. **[9]**

OR

Q4) a) Explain the process of charge transfer in CMOS image sensors. **[8]**

b) Explain with neat sketch working principle of incremental optical encoder. What is the use of index pulse in incremental encoder? Explain how an incremental encoder is used to sense direction of rotation of shaft. **[9]**

P.T.O.

Q5) a) Explain working principle of PZT actuators. State its applications. **[9]**

b) Explain magneto-transistor and magneto-resistive elements (MRE). **[9]**

OR

Q6) a) Write a short note on surface micromachining for MEMS devices. **[9]**

b) Explain with neat block diagram the concept of SMART sensor system. **[9]**

Q7) a) Draw and explain the symbols of following pneumatic valves. **[6]**

i) 5 × 2valve

ii) 4 × 2valve

iii) 3 × 2valve

b) Explain how a solenoid is used as an actuator. **[6]**

c) Draw control valve characteristics and explain the terms **[6]**

i) Quick Opening

ii) Linear and

iii) Equal Percentage

OR

Q8) a) A 5V control signal is to be used to turn ON and OFF a pump operating or 230VAC. Explain a relay driver circuit which can be used for this application. **[6]**

b) Explain control of single acting cylinder using an appropriate directional control valve. **[6]**

c) Explain how actuators are classified. Explain any one type of actuators. **[6]**

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Total No. of Questions : 8]

SEAT No. : [ ]

PC1762

[Total No. of Pages : 2

[6353]-80

T.E. (Electronics Engineering)

MACHINE LEARNING

(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.7or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) What do you understand by first order logic in artificial intelligence? Which are the types of quantifiers? Explain each quantifier by giving suitable example. **[9]**

b) What is Hidden Markov Model? List the steps required for simplified Matrix algorithm. **[8]**

OR

Q2) a) Explain the working of Unification algorithm with suitable example. **[9]**

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

i) Forward Chaining.

ii) Backward Chaining.

Q3) a) What do you understand by Syntactic analysis? What are the challenges in syntactic analysis? Explain the concept of Augmented grammars. **[9]**

b) Define the term Parsing. Show syntactic parsing using Bottom Up parsing. Compare Top-Down and Bottom-Up Parsing. **[9]**

OR

Q4) a) Which parsing approach/procedure is used in Augmented Transition Networks? How Augmented Transition Networks can be used in Natural Language understanding? **[10]**

b) Explain Semantic interpretation. How it can be used for probabilistic language processing? **[8]**

P.T.O.

Q5) a) What is Reinforcement learning? Give 2 examples of reinforcement learning. Compare and contrast between reinforcement learning and supervised learning. **[8]**

b) What are the different types of learning in machine learning? Explain inductive learning. **[10]**

OR

Q6) a) Explain common active and passive RL techniques and the scenarios in which they are applicable? **[8]**

b) What do you understand by learning decision tree? Explain the decision tree learning with the help of an example. **[10]**

Q7) a) What do you mean by membership function? Explain the features of the membership function. **[9]**

b) With the help of neat block diagram, explain how an induction motor can be controlled using fuzzy logic controller. **[8]**

OR

Q8) a) Discuss - any four properties and operations of fuzzy sets. **[9]**

b) What do you understand by PWM controller? With the help of block diagram explain how an PWM controller can be designed using neural networks. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC1763

[Total No. of Pages : 3

[6353]-81

T.E. (Electronics Engineering) (Electronics & Telecommunication)

FUNDAMENTALS OF JAVA PROGRAMMING

(2019 Pattern) (Semester-I) (Elective-I) (304185 C)

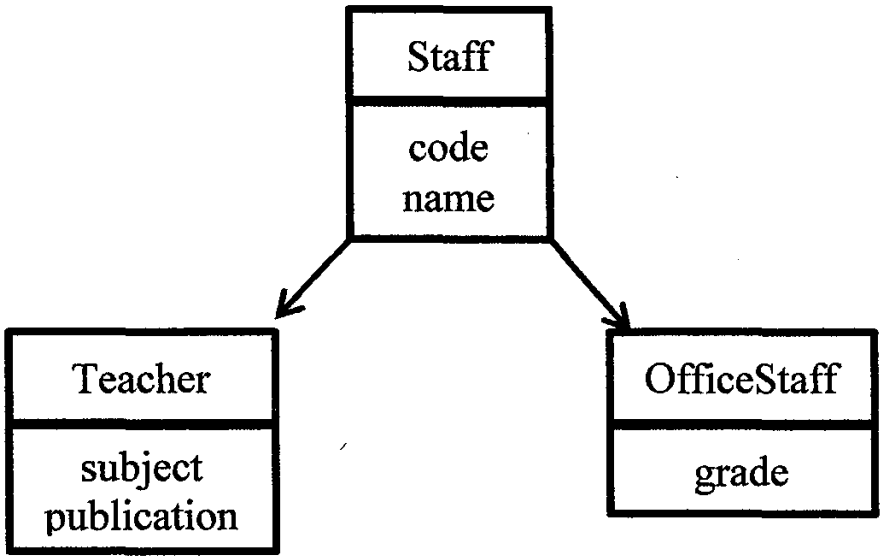
Time : 2 ½Hours] *[Max. Marks : 70*

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 abstract class and abstract methods with an example. **[5]**

b) An educational institute wishes to maintain a database of its employee. The database is divided into a number of classes whose hierarchical relationship is shown in following diagram. Define all the classes and method to create the database for 2 different object of each derived class and initialize it with data. Also, display the initialized data with the appropriate method. **[10]**



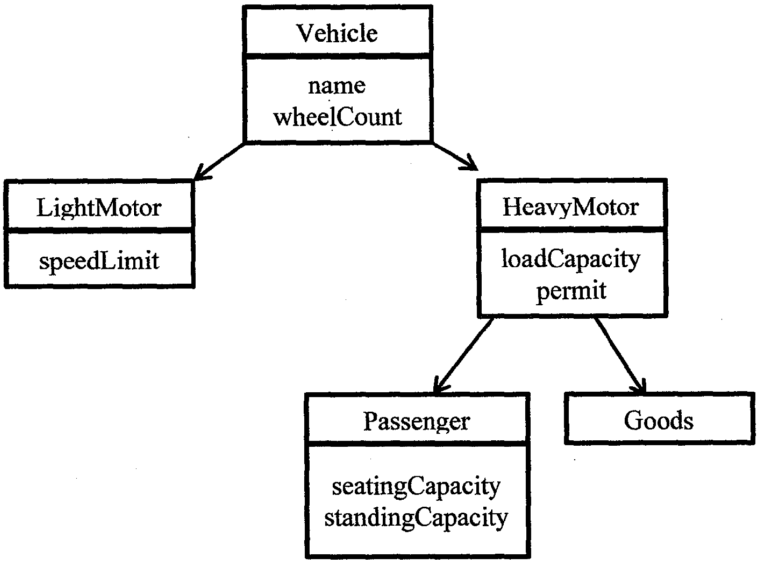
c) Differentiate between String and String Buffer class. **[3]**

OR

P.T.O.

Q2) a) Write applications of wrapper class with suitable example. **[5]**

b) Write a Java program to implement the following class diagram with appropriate methods. **[10]**



c) List and explain in short any three methods of String class. **[3]**

Q3) a) Correct the following code to rectify the compile error generated if any and justify your answer. Rewrite the corrected code. **[8]**

```
public interface NewShape  {
        void draw( ) ;
}
public interface Circle extends NewShape  {
        void getRadius( ) ;
        int radius =10;
}
public class NewCircle implements Circle {
         public void getRadius ( )  {
                 System.out.println(radius);
         }
}
public class ExtendInterface extends NewCircle{
         public static void main(String[ ] args) {
                 // TODO Auto-generated method stub
                 Circle nc = new Circle( ) ;
                 nc .getRadius( ) ;
         }
}
```

b) Explain java API packages. **[6]**

c) How to hide a class in package ? Explain. **[3]**

OR

Q4) a) What is a interface? What is the major difference between interface and class? **[5]**

b) Describe the various forms of the interface implementation. **[4]**

c) What is a package ? Explain with the help of simple example. **[8]**

Q5) a) Differentiate between multithreading and Multitasking. **[5]**

b) Explain life cycle of an applet. **[6]**

c) What is a finally block? Where and how is it used? Give a suitable example. **[7]**

OR

Q6) a) Explain the life cycle of a thread. **[5]**

b) Explain syntax of try throw and catch block with a suitable example. **[5]**

c) Write a program to develop an applet which will accept two values as input from the user and then displays the addition on the screen. **[8]**

Q7) a) What is AWT? What are the differences between AWT and swing? **[6]**

b) List out and explain any four commonly used methods of Component class. **[4]**

c) Write a program to read from one file and write a sentence in a other file. **[7]**

OR

Q8) a) Write a Java program using Swing to create text field. **[7]**

b) Explain the hierarchy of AWT. **[5]**

c) Write a code in Java to open a file. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PC1764

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[6353]-82

T.E. (Electronics Engineering)

DATA COMMUNICATION

(2019 Pattern) (Semester - I) (Elective - 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.7or 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, if necessary.***

Q1) a) The generator matrix of (6,3) block code is given below, Find all code words of this code. Also find the corrected code words for following received words. **[9]**

i) [110101]

ii) [010111]

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

b) A rate l/3 convolution encoder has generating vectors as gl= (100), g2 = (111), g3 = (101) **[9]**

i) Sketch the encoder configuration.

ii) Draw the code tree, state diagram and trellis diagram.

OR

Q2) a) What is ARQ? Explain Go back N and selective repeat ARQ protocols.**[6]**

b) The parity check bits of a (7,4) block code are generated by**[6]**

C5 = dl+d2+d3

C6 = dl+d2+d3

C7 = d2+d3+d4

-Where dl, d2, d3 and d4 are the message digits.

-Find the generator matrix and parity check matrix for this code.

-Find the minimum weight of this code.

-Find error detecting capability of this code.

c) Explain Viterbi Algorithm in Convolutional codes. **[6]**

P.T.O.

Q3) a) Huffman Codes are not unique codes. Justify the statement. Apply Huffman coding to following message ensemble and calculate coding efficiency. **[8]**

[X] = [xl, x2, x3, x4, x5, x6]

P(X) = [0.4,0.19,0.16,0.15,0.08,0.02]

b) Define Self information, Entropy, Mutual Information and Channel Capacity. **[8]**

OR

Q4) a) Apply Shannon Fano coding to following message ensemble and calculate coding efficiency. **[8]**

[X] = [x1,x2,x3,x4,x5,x6,x7]

P(X) = [0.45,0.2,0. 15,0.08,0.05,0.04,0.03]

b) Write a note on Bandwidth SNR trade-off and use of orthogonal signal to achieve Shannon's limit. **[8]**

Q5) a) Explain BPSK generation and detection with block diagram and waveforms. **[6]**

b) Compare M-Ary PSK and M-Ary QAM, also draw Signal Space diagram of both. **[6]**

c) Explain Offset QPSK in detail. **[6]**

OR

Q6) a) Compare all digital modulation schemes (Binary and M ary). **[9]**

b) Draw a spectrum of BFSK also explain generation and detection along with waveforms. **[9]**

Q7) a) Explain DSSS transmitter and Receiver. **[8]**

b) Compare FDMA, TDMA and CDMA. **[8]**

OR

Q8) a) Compare DSSS and FHSS in all respect. **[8]**

b) Explain ALOHA and Slotted ALOHA in detail. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC1765

[Total No. of Pages : 2

[6353]-83

T.E. (Electronics Engineering)

COMPUTER NETWORKS

(2019 Pattern) (Semester - I) (Elective - I) (304205 E)

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

Q1) a) Explain Flow & Error control Protocols. **[9]**

b) Explain Ethernet types. **[9]**

OR

Q2) a) Explain different types of Connecting devices. **[9]**

b) What are the issues in data link layer? **[9]**

Q3) a) Explain datagram detail format of IPv6 and IPv4. **[8]**

b) Explain, what is DHCP & its benefits? **[9]**

OR

Q4) a) Explain distance vector routing and link state routing. **[8]**

b) What is Connection oriented & Connectionless Transport? **[9]**

Q5) a) What is FTP and explain its functions? **[9]**

b) What are the responsibilities of Application Layer? **[8]**

OR

P.T.O.

Q6) a) What do you mean by socket & Socket Interface? **[4]**

b) Explain the Fundamental HTML Elements. **[8]**

c) Explain detail about Domain Name System. **[5]**

Q7) a) Explain Network Simulation. **[9]**

b) Explain Cisco packet tracer. **[9]**

OR

Q8) a) Explain leased line & DSL. **[9]**

b) Explain Basics of Network administration and Simulation. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC1766

[Total No. of Pages : 2

[6353]-84

T.E. (Electronics Engineering)

FUNDAMENTALS OF HDL

(2019 Pattern) (Semester-II) (304212)

Time : 2 ½Hours] *[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 indicate full marks.***

Q1) a) With neat schematic explain the architectural building block of FPGA. **[9]**

b) Explain the following terms related to CPLD **[9]**

i) Functional Blocks/PAL Blocks

ii) I/O Blocks

OR

Q2) a) Explain the salient features of Xilinx XC 9500 family. **[9]**

b) Differentiate between IO blocks of XC 9500 and XC 4000 **[9]**

Q3) a) Write verilog function syntax with example. **[8]**

b) Write HDL code for 4:1 Mux using 2:1 MUX. Use Procedure and Task **[9]**

OR

Q4) a) Describe system tasks with examples. **[9]**

b) With declaration syntax of procedure. explain its facts. **[8]**

P.T.O.

Q5) a) Explain structure of verilog module with an example. **[9]**

b) What is Verilog HDL? What are the major capabilities of Verilog HDL. **[8]**

OR

Q6) a) Write a Verilog module to implement a 4-bit adder by instantiating four 1-bit full adder (structural) modules. **[9]**

b) Explain in detail verilog logical operators and expressions. **[8]**

Q7) a) Explain in detail the modelling styles in verilog. **[9]**

b) Write verilog HDL for 2:4 decoder using data flow modeling. **[9]**

OR

Q8) a) Write Verilog code for Half adder in any two modelling styles. **[9]**

b) Write Verilog code for 4 bit synchronous counter. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC1767

[Total No. of Pages : 2

[6353]-85

T.E. (Electronics Engg.)

EMBEDDED PROCESSORS AND APPLICATIONS

(2019 Pattern) (Semester - II) (304213)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Interface LED's to P0.0 to P0.7 port pins of LPC2148. Write an embedded C program to blink LED's. **[6]**

b) Explain the function of Pin Connect block of LPC2148? Also explain the function of PINSEL0 and PINSEL1 registers. **[6]**

c) List out the features of LPC2148 microcontroller. Also explain the function of IOxSET, IOxCLR and IOxDIR registers of LPC2148. **[8]**

OR

Q2) a) Draw block diagram of timer of LPC2148. Explain the functions of Timer Counter register and Timer Control register. **[6]**

b) Interface soil moisture sensor with LPC2148. Write an embedded C program using analog output A0 of soil moisture sensor. **[6]**

c) What are the steps in PLL programming of LPC2148? Also explain need of VPB divider with suitable diagram and relation between CCLK and PCLK. **[8]**

Q3) a) List out the features of UART0. Draw interfacing diagram and write an Embedded C program to transmit character 'A' to PC using LPC2148.**[8]**

b) Explain DAC register with its features. Write an Embedded C Program for generation of square waveform using on chip DAC of LPC2148 with its interfacing diagram. **[8]**

OR

P.T.O.

Q4) a) Explain ADCR (A/D Control Register), ADDR (A/D Data Register), ADGSR (A/D Global Start Register) and ADGDR (A/D Global Data Register) of LPC2148. **[8]**

b) Draw and explain interfacing of I2C EEPROM with LPC2148. Also write an Embedded C program for the same. **[8]**

Q5) a) Draw and explain the block diagram of Cortex M3 processor along with its features. **[8]**

b) Compare Cortex A series, Cortex R series and Cortex M series. **[8]**

OR

Q6) a) Draw and explain in detail CMSIS structure of cortex series. **[8]**

b) Explain need of operating system in developing complex applications in Embedded system. Also explain the advantages of ARM Cortex M-3 for Embedded Application. **[8]**

Q7) a) Define Embedded System. Draw and explain the block diagram of Embedded System. **[9]**

b) Explain case study of Smart Home Automation using IoT with detailed diagram. **[9]**

OR

Q8) a) Define Internet of Things. Draw and explain the architecture of Internet of Things. **[9]**

b) Explain case study of Smart Car parking system using IoT. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC-1768

[Total No. of Pages :2

[6353]-86

T.E. (Electronics)

INDUSTRIAL MANAGEMENT

(2019 Pattern) (Semester - II) (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.7or Q.8.***
2) ***Figures to the right indicate full marks.***

Q1) a) Explain Six sigma Quality Management Standards. **[8]**

b) Write a short note on Quality Management Assistance Tools: Five S (5S). **[9]**

OR

Q2) a) Explain quality of design, conformance and performance. **[8]**

b) Explain The ISO - Quality Management System Standard. **[9]**

Q3) a) Explain Changing Concepts and Objectives of Business. **[9]**

b) Write a short note on Business ethics. **[9]**

OR

Q4) a) Explain Technological Development and Social Change. **[9]**

b) What is a Social Responsibility of Business? Explain with suitable examples. **[9]**

Q5) a) Evaluate the benefits and drawbacks of the cooperative sector in promoting community development. **[8]**

b) Write a short note on Services sector. **[9]**

OR

Q6) a) Differentiate between a sole proprietorship and a partnership firm in terms of their features, merits and demerits. **[8]**

b) Illustrate Joint stock companies - their features, relative merits, demerits & suitability. **[9]**

P.T.O.

Q7) a) Explain Business plan in details. **[9]**

b) What are Government policies and incentives for a Business? **[9]**

OR

Q8) a) Explain Concept of entrepreneurship, Identification of business opportunities in details. **[9]**

b) Illustrate Preparation of business proposal with suitable example. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1769

[Total No. of Pages : 2

[6353]-87
T.E. (Electronics Engineering)
Elective II - PLC AND AUTOMATION
(2019 Pattern) (Semester - II) (304251 A)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or 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) List various types of timers used in PLC. Explain any one in detail with timing diagram. **[6]**

b) Develop the PLC ladder diagram of control of traffic lights in one direction. **[6]**

c) List the various types of PLC Arithmetic functions. Explain any one with suitable example. **[6]**

OR

Q2) a) Draw PLC ladder diagram for automatic water sprinkler system for a garden with necessary diagram. **[6]**

b) Explain PLC Data compare instructions in detail. **[6]**

c) Explain PLC matrix functions in detail. **[6]**

Q3) a) Explain in detail about various types of operating environment considered for PLC. **[8]**

b) Explain the procedure of troubleshooting for processor module and input malfunctions. **[9]**

P.T.O.

OR

Q4) a) Illustrate the steps to be followed when commissioning a PLC system. **[8]**

b) Explain various testing methods used for PLC. Sketch and explain the circuit of diode connected to suppress DC inductive loads. **[9]**

Q5) a) Explain in detail about an on/off control with suitable example. **[9]**

b) Explain in detail about Remote terminal unit (RTU). **[8]**

OR

Q6) a) Explain about the structure of control systems. List out any three applications of SCADA system. **[9]**

b) Explain Human machine Interface in detail. List out any three applications of HMI in industry. **[8]**

Q7) a) State the advantages of standard industrial network? Explain the serial communication interface in detail. **[9]**

b) Explain with suitable diagram about the Fieldbus and its types. Discuss any two advantages of Fieldbus. **[9]**

OR

Q8) a) Describe the point to point and multipoint connection. Explain with suitable diagram about DeviceNet. **[9]**

b) Explain types of communication interface and types of networking channels in PLC. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1770

[Total No. of Pages : 2

[6353]-88
T.E. (E & TC / Electronics)
ADVANCED JAVA PROGRAMMING
(2019 Pattern) (Semester - II) (304195 C) (Elective - II)

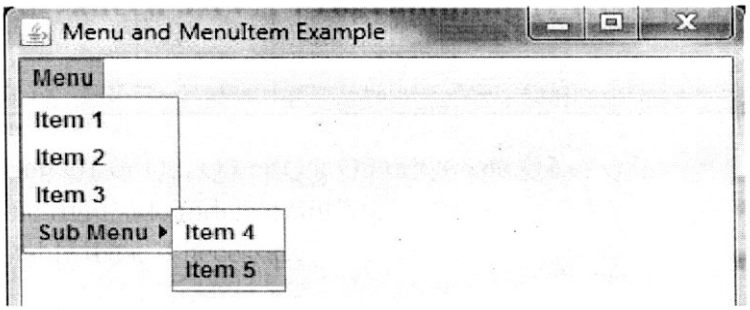
Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Solve question 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) What is a List interface? Differentiate between Array List & Vector. **[9]**

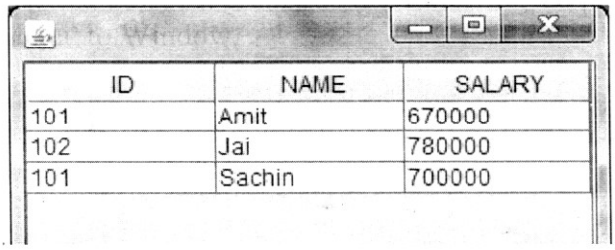
b) Write a Java program for the following output using the concept of adding Menu to Window. **[9]**



OR

Q2) a) Describe the céllection framework in Java with the collection hierarchy. **[9]**

b) Write a Java program for the following output using Java JTable. **[9]**



ID	NAME	SALARY
101	Amit	670000
102	Jai	780000
101	Sachin	700000

P.T.O.

Q3) a) Explain the types of statement in JDBC. Compare between prepared statement & Callable Statement? **[8]**

b) What is a JDBC? Explain Types of JDBC Driver. **[9]**

OR

Q4) a) Explain the JDBC architecture. Explain in detail the steps to establish a connection with a database using JDBC. **[8]**

b) Write a Java Program to Insert the details of Employee:
Employee ID Number, Name, Age, Salary in to a Table using JDBC connection. **[9]**

Q5) a) Develop a RMI application which accepts a string and checks that string is palindrome or not. **[9]**

b) What is RMJ? Explain with neat diagram the RMI Architecture. **[9]**

OR

Q6) a) Write a short note on: **[9]**
i) RMI Remote Object Activation
ii) RMI Interfaces and Implementation.

b) Write a simple RMI application in which the client invokes the method of the server. **[9]**

Q7) a) Write a short note on: **[8]**
i) Cookies
ii) Datagram

b) What is servlet? Explain Life cycle of a Servlet with neat diagram. **[8]**

OR

Q8) a) What is Internet protocol? Differentiate between TCP and UDP. **[8]**

b) What is URL? Write a Java program to obtain the name of the protocol, port number, host name and file name of the URL. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1771

[Total No. of Pages : 3

[6353]-89

T.E. (Electronics Engineering)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - II) (304215B) (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) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of logarithmic tables slide rule, Electronic pocket calculator is allowed.***

Q1) a) Analog filter has a transfer function, **[8]**

$$H(s) = \frac{10}{S^2 + 7S + 10}$$

Design a digital equivalent to this Impulse invariance method for T = 0.2 sec.

b) Give the properties and characteristics of Butterworth filter. Give salient features of Low Pass Butterworth filter. **[9]**

OR

Q2) a) Explain the characteristics of the FIR filters. **[8]**

b) The system transfer function of analog filter is given by, **[9]**

$$H(s) = \frac{S + 0.1}{(S + 0.1)^2 + 16}$$

Obtain the system transfer function of digital filter using BLT which is resonance at $w_r = \frac{\pi}{2}$.

P.T.O.

Q3) a) Draw the direct form-I and II structures for the following systems: **[8]**

i) $y(n) = 0.5\ [x(n) + x(n-1)]$

ii) $y(n) - 5y(n-1) = 7x(n)$

b) Explain the frequency sampling structures. Also explain the lattice realizations. **[9]**

OR

Q4) a) The transfer function of the discrete causal system is given as follows,**[8]**

$$H(z) = \frac{1 + z^{-1}}{1 - 0.2z^{-1} - 0.15\,z^{2}}$$

Draw cascade and parallel realization.

b) Realize the following system function in cascade form, **[9]**

$$H(z) = 1 + \frac{3}{4}z^{-1} + \frac{17}{8}z^{-2}\frac{3}{4}z^{-3} + z^{-4}$$

Q5) a) Explain decimation by factor D. Write an expression for decimated signal at the output. **[9]**

b) Design a three stage decimator that down samples an audio signal by a factor of 96 with the following specifications: F_S = 96 *k*Hz, Highest frequency of interest in data = 450 Hz, $\delta_P = 0.01$, $\delta_S = 0.001$. **[9]**

OR

Q6) a) Explain the interpolation by factor I. Write an expression for interpolated signal at the output. **[9]**

b) Design a two stage decimator for the following specifications. **[9]**

Decimating factor : D = 100.

Passband : $0 \le F \le 50$.

Transition band : $50 \le F \le 75$.

Input sampling rate: 10 kHz.

Ripple: $\delta_P = 0.1$, $\delta_S = 0.001$.

Q7) a) Explanation of the architecture of TMS 320C54XX dsp processor. **[9]**

b) Explanation of the application of DSP processor in speech signal processing. **[9]**

OR

Q8) a) Explain the need for special architecture of DSP processor. Enlist the features of TMS320C54XX dsp processor. **[9]**

b) Give the brief comparison between the DSP processors and General purpose processors. **[9]**

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC-1772

[Total No. of Pages :3

[6353]-90

T.E. (Electronics)

FIBER OPTIC COMMUNICATION

(2019 Pattern) (Semester - II) (304215) (Elective - II)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q5 or Q.6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Write brief notes on: **[8]**

i) Dispersion in optical fibers
ii) Dispersion shifted fibers
iii) Non-zero dispersion shifted fibers
iv) Dispersion flattened fibers

b) Explain the following sources of attenuation in optical fibers in details and draw neat diagrams to illustrate them: **[10]**

i) Material absorption Loss
ii) Scattering Loss
iii) Fiber bending loss

OR

Q2) a) In a laboratory setup. 0.1 mW of optical power is launched at the input of a 10 km optical fiber and 5 μW of power is measured at the fiber end.**[8]**

i) Calculate the signal attenuation per km.
ii) Calculate the overall signal attenuation for a 12 km optical link using the same fiber specifications, with splices at 1 km. interval. The splice loss inserts 0.5 dB loss per splice.

b) Explain the following types of dispersions involved in optical fibers:**[10]**

i) Intramodal dispersion
ii) Intermodal dispersion
iii) Overall fiber dispersion

Draw dispersion curves to illustrate the same.

P.T.O.

Q3) a) Describe with the aid of suitable diagrams the mechanism giving the emission of light from a semiconductor LASER. Compare Lasers over other LED sources. Comment which source would you prefer for designing a long haul high data rate system. **[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) Draw & Explain the V-I characteristics of. **[9]**

i) LED

ii) Laser

Comment in which region would you bias the LED and Laser (show on the graph) so as to avoid distortion during intensity modulation.

b) Explain the following characteristics of photo- detectors from optical link design considerations: **[8]**

i) Responsivity

ii) Quantum efficiency

iii) Noise equivalent power

iv) Dark current

Q5) a) What is WDM technique? Draw and explain the block diagram of a WDM system. **[9]**

b) Explain the various loss mechanisms that arise on account of joints, splices, connectors, mismatch of parameters and fiber misalignment in designing a long haul fiber optic link. **[9]**

OR

Q6) a) Draw the block diagram of a multichannel system. Compare the role of EDFA vs the role of Raman amplifiers in relation to the provision of amplification within optical fiber communication systems. **[9]**

b) Explain: **[9]**

i) Diffraction gratings

ii) Self phase modulation

iii) Optical networks

Q7) a) What are the key requirements of point to point link in FOC? Draw a block diagram of the key components in an optical link. **[9]**

Explain the link design with respect to choice of components and its characteristics.

b) A 40 km Fast Ethernet single mode link with 0.4 dB/km loss, at 1310 nm is used with two connector pairs and 5 splices between a transmitter of - 8 dBm power and receiver with a sensitivity of - 34 dBm. Given: One Connector pair loss = 0.75 dB & per splice loss =0.1 dB. Calculate: **[8]**

i) Total link loss considering a safety margin of 3 dB.

ii) Estimate the maximum fiber distance for the fiber optic link

OR

Q8) a) Write short notes on: **[9]**

i) Analog Links

ii) CNR

iii) Miltichannel transmission techniques

b) Explain with neat block diagram: **[8]**

i) Link power budget

ii) Rise time budget

Total No. of Questions : 8]

SEAT No. :

PC1773

[Total No. of Pages : 3

[6353]-92
T.E. (Electronics & Telecommunication Engineering)
DIGITAL COMMUNICATION
(2019 Pattern) (Semester - I) (304181)

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 QAM? Draw and Explain Block diagram of generation and reception of the QAM. **[8]**

b) Calculate bandwidth requirement and minimum separation (Euclidean distance) of Signal points in signal space for

i) 16-PSK

ii) 16-FSK

iii) 16-QAM. Given that input bit rate is 8kbps and bit energy is 1×10^{-4}J. **[9]**

OR

Q2) a) What is M-ary FSK? Draw and Explain Block diagram of generation and reception of the M-ary FSK. **[8]**

b) What is OFDM? Draw and Explain block diagram of generation and reception of the OFDM. **[9]**

Q3) a) What is PN sequence? Explain properties of PN sequence. **[9]**

b) A DS-SS BPSK system has fb=3kbps, $N0=10^{-10}$ *w/Hz* and is receiving signals with Pe = 10^{-7} in the presence of single tone jammer whose received power is ten times larger than original signal. Calculate the jamming margin. Assume $Q(5.2) = 10^{-7}$. **[9]**

OR

P.T.O.

Q4) a) Write a short note on following. **[9]**

i) Slow FHSS

ii) Fast FHSS

b) Explain DSSS BPSK system in detail. **[9]**

Q5) a) Explain binary symmetric channel in detail and find capacity of channel. **[8]**

b) Apply Shannon-Fano code for following message ensemble and find coding efficiency

X = [x_1 x_2 x_3 x_4 x_5 x_6 x_7 x_8]

P = [1/4 1/8 1/16 1/16 1/16¼ 1/16 1/8]. **[9]**

OR

Q6) a) A discrete source transmits messages x_1 and x_2 with probability ¾ and ¼. The source connected to the binary symmetrical Channel with $p(y_1/x_1) = 2/3$. Calculate all entropies and mutual information. **[8]**

b) Apply Huffman coding for the following message ensemble.

X = [x_1 x_2 x_3 x_4 x_5 x_6 x_7]

P = [0.45 0.15 0.1 0.1 0.08 0.08 0.04] and find coding efficiency. **[9]**

Q7) a) For a systematic linear block code, the three parity check digits, are given by

$$C_4 = d_1 \oplus d_2 \oplus d_3$$
$$C_5 = d_1 \oplus d_2$$
$$C_6 = d_1 \oplus d_3$$

[9]

i) Construct Generator Matrix

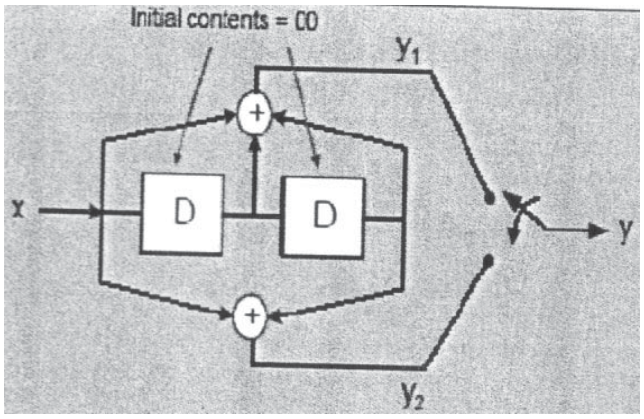
ii) Construct All Code generated by this matrix

iii) Determine error correcting capability

iv) Prepare suitable decoding table

v) Decode the received words 0 0 0 1 1 0

b)



For given convolutional encoder draw three graphical representation. **[9]**

OR

Q8) a) Draw the encoder and syndrome calculator for the generator polynomial $g(x) = 1 + x^2 + x^3$ and obtain the syndrome for the received codeword 1 0 0 1 0 1 1. **[9]**

b) Explain properties of Linear Block code and Cyclic Code with example. **[9]**

* * *

Total No. of Questions : 8]

SEAT No. :

PC-1774

[Total No. of Pages : 2

[6353]-93
T.E. (E & TC Engineering)
ELECTROMAGNETIC FIELD THEORY
(2019 Pattern) (Semester - I) (304182)

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) ***Use of a Calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Derive electrostatic boundary condition for the boundary between two perfect dielectric materials. **[10]**

b) What is an electric dipole? Derive an expression for potential and electric field at point P due to an electric dipole. **[8]**

OR

Q2) a) State the significance of poison's and Laplace's equations. Derive the expression for the same. **[8]**

b) Derive an expression for the capacitance of a parallel plate capacitor. **[10]**

Q3) a) State and Explain Faraday's Law and Lenz's Law. **[8]**

b) A circular loop in Z = 0 plane has a radius of 0.2 m and resistance of 10Ω. Find the current flowing through the conductor due to field $\vec{B} = 0.2\sin 10^3 t\hat{a}_z$ **[8]**

OR

Q4) a) What do you mean by displacement current? Prove that the displacement current density is given by $\bar{J}_d = \frac{\delta \bar{D}}{\delta t}$. **[8]**

b) Write Maxwell equation for time varying electromagnetic fields in point form and integral form. **[8]**

Q5) a) What do you mean by uniform plane wave? Using Maxwell's equations in phasor notation derive the expression for Helmholtz's equation in free space. **[10]**

P.T.O.

b) For uniform plane waves explain : **[8]**

i) Depth of penetration

ii) Polarization

OR

Q6) a) Explain how reflection of wave takes place by perfect conductor. **[8]**

b) Derive the parameters of propagation constant, phase constant, intrinsic impedance and velocity for free space medium. **[10]**

Q7) a) A transmission line has characteristics impedance of 50 Ω. Find the reflection coefficient if line is terminated with **[8]**

i) 50 Ω

ii) 0 Ω

iii) 75 + j75 Ω

iv) 75 + j40 Ω

b) What is meant by dissipation less line? Derive an expression for input impedance for dissipation less line. **[10]**

OR

Q8) a) Explain the primary and secondary constants of Transmission line in detail. **[8]**

b) A lossless 100 Ω transmission line is terminated in an impedance 50 + j60 Ω. Find the following using smith chart **[10]**

i) VSWR

ii) Reflection coefficient

iii) Impedance of 0.35λ from the load.

Total No. of Questions : 8]

SEAT No. : ____

PC-1775

[Total No. of Pages : 2

[6353] - 94
TE (E & TC)
MICROCONTROLLERS
(2019 Pattern) (Semester - I) (304184)

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 side indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data, if necessary***

Q1) a) Draw and explain the programming model of PIC18F4550 **[6]**

b) Explain functions of ALU in PIC18F4550 with example. **[6]**

c) Explain the concept of Watch dog timer in PIC18F4550. **[6]**

OR

Q2) a) State features of PIC18F4550 **[6]**

b) Explain power down modes of PIC18F4550 **[6]**

c) Draw and explain the organization of data memoly in PIC18F4550 **[6]**

Q3) a) Draw and explain the Timer 0, 8 bit operation in details, compare the Timer 0,1&2 **[9]**

b) Write a program for 2.5 KHz and 75 % duty cycle PWM generation with N=4, use fosc=10MHz **[8]**

OR

Q4) a) Write program to generate delay of 10 ms using timer 1, with no prescaler. **[9]**

b) Explain in detail the Capture mode of operation in CCP module. **[8]**

P.T.O.

Q5) a) Draw an interfacing diagram of LCD with PIC18F4550 to display "SPPU" on Linel and "University" on Line 2 **[9]**

b) Design a PIC Test board with Motion sensors, Gas sensors, keys and LED and Buzzer connected to port lines of PIC18F4550, verify it with program. **[9]**

OR

Q6) a) Draw an interfacing diagram of LEDs with PIC l8F4550 using port C and write an embedded C program to display Hex counter continuously on it **[9]**

b) Draw and explain port structure with SFRs used in programming **[9]**

Q7) a) Draw and explain block diagram of UART Transmitter. **[9]**

b) State features of EEPROM, draw an interfacing diagram with PIC18F4550 **[8]**

OR

Q8) a) State features of RS485, explain with diagram SPI mode of MSSP structure of PIC18F4550. **[9]**

b) State features of RTC, draw an interfacing diagram with PIC18F4550**[8]**

Total No. of Questions : 8]

SEAT No. : ____

PC1776

[Total No. of Pages : 2

[6353]-95

T.E. (E & TC)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - I) (Elective - I) (304185(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.7or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume the suitable data, jf necessary.***

Q1) a) Compute DFT of $x(n) = \{1,2,0,1\}$ using direct computation method and matrix method. **[8]**

b) State and prove two important properties of DFT. **[6]**

c) Explain frequency domain sampling and its importance in digital signal Processing. **[4]**

OR

Q2) a) Find the response of linear filter with impulse response $h(n)=\{1,2,4\}$ to input sequence $x(n)=\{1,2\}$ using linear convolution computed through circular convolution. **[8]**

b) Compute 5-point DFT for the given sequence $x[n] = \{1,0,1,0,1\}$ **[6]**

c) Compare linear and circular convolutions. **[4]**

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) Find out H(z) using impulse invariance method at 5 Hz sampling frequency from H(s) as given. **[6]**

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

c) Explain the wrapping effect in detail. **[4]**

OR

P.T.O.

Q4) a) Digital filter has frequency specifications as passband frequency Wp=0.2π and stopband frequency Ws=0.3π. What are corresponding specifications for pass band and stop band frequencies in analog domain if. **[10]**

i) Impulse invariance technique is used for designing

ii) Bilinear transformation is used for designing

Assume sampling time as 1 sed

b) Compare IIR filter realization using cascade form and parallel form. **[8]**

Q5) a) Find the magnitude and phase response function of 7th order low pass linear phase FIR filter with cutoff frequency l rad/sec using Hanning window. **[9]**

b) List out all windowing techniques? Describe any three with its mathematical formula and characteristics and compare them. **[8]**

OR

Q6) a) Design FIR filter to meet following specifications using rectangular window. **[9]**

$$\mathrm{H}d(e^{jw}) = e^{-5jw}, 0 \leq |w| \leq 0.3 * pi, 0.5\pi \leq |w| \leq \pi = 0 otherwise$$

b) Design a linear phase FIR low pass filter of length 7 with cutoff frequency of 1 rad/sec using rectangular window. **[8]**

Q7) a) Draw the diagram of human speech production system and explain the role of vocal cords, velum and vocal track. **[9]**

b) Describe the ECG signal with the help of neat sketch and elaborate the types of interference. **[8]**

OR

Q8) a) Explain ZCR and autocorrelation methods for pitch detection of speech signals. **[9]**

b) Explain how Digital signal processing is useful interference cancellation in ECG. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC1777

[Total No. of Pages : 2

[6353]-96

T.E. (E & TC)

ELECTRONIC MEASUREMENTS

(2019 Pattern) (Semester - I) (Elective - I) (304185 B)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, 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) Draw and explain the Basic block diagram of Random Noise Generator. **[5]**

b) Compare Standard Signal generator and Modern Signal generator. **[5]**

c) Draw the block diagram and explain the Function generator. **[7]**

OR

Q2) a) Draw and explain the Basic block diagram of Sine Wave Generator. **[5]**

b) Explain the working principle of pulse generator. **[5]**

c) Draw and explain the frequency synthesizer direct synthesis. **[7]**

Q3) a) If the Bandwidth of Oscilloscope is given as direct current to 10 MHz. What is the fastest rise time a sine wave can have to be accurately introduced. **[6]**

b) Draw and explain the Basic block diagram of Sampling oscilloscope. **[6]**

c) Explain the Curve tracer with the help of block diagram. **[6]**

OR

P.T.O.

Q4) a) Explain the diode and transistor testing using CRO? **[6]**

b) Explain the operation of vertical amplifier used in CRO, with the help of a block diagram. **[6]**

c) Why CRO is required for Electronic Practical? What is X-Y mode operation in CRO.? **[6]**

Q5) a) Write short notes on Seven Segment display. **[5]**

b) Draw and explain the construction and working of X-Y recorder. **[5]**

c) Explain the RS232 on DB-9 connector. **[7]**

OR

Q6) a) Explain Universal Counter with the help of a bolck diagram. **[5]**

b) Write a short notes on RS/EIA/TIA/-422. **[5]**

c) Draw and explain the block diagram of DAQ card. **[7]**

Q7) a) What is Network Analyzer and explain its different types. **[6]**

b) Write a short notes on OTDR. **[6]**

c) Explain microprocessor based instrument. **[6]**

OR

Q8) a) Describe in detail EMI/EMC test instrument. **[6]**

b) Write a notes on Industrial Internet of Things. **[6]**

c) What is Automatic Test System explain in brief. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC1778

[Total No. of Pages : 2

[6353]-97

T.E. (E & TC)

COMPUTER NETWORKS

(2019 Pattern) (Semester - I) (Elective - I) (304185 D)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, 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) Explain different network layer design issues. **[4]**

b) Give classification of switching? Explain packet switching in detail. **[6]**

c) Explain network layer protocols with suitable diagram. **[6]**

OR

Q2) a) Compare connection oriented and connectionless services. **[4]**

b) Explain the concept of classful and classless addressing. **[6]**

c) Draw and explain IPV4 frame format. **[6]**

Q3) a) What are different methods are used for transfer the packets? Explain broadcast routing with advantages and disadvantages. **[6]**

b) Explain Internet Group Message Protocol (IGMP) with suitable architecture diagram. **[6]**

c) Explain in detail path vector with suitable diagram. **[6]**

OR

P.T.O.

Q4) a) Explain OSPF with suitable diagram and special areas. **[6]**

b) Explain BGP with four different messages. **[6]**

c) Compare link state routing algorithm and distance vector algorithm. **[6]**

Q5) a) List the features of transport layer services provided to upper layer. Explain one in detail. **[4]**

b) What are transport service primitives? Explain in brief. **[6]**

c) Explain in detail TCP with header format. **[8]**

OR

Q6) a) List and explain services provide by SCTP. **[4]**

b) What is congestion control? List the typical QoS parameters in the transport layer and explain each one. **[6]**

c) Explain user datagram protocol. **[8]**

Q7) a) Explain feature of HTTP. **[4]**

b) Explain TELNET in detail with respect to server and client communication. **[6]**

c) What are the different commands used in FTP? Explain File transfer Protocol in detail. **[8]**

OR

Q8) a) Write short on SMTP. **[4]**

b) Explain post office protocol with neat diagram. **[6]**

c) Explain with neat diagram working of Bootstrap protocol (BOOTP). **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PC1779

[Total No. of Pages :2

[6353]-98

T.E. (E & TC)

CELLULAR NETWORKS

(2019 Pattern) (Semester- II) (304192)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer questions - 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) ***Assuem Suitable data, if necessary.***

Q1) a) Illustrate cell splitting in Cellular system. What is a microcell? **[6]**

b) What are the reasons for choosing Hexagonal cells? **[5]**

c) Define Frequency reuse and also illustrates the frequency reuse factor derivation. **[6]**

OR

Q2) a) Explain in detail with diagram Cellular Network Architecture. **[8]**

b) List types of handoffs. With neat diagram, describe the significance of handover in cellular systems with algorithm. **[9]**

Q3) a) Derive an expression to measure required transmitted power at station with link budget expression. **[6]**

b) Over a 20 min observation interval, 40 subscribers initiate calls. Total duration of calls is 4800 sec. Calculate load offered to N/W by subscribers and average subscribers traffic. **[6]**

c) Derive the first Erlang Distribution for Lost Call system. **[6]**

OR

Q4) a) How link budget analysis is carried out? Explain in detail. **[6]**

b) Define blocking probability. With neat diagram and assumptions explain tele-traffic system model. **[6]**

c) Explain Grade of Service and offered traffic with the help of equation. **[6]**

P.T.O.

Q5) a) With the help of Block diagram Illustrate LTE architecture. **[6]**

b) Differentiate between adhoc network and infrastructure based wireless network. **[6]**

c) Explain 5G with its architecture. **[6]**

OR

Q6) a) With neat diagram, explain in detail Evolved Packet Core architecture of LTE. **[6]**

b) Compare 3G, 4G and 5G mobile technology. **[6]**

c) Compare different WiFi protocols. **[6]**

Q7) a) Illustrate Weighted Round Robin Scheduling. **[6]**

b) Write short note on power control in wireless communication. **[6]**

c) Illustrate the use of Network coding for Content Distribution in a Multi-Hop Network. **[5]**

OR

Q8) a) What is Network Coding (NC)? Explain with example. **[5]**

b) Illustrate the use of power control in different functionalities in cellular network. **[6]**

c) With reference to Scheduler Design, explain following components in brief: **[6]**

i) Classifier

ii) Channel Quality

iii) Scheduler

Total No. of Questions : 8]

SEAT No. :

PC1780

[Total No. of Pages : 3

[6353]-99

T.E. (E & T.C. Engg.)

PROJECT MANAGEMENT

(2019 Pattern) (Semester - II) (304193)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, 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) Discuss the advantages and disadvantages of super imposing one organizational form over another. **[9]**

b) Discuss the different types of organizations and their characteristics. **[9]**

OR

Q2) a) Discuss the characteristics of different types of projects and their characteristics. **[9]**

b) Explain in detail the structure of an organization and its team members. What are the responsibilities of Project team members? **[9]**

Q3) a) Explain in detail the PERT technique for Network Scheduling. **[9]**

b) What are charts? What are the different types of charts used in Project Planning? Discuss in detail. **[9]**

OR

P.T.O.

Q4) a) A project schedule has the following characteristics. **[12]**

Activity	Time (Days)
1-2	4
1-3	1
2-4	1
3-4	1
3-5	6
4-9	5
5-6	4
5-7	8
6-8	1
7-8	2
8-10	5
9-10	7

i) Construct the Network Diagram.

ii) Compute the earliest - latest time (both start & finish)

iii) Determine the critical path and total Project duration.

b) What are the different Steps involved in Network Scheduling by using PERT? Explain in detail. **[6]**

Q5) a) What do you understand by Risk Analysis in detail. **[9]**

b) Discuss the steps involved in Project Financial analysis. **[9]**

OR

Q6) a) What are the different types of Risk? Explain with suitable examples. **[9]**

b) Explain in detail, how the Financial Break- even analysis done? **[9]**

Q7) a) Explain in detail the product development process and an organization. **[6]**

b) What is on Entrepreneurship? what are the characteristics required for successful entrepreneurship? Explain with suitable example. **[6]**

c) Explain in detail the legal issues related to product development and Entrepreneurship, with Suitable examples. **[4]**

OR

Q8) a) Write a Short Note on Patent, Copy right, trademark. **[6]**

b) Explain in detail how the product development relies on the customer needs? **[6]**

c) What are the characteristics of successful Entrepreneur. **[4]**

■■■■

Total No. of Questions : 8]

SEAT No. :

PC-1781

[Total No. of Pages : 3

[6353] - 100
T.E. (E& TC Engineering
Power Devices & Circuits
(2019 Pattern) (Semester - II) (304194)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8***
2) ***Neat diagrams 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 working of single phase half bridge inverter (using MOSFET / IGBT) for R-L load with input & output waveforms. **[7]**

b) Single phase full bridge inverter is operated from 50V dc supply, it has a resistive load of R = 5 Ω. Find: **[6]**

i) rms o/p voltages at third & fifth harmonic (Vo_3 & Vo_5)

ii) Distortion factor (DF) of 3rd harmonic component

iii) Total harmonic distortion (THD)

c) Distinguish between freewheeling diode with feedback diode **[4]**

OR

Q2) a) What is mean by harmonics in inverters? Explain effects of harmonics.**[5]**

b) Draw a three phase inverter for balanced star R load? Explain its operation of 180º mode with gate signals & output waveforms. **[12]**

P.T.O.

Q3) a) Explain working of step down chopper for R load and derive an expression for its average o/p voltage? **[6]**

b) Explain with block schematic working of SMPS. **[6]**

c) A step down chopper is operated from dc supply voltage of 230V. It has resistive load with R= 10Ω If duty cycle is 40%, calculate: **[6]**

i) Average & rms o/p volages ii) Averoge & rms o/p currents
iii) Chopper efficiency

OR

Q4) a) A step up chopper is operated from 220V dc supply and it provides 550V output. If chopping frequency is 1KHz, calculate ON & Off times of chopper. **[4]**

b) What are various types of choppers? Explain operation of two quadrant chopper with circuit diagram **[8]**

c) Draw circuit diagram of step up chopper and distinguish between step up & step down choppers **[6]**

Q5) a) What are different over voltage protection techniques in power electronics? Explain any one in detail. **[7]**

b) Why isolation is required in power electronic circuits? Explain with neat diagram working of isolation transformer. **[6]**

c) For a thyristor, Maximum junction temperature is 150°C. The thermal resistances are $ø_{jc}$ = 0.16°C/W, $ø_{cs}$ = 0.08°C/W. for heat sink temperature of 60°C, calculate total average power loss in thryistor - sink combination. If heat sink temperature is reduced to 60°C, find new total average power loss in thryistor - sink combination. **[4]**

OR

Q6) a) What is resonant converter? What are its various types? Explain any one resonant converter with circuit & waveforms. **[8]**

b) What is EMI? Explain various sources & minimizing techniques of EMI.**[5]**

c) Explain the role of heat sink in power electronic circuits with its thermal equivalent circuit **[4]**

Q7) a) Explain with circuit diagram single phase full wave AC voltage controller for R-load. Also draw following waveforms? **[7]**

i) Input voltage

ii) Gate signals for power devices

iii) Output voltage

iv) Output current

b) What is UPS? Explain operation of Off-line UPS with block schematic.**[6]**

c) Explain with suitable circuit diagram working of a LED driver **[5]**

OR

Q8) a) Explain various performance parameters of batteries used in battery operated power systems. **[6]**

b) Explain with diagram architecture of EVs battery charger **[6]**

c) Explain working of electronic ballast with block schematic. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC-1782

[Total No. of Pages :2

[6353]-101

T.E. (E & TC)

DIGITAL IMAGE PROCESSING

(2019 Pattern) (Semester - II) (Elective - II) (304195 (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.7or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Your answers will be valued as a whole.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) a) What is edge detection? Compare the performance of first order & second order derivative w.r.t. image. **[6]**

b) Explain the Laplacian edge detector. Explain Why the LoG mask is preferred over the Laplacian edge detector. **[6]**

c) What is Image thresholding? Explain Local, global, and adaptive thresholding. **[6]**

OR

Q2) a) Explain Image segmentation using. **[6]**

i) Region growing.

ii) Region Splitting.

b) With the help of suitable masks, explain the following. **[6]**

i) Point detection.

ii) Line detection.

c) Explain the following edge-detecting operators in detail. **[6]**

i) Prewitt operator

ii) Sobel operator

Q3) a) What is the need of image compression? Explain an image compression model. **[6]**

b) What is data redundancy? Explain the redundancies used in image compression. **[5]**

c) Explain the need for fidelity criteria in image compression. Write any two fidelity measures. **[6]**

P.T.O.

OR

Q4) a) What is lossy compression technique? Explain the DCT-based compression technique. **[6]**

b) Explain the concept of motion estimation with the help of any one algorithm in detail. **[6]**

c) Draw and explain JPEG base line encoder. Comment on block size used in JPEG. **[5]**

Q5) a) Explain image restoration process with help of block diagram. **[6]**

b) Explain any three noise models in short. **[6]**

c) Explain how the Weiner filter is used in image restoration. **[6]**

OR

Q6) a) Explain any three Geometric transforms in image restoration. **[6]**

b) Explain estimating the degradation function for image restoration. **[6]**

c) Compare in detail between image enhancement and image restoration. **[6]**

Q7) a) What is a pattern in images? Explain the different pattern classes in object recognition. **[6]**

b) What are the methods of object recognition? Explain the recognition based on decision-theoretic methods. **[6]**

c) Explain any one application of image processing as object recognition in detail. **[5]**

OR

Q8) a) Explain any one algorithm of content-based image retrival. **[6]**

b) Write a short note on the following structural methods. **[6]**

i) Matching shape numbers ii) String matching.

c) Explain in detail deep learning using CNN. **[5]**

Total No. of Questions : 8]

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PC-1783

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[6353]-102

T.E. (E & TC)

SENSORS IN AUTOMATION

(2019 Pattern) (Semester - II) (Elective - II) (304195)

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 and 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) Classify pressure sensors and write features of solid state pressure sensor. **[6]**

b) With Neat diagram explain Venturi type flow measurement technique. **[6]**

c) State different selection criteria used for selection of sensors. **[5]**

OR

Q2) a) Explain how differential pressure transducer works(w.r.t. Bernoulli's theorem). **[6]**

b) Explain working of Diaphragm type pneumatic sensor for Pressure measurement. **[6]**

c) Explain use of Load cell for pressure measurement. **[5]**

Q3) a) Explain working principal of strain gauge, Enlist different types of strain gauge sensing elements. **[6]**

b) Explain working of Hall effect proximity sensors. **[6]**

c) How optical encoders plays role in displacement measurement? **[6]**

OR

Q4) a) With neat diagram explain working of Eddy current proximity sensor. **[6]**

b) With neat diagram explain working of Magnetometer. **[6]**

c) What is difference between Gyroscope and Accelerometer? **[6]**

P.T.O.

Q5) a) Explain working of Resonent mirror biosensor for optical imaging. **[6]**

b) With neat diagram explain working of Photo diode. **[6]**

c) Write features and applications of a non-contact type temperature sensor (MLX90614). **[5]**

OR

Q6) a) Explain the working ‘of Light addressable Potentio-Metric sensor. **[6]**

b) Explain how Electrochemical surface plasma resonance can be used in environmental and biomedical studies. **[6]**

c) Write short note on MEMS sensor. **[5]**

Q7) a) Explain Data Acquisition System w.r.t. block diagram, working and applications. **[8]**

b) Explain the application of IoT in Automobile Engine Management System w.r.t. its block diagram. **[8]**

c) State various applications of IoT. **[2]**

OR

Q8) a) Explain the IoT based Agriculture/Greenhouse systems w.r.t its block diagram, working, advantages and applications. **[8]**

b) What is IoT? Explain the IoT based Healthcare Systems w.r.t its block diagram. **[8]**

c) State different applications of Data Acquisition System. **[2]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1784

[Total No. of Pages :2

[6353]-103

T.E. (E & TC)

Embedded Processors (Elective - II)

(2019 Pattern) (Semester - II) (304195 D)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q5 or Q.6, 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) Interface of LPC 2148 with PC using UART. Draw interfacing diagram and explain it. **[9]**

b) What is interfacing? What are the advantages of using LPC2 148 instead of other processors in embedded system? **[9]**

OR

Q2) a) Write down the characteristic features of UART of LPC2148. **[5]**

b) Write an embedded C program to transmit character 'A' to PC. **[8]**

c) List the features of LPC2148. **[5]**

Q3) a) What are the features and advantages of ARM CORTEX M3 in embedded system. **[8]**

b) Compare CORTEX A, CORTEX M. CORTEX R processors. **[5]**

c) Write a note on ARM processor development. **[5]**

OR

Q4) a) Write down the specifications of ARM CORTEX M4. **[5]**

b) Draw detailed architecture of ARM CORTEX M4. **[8]**

c) Compare between ARM Cortex-M3 and ARM Cortex-M4. **[5]**

P.T.O.

Q5) a) Explain programmer model of ARM CORTEX M4 with neat labelled diagram. **[9]**

b) Explain an algorithm to send "SPPU" serially via STM32F4xx controller to Desktop PC on HyperTerminal. Assume (UART, 9600 Baud Rate) **[8]**

OR

Q6) a) Write a note on different types of timers and counters of STM32F4xx.**[9]**

b) Draw an interfacing diagram and flowchart to interface Seven segments LED with STM32F4xx microcontroller. **[8]**

Q7) a) Draw an interfacing diagram of STM32F4xx Interfacing with accelerometer MPU 6050. **[8]**

b) Enlist the features of' CAN Bus. **[4]**

c) Draw an interfacing diagram to interface DC motor with STM32F4xx controller. **[5]**

OR

Q8) a) Write detailed note on PWM. Explain howPWM is used to control speed and direction of DC Motor. **[9]**

b) Explain the steps of transmitting and receiving data using CAN Bus. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-1785

[Total No. of Pages :2

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T.E. (E & TC)

NETWORK SECURITY

(2019 Pattern) (Elective - II) (Semester - II) (304195 E)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***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 the concept of Diffie-Hellman key exchange algorithm with details of steps. **[6]**

b) Elaborate the steps in various rounds of AES. **[6]**

c) Discuss linear and differential cryptanalysis methods in detail. **[6]**

OR

Q2) a) State advantages and disadvantages of symmetric and asymmetric key cryptography. **[6]**

b) Which basic steps are performed in one round of operation in DES? Explain in detail. **[6]**

c) Explain RSA Algorithm using any example. **[6]**

Q3) a) Write short note on: Knapsack Algorithm. **[5]**

b) Elaborate the working of Hash Based Message Authentication Codes (HMAC). **[6]**

c) Compare MD5 with SHA. Why is SHA more secure than MD5. **[6]**

P.T.O.

OR

Q4) a) What are biometric Authentication techniques? Explain its imporatnce in today's digital word. **[6]**

b) How Authentication Application kerberos works? Discuss. **[5]**

c) Write short note on: Digital signature. **[6]**

Q5) a) Discuss the concept of key rings in PGP. **[6]**

b) Write a short note on S/MIME. Which cryptographic algorithms are used in it? **[6]**

c) Describe Authentication header format Also explain its modes of operation. **[6]**

OR

Q6) a) What are the advantages & applications of IP security. **[6]**

b) What do you mean by Security Association? What are the fields of SAD? **[6]**

c) Write short note on Encapsulating security payload. **[6]**

Q7) a) Explain the SSL hand shake protocol. **[5]**

b) List and explain any two password management practices. **[6]**

c) Which are the key participants in SET? **[6]**

OR

Q8) a) Elaborate different types of fire walls. What are limitations of firewalls. **[6]**

b) What is need of SSL? Explain all phases of SSL hand shake protocol in detail. **[6]**

c) Explain anomaly based IDS. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC1786

[Total No. of Pages : 3

[6353]-105
T.E. (Electronics & Computer Engineering)
DATABASE MANAGEMENT SYSTEMS
(2019 Pattern) (Semester - I) (310341)

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

Q1) a) Explain SQL ORDER BY and WHERE clause with suitable example. **[6]**

b) Consider the following schema- **[6]**

employees (emp_id, emp_name, city salary, age)

Write SQL queries for following requirements-

i) Retrieve all records from the employees table.

ii) Retrieve emp_id, emp_name from the employees table.

iii) Retrieve the emp_id and emp_name of employees whose salary is greater than 2,00,000

iv) Delete all records from employees table where salary is greater than or equal to 2,00,000

c) Explain the following SQL statements by giving suitable example. **[8]**

i) CREATE

ii) ALTER

iii) SELECT

iv) INSERT

OR

Q2) a) Differentiate between DELETE and TRUNCATE command in SQL. **[6]**

b) What is meant by constraints in SQL? Explain Primary Key and Unique constraints in SQL with example. **[6]**

c) Explain following SQL Joins with suitable example. **[8]**

i) CROSS JOIN

ii) NATURAL JOIN

iii) INNER JOIN

iv) LEFT OUTER JOIN

P.T.O.

Q3) a) What is transaction? Explain ACID properties of a transaction in SQL. **[8]**

b) Explain the need of concurrency control in DBMS. Explain time stamp based concurrency control. **[8]**

OR

Q4) a) Explain concept of schedule in DBMS transaction in detail. With the help of transaction states diagram explain the different transation state in DBMS during its execution. **[8]**

b) Check whether the given non-serial schedule is conflict serializable or not. If serializable, find conflict equivalent schedule. **[8]**

T1	T2	T3
R(X)		
		R(Y)
		R(X)
	R(Y)	
	R(Z)	
		W(Y)
	W(Z)	
R(Z)		
W(X)		
W(Z)		

Q5) a) Explain data replication and data fragmentation in distributed data storage. **[8]**

b) What are commit protocols in distributed DBMS? Explain two phase commit protocol in detail with necessary illustration. **[8]**

OR

Q6) a) Draw and explain four types of parallel database architectures. **[8]**

b) Explain distributed database management system with the help of diagram. with the help of diagram explain homogeneous and heterogeneous distributed databases. **[8]**

Q7) a) Explain in short following types of NoSQL Databases. **[9]**

i) Key-value Pair Based

ii) Column-oriented

iii) Document-oriented

b) Explain the syntax and usage of CRUD operations (Create, Read, Update, Delete) in Mongo DB with suitable examples. **[9]**

OR

Q8) a) What is MongoDB replication? Write advantages and disadvantage of MongoDB replication. Differentiate between replication and sharding in Mongo DB. **[9]**

b) What is aggregation in MongoDB? Explain MongoDB aggregation pipeline syntax in detail. Explain aggregation in MongoDB with suitable example. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC1787

[Total No. of Pages : 2

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T.E. (Electronics and Computer Engineering)

ADVANCED JAVA PROGRAMMING

(2019 Pattern) (Semester - I) (310342)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, and Q7 or Q8.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain the difference between an applet and a standalone application. Describe the purpose of the init() method in an applet. **[6]**

b) Explain in detail about the complete life cycle of an applet. **[6]**

c) Write a Java Applet program to handle mouse events implementing the Mouse Listener interface. **[5]**

OR

Q2) a) Explain in detail about different attributes of HTML APPLET tag. **[6]**

b) Explain the following Swing components in detail: **[6]**

i) JLabel

ii) Scroll Panes

c) Compose a Java program to create a simple 'Hello World" applet and also write output. **[5]**

Q3) a) Define an event in Java and illustrate the Event Delegation Model in Java. **[6]**

b) Explain Adapter classes and inner classes in detail. **[6]**

c) Compose a Java program to handle keyboard events implementing the KeyListener interface. **[5]**

OR

P.T.O.

Q4) a) Describe the following: **[6]**

i) Event Sources and

ii) Event Listeners

b) Explain any four types of containers in Java AWT. **[6]**

c) Compose a program to create a Panel in Frame Window indicating the size of panel and frame. **[5]**

Q5) a) Explain any two layout management classes with examples of each. **[6]**

b) Explain list and set interface used in Collection framework with suitable example? **[6]**

c) Compose a java program to create a JMenu and add it to a JMenuBar inside a JFrame? **[6]**

OR

Q6) a) Compare Java AWT and Java Swing. **[6]**

b) Describe the following: **[6]**

i) Model-View-Controller terminology

ii) JMenubar.

c) Write a java program using swings components to create a login page. On clicking the JButton a dialog box should appear saying login successful.**[6]**

Q7) a) Explain the any three types of JDBC drivers with the suitable diagram.**[6]**

b) Explain the process of database connection in JDBC. **[6]**

c) Compose a Java program to insert data and retrieve in MySQL database using JDBC? **[6]**

OR

Q8) a) Explain in detail about prepared statement & callable statement? **[6]**

b) Define JDBC. Using JDBC, explain in detail about the steps to connect to the database in java. **[6]**

c) Explain in detail about ResultSet Interface. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PC-1788

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T.E. (Electronics & Computer Engineering)

DATA COMMUNICATION

(2019 Pattern) (Semester - I) (310343)

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

Q1) a) Explain why is amplitude shift keying susceptible to noise? **[5]**

b) Explain QPSK Transmitter in detail with the help of block diagram. **[6]**

c) Explain FSK Receiver with waveform. **[6]**

OR

Q2) a) Compare between ASK and FSK. **[5]**

b) Explain M-ary PSK Receiver with appropriate diagram. **[6]**

c) Explain QPSK Receiver in detail with the help of block diagram. **[6]**

Q3) a) Compare between CDMA and TDMA. **[5]**

b) Explain FDMA technology in details. **[6]**

c) What are the Advantages and disadvantages of Spread Spectrum? **[6]**

OR

Q4) a) What is PN Sequence in CDMA? Explain. **[5]**

b) Explain TDMA technology in details. Also state its advantages and disadvantages. **[6]**

c) What is Frequency Hopping? Expiain in details. **[6]**

P.T.O.

Q5) a) Prove the following statement, If receiver know the message being transmitted, the amount of information carried is "Zero". **[5]**

b) Explain the following terms, **[6]**

i) Measure of Information

ii) Unit of Information

iii) Information Rate

c) In binary sequence '0' occur with probability of ½, and '1' occur with probability of 2/3 then calculate amount of information conveyed by each binit. **[7]**

OR

Q6) a) Explain Huffman coding algorithm. Also state its advantages. **[5]**

b) Define mutual information. Also state its properties. **[6]**

c) Define entropy. Drive the expression for entropy. **[7]**

Q7) a) Define and explain single bit error and burst error. Also state disadvantages of error control coding. **[5]**

b) Define the following related to error control coding. **[6]**

i) Code efficiency

ii) Hamming distance

iii) Minimum distance

c) What is meant by error detection? Explain parity checking error detection method. **[7]**

OR

Q8) a) Explain how to obtain the parity bits in linear block code. **[5]**

b) What is meant by error detection? Explain check sum error detection method. **[6]**

c) Define linear block code. Why it is called linear code. Explain code word structure of linear block code. **[7]**

Total No. of Questions : 8]

SEAT No. :

PC-1789

[Total No. of Pages : 2

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T.E. (Electronics and Computer Engineering)

MICROCONTROLLER AND APPLICATIONS

(2019 Pattern) (Semester - I) (310344)

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 side indicate fill marks.***

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

Q1) a) Interface relay with 8051 microcontroller. Write an embedded C program for the same. **[6]**

b) Draw interfacing of DAC to 8051 microcontroller and write an embedded C program to generate sine wave form. **[6]**

c) Write an embedded C program for interfacing of stepper motor to 8051 microcontroller along with its interfacing diagram. Also draw its flowchart. **[8]**

OR

Q2) a) Interface buzzer with 8051 microcontroller. Write an embedded C program to turn buzzer ON and OFF. **[6]**

b) Draw interfacing diagram of opto - isolator with 8051 microcontroller. Also write an embedded C program for same. **[6]**

c) Draw interfacing diagram of temperature sensor (LM35) with 8051 microcontroller using ADC 0808/0809. Write an Embedded C program for the same. **[8]**

Q3) a) Draw and explain architecture of MSP430 Microcontroller. **[8]**

b) State any 4 differences between MSP430x2x, MSP430x4x, MSP430x5x. **[8]**

P.T.O.

OR

Q4) a) Explain in detail register set used in MSP430 microcontroller. **[8]**

b) Explain in detail low power modes in MSP430 microcontroller. **[8]**

Q5) a) Draw interfacing diagram of IR sensor with MSP43 microcontroller. Also write an Embedded C program for the same. **[8]**

b) List the features of ADC of MSP430 microcontroller. Draw and explain the block diagram of ADC 10 of MSP430 microcontroller. **[8]**

OR

Q6) a) Explain PWM generation of MSP430 microcontroller. Also write an embedded C program for PWM generation. **[8]**

b) Explain different GPIO registers of MSP430 microcontroller. **[8]**

Q7) a) Design frequency counter using 8051 microcontroller and display the result on LCD. **[6]**

b) Design water level monitoring and control system using 8051 microcontroller and write th e algorithm for the same. **[6]**

c) Design soil monitoring system for agriculture using MSP430 microcontroller. **[6]**

OR

Q8) a) Explain with neat block diagram DAS using 8051 microcontroller. **[6]**

b) Design environment monitoring system using MSP430 microcontroller.**[6]**

c) Draw the home automation system using MSP430 microcontroller. Also write an embedded C program for same. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC1790

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T.E. (Electronics and Computer Engineering)

DISTRIBUTED SYSTEMS

(2019 Pattern) (Semester - I) (Elective - I) (310345 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) ***Figures to the right side indicate full marks.***
3) ***Assume Suitable data if necessary.***

Q1) a) State the difference between overlay networking and IP routing. **[6]**

b) Explain the Domain Name System service and BIND implementation of DNS. **[6]**

c) Explain the working of Peer to Peer System. What are the features of Peer to Peer system? Difference between Structured verus unstructured peer-to-peer systems. **[8]**

OR

Q2) a) What is Andrew File System? Explain the working of Andrew File system. **[6]**

b) What is the role of routing overlays in peer to peer system? What are the tasks performed by routing overlay? **[6]**

c) What is the need of Name service? What is Identifier and object address? What is Name resolution? What is Global Name Service? **[8]**

Q3) a) Explain the terms : Clocks, Clock Skew, Clock Drift, Co-ordinated Universal Time. **[8]**

b) Explain the following. **[8]**

i) Active replication

ii) Passive replication

iii) Ring based election algorithm

iv) Bully election algorithm.

OR

P.T.O.

Q4) a) What is transaction? Explain flat transaction and nested transaction with suitable example. **[8]**

b) What is a deadlock in distributed systems? Explain with example. How deadlock can be recovered? **[8]**

Q5) a) Explain about various Thread Models in detail. Explain the design Issues in Threads Package. How to Implement a Thread Package? **[8]**

b) Explain the following. **[8]**

i) Address space transport mechanisms.

ii) Messages Forwarding.

iii) Origin site mechanism.

iv) Link traversal mechanism.

OR

Q6) a) What is Global Scheduling? With the help of neat diagram explain Global Scheduler Architecture. **[8]**

b) What is Load balancing? What is the Goal of Load Balancing Algorithms? What are the rules of Load Balancing Operation? What is Static Load Balancing? **[8]**

Q7) a) Explain design constraints/issues of Google File system. **[6]**

b) What is distributed file system? Explain various components of distributed file system in its services. **[6]**

c) Explain challenges associated with distributed file system. **[6]**

OR

Q8) a) What do you mean by Google file system? How does the Google file system work? State the features of Google file system. **[6]**

b) What is Network File System (NFS) of distributed file system? State the advantages and disadvantages of Network File System (NFS). **[6]**

c) What do you mean by Coda file system? Explain the disconnected operation in the Coda File System. **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1791

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T.E. (Electronics & Computer Engg.)

BLOCKCHAIN TECHNOLOGY

(2019 Pattern) (Semester - I) (Elective - I) (310345B)

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.7or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, jf necessary.***

Q1) a) Define hash in cryptography. Explain hash function. **[6]**

b) Explain cryptography and its Primitives. **[6]**

c) What is solidity programming in ethereum. Why it is popular in Blockchain technology. **[6]**

OR

Q2) a) Explain working of Message Authetication code. **[6]**

b) Compare Asymmetric & symmetric cryptography. **[6]**

c) Describe distributed hash table in detail. **[6]**

Q3) a) Explain proof of work consensus algorithm. **[6]**

b) Explain the process of ethereum transaction. **[6]**

c) Explain the working of ethereum virtual machine. **[5]**

OR

Q4) a) Define ethereum wallet & explain the types of ethereum wallet. **[6]**

b) Explain proof of Burn consensus algorithm. **[5]**

c) Write the list of tools for ethereum development. Explain the tools in brief. **[6]**

P.T.O.

Q5) a) What is Bitcoin? Write the history of Bitcoin. **[6]**

b) Draw & explain Bitcoin block structure. **[5]**

c) Describe the features of Bitcoin in trade/transactions. **[6]**

OR

Q6) a) Explain the types of Bitcoin Wallets. **[6]**

b) Describe Bitcoin Network elements in detail. **[5]**

c) Explain, how Bitcoin client gives security in Bitcoin transactions. **[6]**

Q7) a) Describe the integration of Blockchain & cloud technology for technology advancement. **[6]**

b) How blockchain with machine learning can improve the performance of blockchain technology. Explain. **[6]**

c) Describe the features of blockchain technology to help in rise of process Automation. **[6]**

OR

Q8) a) Explain characteristics of Bitcoin cloud. **[6]**

b) Describe Bitcoin address & Bitcoin transactions. **[6]**

c) Justify "Bitcoin-support of Data security in IoT. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PC1792

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[6353]-111

T.E. (Electronics and Computer Engineering)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - I) (Elective - I) (310345 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) ***Figures to the right side indicate full marks.***
3) ***Assume Suitable data if necessary.***
4) ***Use of Calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain the design of FIR filters using windows. **[8]**

b) What are the advantages of bilinear transformation method over impulse invariance method for IIR filters. **[9]**

OR

Q2) a) Explain Properties of FIR filters. **[8]**

b) Write a short note on butter worth filter approximation. **[9]**

Q3) a) Draw the direct form-I and II structures for the following systems. **[9]**

i) $3y(n) - 2y(n-1) + y(n-2) = 4x(n) - 3x(n-1) + 2x(n-2)$

ii) $y(n) = 0.5\,[x(n) + x(n-1)]$

b) Explain direct form structure of for FIR system in detail. **[9]**

OR

Q4) a) Explain cascade form structure for IIR filter. **[9]**

b) Obtain the system function H (z) for h (n) = {4, 2, -2, -3} and draw a direct form FIR filter structure. **[9]**

Q5) a) What is the role of anti-aliasing filter and anti-imaging filter in decimator and interpolator? **[9]**

b) What are the different applications of multirate digital signal processing.**[9]**

OR

P.T.O.

Q6) a) Explain the various methods of converting a sampling rate by non-integer factors. **[9]**

b) What is principle of interpolation? Derive the expression for interpolated signal at the output. **[9]**

Q7) a) Explain any one application of Biomedical Signal Processing. **[8]**

b) With the help of block diagram explain the basic elements of DSP system. **[9]**

OR

Q8) a) Explain the features of a digital signal processing. **[8]**

b) What are the Difference between DSP processor & microprocessor? **[9]**

Total No. of Questions : 8]

SEAT No. :

PC1793

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T.E. (Electronics & Computer Engineering)

SENSORS AND APPLICATIONS

(2019 Pattern) (Semester - I) (Elective - I) (310345D)

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.7or Q.8.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data, jf necessary.***

Q1) a) Explain Static, Stagnation and dynamic pressure in static tube. **[6]**

b) With the help of neat diagram explain working of Pitot tube flow meter. **[6]**

c) With the help of neat diagram explain working of variable area meter/Rotameter. State its advantages and disadvantages. **[8]**

OR

Q2) a) With the help of neat diagram explain working of transit time ultrasonic flow Meters. **[6]**

b) With the help of neat diagram explain capacitance level sensor for conductive Liquid. **[6]**

c) With the help of neat diagram explain Radiation type level detection and Hydrostatic Pressure type Level Sensor. **[8]**

Q3) a) With the help of neat diagram explain linear absolute optical encoder. Compare Absolute optical encoder and incremental optical encoder. **[8]**

b) Explain structure of CMOS image sensor cell. Compare CCD and CMOS sensor. **[8]**

OR

Q4) a) Draw construction diagram and explain working of phototransistor. Compare Photo diode and Photo transistor. **[8]**

b) Explain linear and rotary resistive displacement transducer and capacitive displacement transducer. **[8]**

P.T.O.

Q5) a) With the help of neat construction diagram explain Hall Effect Magnetic field sensors and PZT sensors and actuators. **[8]**

b) With the help of neat block diagram explain Smart sensor. State its advantages. **[8]**

OR

Q6) a) With the help of neat construction diagram explain Magneto-Resistive Elements (MRE) and Magneto transistors. **[8]**

b) Explain surface micromachining process with the help of neat diagram. **[8]**

Q7) a) What is actuator? Explain structure of actuator. Compare sensors and actuators. **[6]**

b) With the help of neat diagram explain Pressure control valve. **[6]**

c) Draw relay driver circuit using transistor and explain design of relay driver circuit using transistor. **[6]**

OR

Q8) a) Draw and explain Valve Actuation Symbol. **[6]**

b) With the help of neat diagram explain the operation of solenoid actuators. **[6]**

c) With the help of neat diagram explain double acting cylinder. **[6]**

ⓘⓘⓘⓘ

Total No. of Questions : 8]

SEAT No. : ____

PC1794

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[Total No. of Pages :2

T.E. (Electronics and Computer Engineering)

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

(2019 Pattern) (Semester- II) (310352)

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) ***Figure to the right indicate full marks.***
4) ***Assuem Suitable data if necessary.***

Q1) a) What is need of project estimation? What are the steps while estimation of software. **[8]**

b) How do you calculate FP and how it is used in estimation of software project? **[6]**

c) What are basic principles of project scheduling? **[4]**

OR

Q2) a) Compare Lines of code (LOC) and Function Point (FP) based estimation of software. **[8]**

b) Explain decomposition techniques. **[6]**

c) What is task network in project scheduling? **[4]**

Q3) a) Explain data flow architecture style with neat diagram. **[7]**

b) Explain the design concept: Functional Independence. A design should have high cohesive and low coupling. Justify. **[6]**

c) Explain user interface design issues. **[4]**

OR

Q4) a) What are the software design quality attributes and quality guidelines? **[7]**

b) Explain component level design for Web Apps. **[6]**

c) What is difference between abstraction and refinement. **[4]**

P.T.O.

Q5) a) Explain RMMM plan with suitable example. **[8]**

b) Explain SCM repository in detail. What are the advantages of SCM repository. **[6]**

c) Write a short note on: Change control process. **[4]**

OR

Q6) a) What are the layers of SCM process? Explain each in detail. **[8]**

b) What is risk identification? What are the different categories of risks? **[6]**

c) Write a short note on: Risk table. **[4]**

Q7) a) Explain defect life cycle in detail. **[7]**

b) What do you understand by Integration testing? Explain objectives of integration testing. **[6]**

c) Compare Alpha testing and Beta Testing. **[4]**

OR

Q8) a) What do you understand by System testing? What are the different kinds of system testing that are usually performed on large software? **[7]**

b) What is test plan, test scenario and test cases? How to write test cases for Login Page? **[6]**

c) What is GUI testing? Give advantages and drawbacks of GUI testing. **[4]**

Total No. of Questions : 8]

SEAT No. :

PC1795

[Total No. of Pages :2

[6353]-114

T.E. (Electronics and Computer Engineering)
COMPUTER NETWORKS AND SECURITY
(2019 Pattern) (Semester - II) (310353)

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 Random Access Techniques in detail. **[8]**

b) Describe in brief HDLC frame format. **[6]**

c) Differentiate between Noisy channel and Noiseless channel. **[4]**

OR

Q2) a) Explain Services provided by the data link layer. **[8]**

b) Explain CSMA/CD Protocol. **[6]**

c) Write a note on Backbone networks **[4]**

Q3) a) What is use of IP address? Explain in brief IPV4 classful addressing technique. **[7]**

b) Write a note on Address Resolution Protocol. **[6]**

c) Differentiate between Intra domain and Inter domain Routing. **[4]**

OR

Q4) a) What is mean by congestion and quality of service in computer networks. **[7]**

b) Explain shortest path algorithm. **[6]**

c) Compare TCP and UDP. **[4]**

P.T.O.

Q5) a) List out the different commands used in SMTP? Explain Simple mail transfer protocol. **[8]**

b) What is HTML? Explain with any application. **[6]**

c) Explain working of Ping and Trace route commands. **[4]**

OR

Q6) a) Explain SNMP with suitable diagram. Explain role of structure management information in SNMP. **[8]**

b) Write a note on. **[6]**

i) Email

ii) WWW

c) Explain Telnet with example. **[4]**

Q7) a) What is public key cryptography? Explain RSA algorithm in detail. **[7]**

b) Write a note on Hash function. **[6]**

c) Write a note on Network tester. **[4]**

OR

Q8) a) What is network monitoring. how to perform network monitoring effectively. **[7]**

b) Explain Basics of security requirement. **[6]**

c) Explain working of DSL. **[4]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1796

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[6353] - 115

T.E. (Electronics & Computer Engineering)

EMBEDDED PROCESSORS AND APPLICATIONS

(2019 Pattern) (Semester - II) (310354)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q1 or Q2 , Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Figures to the right side indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Draw interfacing diagram and write an embedded C program to transmit character 'Y' to PC using LPC2148. **[6]**

b) Write the features of ADC of LPC2148. Draw block diagram of ADC of LPC2148. **[6]**

c) Explain DAC register of LPC2148. Write an embedded C Program for generation of square waveform using on chip DAC of LPC2148 with its interfacing diagram. **[8]**

OR

Q2) a) Draw interfacing of GSM module with LPC 2148. Write algorithm and draw flowchart for sending the message through GSM module. **[6]**

b) Draw the architecture of UARTO of LPC 2148 and explain the function of each block in detail. **[6]**

c) Draw and explain interfacing of 12C EEPROM with LPC2148. Also write algorithm and draw flow chart for the same **[8]**

Q3) a) Write the features of Cortex M3 processor. Draw and explain the block diagram of Cortex M3 processor. **[8]**

b) Draw and explain in detail CMSIS structure of cortex series. **[8]**

P.T.O.

OR

Q4) a) Write features of Cortex R series. Compare Cortex A series, Cortex R series and Cortex M series. **[8]**

b) Compare ARM7 and ARM Cortex -M3 series. Also list out advantages of ARM Cortex -M3 for embedded application. **[8]**

Q5) a) Draw and explain the block diagram of ARM Cortex M4 processor. Also list out the features of same. **[8]**

b) Explain with example following GPIO registers of STM32F4xx series. **[8]**

i) GPIOx_MODER ii) GPIOx_IDR iii) GPIOx_ODR

iv) GPIOx_BSSR

OR

Q6) a) With the help of diagram explain in detail programmers model of ARM Cortex M4 processor. **[8]**

b) Draw interfacing of seven segment display to STM32F4xx series. Write a program to display 0 to 9 count on seven segment. **[8]**

Q7) a) Explain Sensors and Actuators with suitable examples. Compare Sensors and Actuators. **[9]**

b) Explain case study of Smart Home Automation using IoT with detailed diagram. **[9]**

OR

Q8) a) Define Internet of Things. Draw and explain the architecture of Internet of Things. **[9]**

b) Explain case study of Agriculture Automation using IoT with detailed diagram. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1797

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T.E. (Electronics & Computer Engineering)

SOFTWARE MODELING AND DESIGN

(2019 Pattern) (Semester - II) (310355 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, Q5 or Q.6, Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) What is activity diagram? Write benefits of activity diagrams. **[6]**

b) What are some limitations or challenges associated with using activity diagrams? **[6]**

c) What are the basic components of a sequence diagram? Explain in details. **[8]**

OR

Q2) a) Describe the difference between association roles and link names in a collaboration diagram. **[6]**

b) What is a state diagram, and what is its purpose in software engineering? **[6]**

c) Explain the key differences between state diagrams, sequence diagrams, and activity diagrams in software modeling. **[8]**

Q3) a) Explain Object Oriented Constraints Language. **[8]**

b) Explain Method Design Using UML Activity Diagram. **[8]**

OR

Q4) a) Describe Object Relation Mapping, Table Class Mapping. **[8]**

b) Describe Macro-Level Design Process. **[8]**

P.T.O.

Q5) a) Explain General Responsibility Assignment Software Patterns. **[8]**

b) Explain Types of design patterns in brief. **[8]**

OR

Q6) a) Describe the Facade pattern and its use in providing a simplified interface to a complex system. **[8]**

b) Explain the difference between structural design patterns and other categories of design patterns, such as creational and behavioral patterns. **[8]**

Q7) a) Describe the role of software architecture in shaping the structure, behavior, and performance of a software system. **[9]**

b) Designing Client/Server Software Architecture. **[9]**

OR

Q8) a) Explain Designing Component-Based Software Architectures. **[9]**

b) Explain Designing Concurrent and RealTime Software Architectures. **[9]**

Total No. of Questions : 8]

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PC-1798

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T.E. (Electronics & Computer Engineering)

ADVANCED DATABASE MANAGEMENT SYSTEM (Elective - II)

(2019 Pattern) (Semester - II) (310355 B)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q5 or Q.6, and Q7 or Q8.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Explain the following: **[10]**

i) NoSQL database Development Tool: MapReduce

ii) Column Oriented Database : Apache Cassandra.

b) Explain XML data model. List advantages and disadvantages of XML. **[8]**

OR

Q2) a) What is No SQL? Describe No SQL Database development tools. **[10]**

b) What is MongoDB? Differentiate between apache Cassandra and MongoDB. **[8]**

Q3) a) Draw and explain Data warehouse Architecture. **[8]**

b) Define OLAP. Explain any one architecture in detail. Compare different OLAP. architectures. **[9]**

OR

Q4) a) Explain the following: **[8]**

i) Decision support system.

ii) Snowflake schema

b) What is data warehouse? Explain in brief characteristics and limitations of data warehouse. **[9]**

P.T.O.

Q5) a) Explain predictive and descriptive algorithms in Data Mining. **[8]**

b) What is Data Mining. Explain benefits of Data Mining. Explain application of Data Mining in Healthcare. **[9]**

OR

Q6) a) Explain architecture of data mining techniques. **[8]**

b) Explain Knowledge Discovery in Databases seven step process in Detail. **[9]**

Q7) a) Explain geographical information systems and Mobile databases in detail with examples. **[9]**

b) Explain Deductive Database in detail with the help of example. **[9]**

OR

Q8) a) What are active databases? Elaborate with example. **[9]**

b) Explain spatial database in detail with example. **[9]**

Total No. of Questions : 8]

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PC-1799

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T.E. (Electronics & Computer Engineering)

POWER ELECTRONICS

(2019 Pattern) (Semester - II) (310355 C)(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.7or 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. **[9]**

b) Derive the equation for average and rms output voltage of single phase fully controlled converter connected to RL Load. **[8]**

OR

Q2) a) Draw a neat circuit diagram and explain working of a single - phase fully controlled bridge converter feeding RL load with freewheeling diode. **[8]**

b) Explain working of three phase fully controlled converter with RL Load and firing angle of 60 degrees. Draw output voltage waveforms. **[9]**

Q3) a) What is a chopper? Explain with circuit diagram and waveforms, working of 2 quadrant step-up chopper. **[9]**

b) Explain working of SMPs with block diagram. Explain flyback converter with circuit diagram and waveform. **[9]**

OR

Q4) a) Explain in details the operation of step-down chopper. Derive the expression for average output voltage. **[9]**

b) Explain working of AC Voltage regulator with RL Load. Draw output voltage waveforms. Derive expression for output voltage. **[9]**

P.T.O.

Q5) a) Explain with neat labeled circuit diagram working of single - phase full bridge voltage source inverter connected to RL load. Draw output voltage and current waveforms. **[9]**

b) What are different harmonic elimination techniques in inverter? Explain any one method. **[8]**

OR

Q6) a) Explain working of three phase inverter with 120 degree conduction mode with neat diagram, Switching sequence of Switches and output voltage waveforms. **[10]**

b) What is need of PWM inverter? Explain with circuit diagram. **[7]**

Q7) a) What are the advantages of online UPS over offline UPS? **[6]**

b) Explain the advantages of HVDC transmission over HVAC transmission. Also explain 12 pulse converter used in HVDC transmission. **[12]**

OR

Q8) a) Explain performance parameter of battery. **[6]**

b) Draw and explain battery charger. **[6]**

c) Explain application of power electronics in induction heating. **[6]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1800

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[6353]-119

T.E. (Electronics & Computer Engineering)

PLC AND AUTOMATION

(2019 Pattern) (Semester - II) (Elective - II) (310355 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.7or 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 on-delay timer in detail with timing diagram. Draw the ladder diagram of control of traffic lights in one direction. **[9]**

b) List the various types of PLC Data compare instructions. Explain Analog PLC operation in detail. **[9]**

OR

Q2) a) Explain the up-counter in detail with timing diagram. Write a PLC Ladder program for 24-hour clock program. **[9]**

b) List the various types of PLC Arithmetic functions. Explain in detail about PID control of continuous processes. **[9]**

Q3) a) Explain any four types of operating environment considered for PLC. **[8]**

b) Explain: **[9]**

i) Test method of PLC.

ii) Electrical Noise.

P.T.O.

OR

Q4) a) Explain the concept of voltage variation and surges? List different external suppression devices for voltage variation and surges and explain any one. **[9]**

b) Explain in detail about Troubleshooting of Input and Output module Malfunction. **[8]**

Q5) a) Explain any one type of process used in process control Industries. Explain motion control in detail. **[9]**

b) Explain Human machine Interface in detail. Explain the functions handled by RTU. **[8]**

OR

Q6) a) Explain the concept of PID control in detail. **[9]**

b) List various process used in industry. Explain in detail about Master Terminal Unit (MTU). **[8]**

Q7) a) State the advantages of standard industrial network? Explain the Ethernet-IP Communication interface in detail. **[9]**

b) Explain the collision detection access control scheme and Controller area network (CAN) protocol in detail. **[9]**

OR

Q8) a) Explain with suitable diagram about the Fieldbus and its types. Discuss any two advantages of Fieldbus. **[9]**

b) Explain about ControlNet and Modbus protocol. **[9]**

Total No. of Questions : 8] **SEAT No. :**

PC1801 **[Total No. of Pages : 2**

[6353]-120
T.E. (Information Technology)
THEORY OF COMPUTATION
(2019 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.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Convert the following CFG (Context Free Grammar) to its equivalent CNF (Chomsky Normal Form) **[5]**

$S \rightarrow bA|aB$

$A \rightarrow bAA|aS|a$

$B \rightarrow aBB|bS|b$

b) Explain the following terms **[6]**

i) Ambiguous Grammar

ii) Derivation Tree

c) Simplify the following CFG (Context Free Grammar) **[7]**

$S \rightarrow a|Bb|aDa|B$

$B \rightarrow D|Da|\in$

$D \rightarrow b|aBb$

OR

Q2) a) Distinguish between Regular Grammar (RG) and Context Free Grammar (CFG) with example. **[5]**

b) Convert the following Right Linear Grammar (RLG) to its equivalent Left Linear Grammar (LLG). **[7]**

$S \rightarrow aA|bE$

$A \rightarrow bA|aB$

$B \rightarrow bC|aD$

$C \rightarrow bD|b|aE$

$D \rightarrow bD$

$E \rightarrow a$

c) Construct the DFA for the following Right Linear Grammar (RLG) **[6]**

$S \rightarrow bB$

$B \rightarrow bC|aB|b$

$C \rightarrow a$

P.T.O.

Q3) a) Construct the PDA for $L=\{a^n b^{m+n} c^m | n,m>=1\}$ **[6]**

b) Construct a Post Machine to accept a language $L = \{a^n b^{n+1} | n>=0\}$ **[6]**

c) Explain the following. **[6]**

i) Deterministic PDA and Non-Deterministic PDA.

ii) CFL for PDA

OR

Q4) a) Design a Pushdown Automata (PDA) for accepting the set of all strings of well formed parenthesis over inputs (,), [,], {,} **[8]**

b) Differentiate between Finite Automata and Push Down Automata. **[4]**

c) Construct a Post Machine to accept the strings for a language $L = \{a^n b^n c^n | n>=0\}$ **[6]**

Q5) a) Design a Turing Machine for a Language $L = \{a^n bc^n | n>=0\}$ **[7]**

b) Write a short note on **[6]**

i) Recursive Language

ii) Recursively Enumerable Language

c) Write a short note on Multi Tape Turing Machine. **[4]**

OR

Q6) a) Design a Turing Machine to compute proper subtraction of two unary numbers. The proper subtraction function f is defined as follows. **[7]**

$f(x,y) = \{x-y$ if $x>y$

0 otherwise

b) Design a Turing Machine (TM) to increment a binary number by 1 **[6]**

c) Write a short note on Church-Turing thesis. **[4]**

Q7) a) Write Short note on **[6]**

i) Un-decidable Problem

ii) Measuring Complexity

b) Let HALT TM = {where M is a TM and M halts on input w}. Prove that HALT TM is undecidable. **[6]**

c) Give difference between P Class and NP class Problem. **[5]**

OR

Q8) a) A_{DFA} is a decidable language. **[6]**

A_{DFA} = {|B is a DFA that accepts input string w}

b) Write a short note on Normal Forms of Boolean Expressions. **[6]**

c) Write a short note on NP Completeness of SAT Problem. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC1802

[Total No. of Pages : 2

[6353]-121

T.E. (Information Technology)

OPERATING SYSTEMS

FMG - 6 : Financial Mathematics

(2019 Pattern) (Semester - I) (314442)

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) ***Assume Suitable data jf necessary.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***

Q1) a) State the dining philosopher problem. Provide solution by using semaphores and discuss how the critical section requirements are fulfilled? **[9]**

b) Describe methods for deadlock recovery. **[8]**

OR

Q2) a) Consider the following snapshot of the system **[10]**

	Allocation	Max	Available
	R_1 R_2 R_3	R_1 R_2 R_3	R_1 R_2 R_3
P_1	0 1 0	7 5 3	2 3 0
P_2	3 0 2	3 2 2	
P_3	3 0 2	9 0 2	
P_4	2 1 1	2 2 2	
P_5	0 0 2	4 3 3	

Answer the following questions using Banker's Algorithm

i) What are the values of need matrix?

ii) Is the system in the safe mode? If yes, what is the safe sequence?

iii) Request for process P1-> 2 0 1, determine whether the request can be granted safely or not? if yes then write safe sequence.

b) Define Mutual Exclusion. List the requirements of mutual exclusion.**[7]**

P.T.O.

Q3) a) For the following reference string. **[12]**

1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 5, 4, 2, 4, 9

Count the number of page faults that occur with 3 frames using FIFO, Optimal and LRU page replacement methods. Discuss the result.

b) Write short note on virtual memory management. **[6]**

OR

Q4) a) Describe dynamic partitioning memory allocation strategies with example **[10]**

b) Elaborate the concept of demand paging with appropriate diagram **[8]**

Q5) a) A disk drive has 200 cylinders, numbered 0-199. The drive is currently serving the request at cylinder 53. The queue of pending requests in FIFO order is 98,183, 37, 122, 14, 124, 65, 67. Starting from the current head position, what is the total distance that the disk arms moves to satisfy all the pending requests for the following disk scheduling algorithms. Assume head is moving towards end of disk for C-SCAN and LOOK. **[12]**

i) FCFS
ii) C-SCAN
iii) LOOK
iv) SSTF

b) State and explain different I/O buffering techniques. **[6]**

OR

Q6) a) Explain different file allocation techniques. **[8]**

b) Write a short note on disk free space management. **[6]**

c) Describe File sharing. **[4]**

Q7) a) Draw a general model of compiler and explain all phases in detail. **[9]**

b) What are the types of loaders? Discuss four different functions of loaders. **[8]**

OR

Q8) a) Define Lexeme, Token and Pattern. **[6]**

b) Discuss forward reference problem with example. **[5]**

c) Explain the 'Compile and Go' Loader scheme with advantages and disadvantages using a suitable diagram. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PC1803

[Total No. of Pages : 4

[6353]-122
T.E. (IT)
MACHINE LEARNING
(2019 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.***
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 linear Regression? When is it suitable to use linear regression over classification? **[6]**

b) What is bias-variance? Give its impact in choosing the best model. **[5]**

c) Explain evaluation metrics or loss functions for regression. **[6]**

OR

Q2) a) Explain gradient descent with respective to linear regression. **[6]**

b) Explain under fit,over fit and just fit models for Regression. **[5]**

c) What is regression? Explain univariate regression and multivariate regression. **[6]**

Q3) a) What is decision tree? Explain ID-3 algorithm of Decision tree in detail. **[8]**

b) Define **[4]**

i) Conditional Probability

ii) Posterior Probability

c) Explain in brief the Bayesian network for learning and inference. **[6]**

OR

P.T.O.

Q4) a) For given dataset predict the class of new test instance using naïve Bayes classifier. Given a new instance as:

(Outlook = Sunny; Temperature =Cool; Humidity= High; Wind= Strong)

What will be the value of PlayTennis? **[12]**

Day	Outlook	Temperature	Humidity	Wind	PlayTennis
1	Sunny	Hot	High	Weak	No
2	Sunny	Hot	High	Strong	No
3	Overcast	Hot	High	Weak	Yes
4	Rain	Mild	High	Weak	Yes
5	Rain	Cool	Normal	Weak	Yes
6	Rain	Cool	Normal	Strong	No
7	Overcast	Cool	Normal	Strong	Yes
8	Sunny	Mild	High	Weak	No
9	Sunny	Cool	Normal	Weak	Yes
10	Rain	Mild	Normal	Weak	Yes
11	Sunny	Mild	Normal	Strong	Yes
12	Overcast	Mild	High	Strong	Yes
13	Overcast	Hot	Normal	Weak	Yes
14	Rain	Mild	High	Strong	No

b) Explain the measures of impurity (Information Gain, Gini Index, and Entropy). **[6]**

Q5) a) Using k-means algorithm cluster the following eight data points (with (x, y) representing locations) into three clusters (C1= (2,5), C2=(5,8), C3=(1,2)) **[12]**

X:	2	2	8	5	7	6	1	4
Y:	10	5	4	8	5	4	2	9

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

i) Support

ii) Confidence

iii) Lift

OR

Q6) a) Consider the following sample dataset of students. Using K-Nearest-Neighbour classifier predicts the result of new student S_{new} (new test instance). (use k=3 and Euclidean Distance measure) **[10]**

Student	Rating by Internal Examiner (X_{i1})	Rating by External Examiner (X_{i2})	Result (Y)
S1	7	7	PASS
S2	7	4	PASS
S3	3	4	FAIL
S4	1	4	FAIL
S_{new}	3	7	??

b) Explain Hierarchical clustering with suitable example. **[8]**

Q7) a) With the help of suitable diagram explain architecture of Artificial Neural Network. **[6]**

b) What is the use of activation function in Neural Network? Explain any two activation functions in detail. **[6]**

c) Explain deep learning with applications. **[5]**

OR

Q8) a) Explain Perceptron training algorithm used for linear classification. **[6]**

b) Write a note on following activation functions. **[6]**

i) Sigmoid

ii) Tanh

iii) ReLU

c) How artificial neuron is inspired by biological neuron. **[5]**

* * *

Total No. of Questions : 8]

SEAT No. :

PC-1804

[Total No. of Pages : 2

[6353] - 123
T.E. (I.T.)
HUMAN COMPUTER INTERACTION
(2019 Pattern) (Semester - I) (314444)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answers Q1 or Q2, Q3 or Q4, QS 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) Categorize user profiles for any social media application based on usage. **[8]**

b) Hierarchical task analysis (HTA) is used to describe the interactions between a user & software system. Draw & explain HTA to online bus reservation system? **[9]**

OR

Q2) a) Consider designing a user 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]**

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? **[8]**

Q3) a) What is a prototype? Explain low-fidelity, medium-fidelity and high-fidelity prototyping technique with relevant example. **[9]**

b) Explain the principle of Learnability and principle of Flexibility with relevant examples. **[9]**

OR

P.T.O.

Q4) a) Write short notes on: **[9]**

i) Wire-Framing

ii) Mondel-View-Controller (MVC) Framework

b) Consider two different ATM machines. One giving away the cash & then ejecting the bank card & the other one ejecting the bank card first & then dispensing the cash. Which is a better interface from interaction design point of view? justify. **[9]**

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) What are the goals of evaluation? Explain Cognitive Walkthrough and heuristics evaluation technique in detail. **[8]**

b) Explain DECIDE framework with necessary diagram and an example of the same. **[9]**

Q7) a) Draw and explaIn the design thinking process. **[10]**

b) Discuss in the detail the Challenges faced by designer while designing interfaces for **[8]**

i) Smart homes

ii) Smart devices

OR

Q8) a) Differentiate Augmented and Virtual Reality. Also explain both with real life examples. **[8]**

b) Explain Ubiquitous Computing Definition, key features, Applications, Advantages & disadvantages, **[10]**

Total No. of Questions : 8]

SEAT No. : ____

PC1805

[Total No. of Pages : 2

[6353]-124

T.E. (Information Technology)

DESIGN & ANALYSIS OF ALGORITHMS

(2019 Pattern) (Semester - I) (Elective - I) (314445A)

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.7or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, jf necessary.***

Q1) a) Consider an instance of a Coin change-making problem, with coins 1, 4 and 6 units. Illustrate its solutions using dynamic programming approach involving a payment of 8 units. **[9]**

b) Write an algorithm for 0/1 knapsack problem using dynamic programming. **[9]**

OR

Q2) a) Discuss the dynamic programming approach to solving the coin change-making problem. Explain how the problem can be formulated as a dynamic programming task and provide a step-by-step explanation of the algorithm. **[9]**

b) Explain the Bellman-Ford algorithm for finding the shortest paths in a weighted directed graph. Discuss the problem it solves, its applications, and its time complexity. **[9]**

Q3) a) State the principal of backtracking and write backtracking algorithm for N-Queen problem. **[8]**

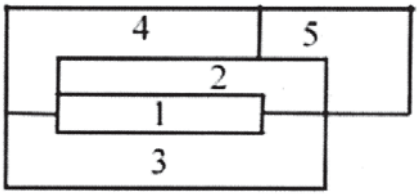
b) Let W = {5, 7, 10, 12, 15, 18, 20} and M = 35. Find all possible subsets of W that sum to M. Construct the portion of state space tree. **[9]**

OR

P.T.O.

Q4) a) Write recursive and iterative algorithm for backtracking method. **[8]**

b) Construct planar graph for following map. Explain how to find m - colouring of this planar graph by using m-colouring Backtracking algorithm. **[9]**



Q5) a) Solve the following instance of 0/1 knapsack problem by FIFO branch and bound approach. N = 4, (p_1, p_2, p_3, p_4) = (l0, l0, l2,18) (w_1, w_2, w_3, w_4) = (2, 4, 6, 9) and M = l5. **[10]**

b) Write the control abstraction for least cost search. **[8]**

OR

Q6) Construct the solution of following Travelling Salesperson problem using Branch and Bound. **[18]**

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

Q7) a) Prove that Satisfiability problem in NP complete. **[8]**

b) Discuss the proof for the NP-completeness of the Vertex Cover problem. **[9]**

OR

Q8) a) Explain deterministic and non-deterministic algorithm with example. **[8]**

b) When do you claim that algorithm is polynomial time algorithm? Explain with an example. **[9]**

ⓘⓘⓘⓘ

Total No. of Questions : 8]

SEAT No. : ____

PC-1806

[Total No. of Pages : 2

[6353] - 125

T.E. (Information Technology)

ADVANCED DATABASE AND MANAGEMENT SYSTEM

(2019 Pattern) (Semester - I) (314445 B) (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) What is a NOSQL Database? How would you classify the different types of NOSQL Databases? **[9]**

b) Explain in brief the advantages of MongoDB over RDBMS. **[9]**

OR

Q2) a) What is meant by a column-based database? What are the different components of the Cassandra Database? **[9]**

b) How would you classify the difference between SQL and NOSQL databases? **[9]**

Q3) a) How would you compare OLTP and OLAP Systems based on their features? **[8]**

b) Draw and explain the main components of a data warehouse and its characteristics. **[9]**

OR

P.T.O.

Q4) a) Explain in brief the characteristics and limitations of the data warehouse. **[8]**

b) Explain what is a data warehouse and describe schemas in the data warehouse. **[9]**

Q5) a) How would you demonstrate the KDD seven-step process? **[9]**

b) Explain different applications of data mining. **[9]**

OR

Q6) a) Explain the architecture of data mining techniques. **[9]**

b) How would you demonstrate predictive and descriptive algorithms with an example? **[9]**

Q7) a) Elaborate the term Mobile databases. **[9]**

b) Differentiate between Spatial and Temporal databases. **[8]**

OR

Q8) a) Write a short note on Multimedia databases. **[9]**

b) Discuss Geographical Information Systems in detail. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-1807

[Total No. of Pages : 2

[6353] - 126
T.E. (Information Technology)
INTERNET OF THINGS
(2019 Pattern) (Semester - I) (314445 D) (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) Explain in detail IEEE 802.15.4. **[8]**

b) What are disadvantages of IPv4 as compare to IPv6? How IPv6 is more suitable for IoT implementation? **[9]**

OR

Q2) a) Explain how Bluetooth pays important role in communication system? Explain in detail Bluetooth Technology with neat diagram. **[8]**

b) What are advantages of 6LoWPAN? Explain in detail 6LoWPAN technology. **[9]**

Q3) a) What is 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 Bluetooth speaker using raspberry pi with python program **[9]**

OR

P.T.O.

Q4) a) Compare Arduino Uno & Raspberry Pi Model. **[8]**

b) Draw and explain interfacing of robotic ARM using raspberry pi with python program **[9]**

Q5) a) List different cloud storage models. Explain Cloud Storage models (SaaS, Paas, IaaS) and communication APIs Web server in details. **[9]**

b) Explain how security is important in IoT? Explain the challenges of secure IoT? **[9]**

OR

Q6) a) What is vulnerabilities in IoT? Explain in detail. **[9]**

b) Explain in detail why there is a need of security model in IoT? Explain security model of IoT? **[9]**

Q7) a) Explain in detail how IoT is used in Home automation **[9]**

b) List applications of IoT in agriculture. Explain in detail how IoT can be used in agriculture Applications? **[9]**

OR

Q8) a) Explain in detail how IoT is used in smart city application **[9]**

b) Elaborate on how you will use IoT for remote health care. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC1808

[Total No. of Pages :2

[6353]-127

T.E. (Information Technology)

COMPUTER NETWORKS AND SECURITY

(2019 Pattern) (Semester- II) (314451)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or 2, Q.3 or 4, Q.5 or 6, Q.7 or 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 DSDV (Destination Sequenced Distance Vector) with connection establishment and data transfer phase in detail. **[9]**

b) Comment on Adhoc Network MAC Layer with Design Issues, Design Goal. **[9]**

OR

Q2) a) Briefly explain classification of routing protocol for AdHoc Wireless Networks. **[6]**

b) Explain with diagram Clustered Architecture of Sensor Network. **[6]**

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

Q3) a) What is stream Cipher? Explain the encryption process using stream Cipher with suitable example. **[8]**

b) What is Cipher Feedback Mode(CFM)? Explain the process of CFM with suitable example. **[9]**

OR

Q4) a) Write comparison between symmetric and asymmetric key cryptography. **[5]**

b) Define Network Attack. Explain with suitable example what do you mean by Active attacks and Passive attacks? **[6]**

c) Describe the following network security threats: **[6]**

i) Unauthorized access

ii) Distributed denial of service

iii) Man in the middle

P.T.O.

Q5) a) Explain PKIX Model. **[9]**

b) Explain Advanced Encryption Standard with diagram. **[9]**

OR

Q6) a) Explain following terms **[9]**

i) Hash Function

ii) Digital Signature

iii) Digital Certificate

b) Explain the working of DES algorithm with suitable example. **[9]**

Q7) a) Define Crime and Cybercrime? State Cybercrimes classification. **[8]**

b) What is the difference between Information security and cyber security? Explain the different layers of security? **[9]**

OR

Q8) a) Explain the concept of Software attacks & hardware attacks with example. **[8]**

b) Write a short note on: **[9]**

i) Malware

ii) Phishing

iii) Cyber Threat

Total No. of Questions : 8]

SEAT No. : [ ]

PC1809

[Total No. of Pages : 2

[6353]-128

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) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) a) Explain the working of Google File System with a neat diagram with relevant to Big Data. **[9]**

b) Write Short note on YARN and Map - Reduce technique. Is there any difference between both. **[8]**

OR

Q2) a) Explain Hadoop Frame work components with a neat Diagram, which component is used in Big data. **[9]**

b) Write the 4 types of NoSQL databases. How they are used in Big Data. **[8]**

Q3) a) Explain 4 types of big data analytics along with the analytical purpose in each phase. **[8]**

b) Explain different steps in Data Analytics project life cycle, how it is different than normal project life cycle. **[9]**

OR

Q4) a) Explain the tasks in Data integration and Data Transformation phase with suitable example. **[8]**

b) Explain the three ways of Data Normalization used in data analytics. **[9]**

P.T.O.

Q5) a) Explain different Data Visualization Techniques. Why visualization is important in Big Data. **[8]**

b) Explain various types of charts used in data visualization along with its analytical purpose. **[10]**

OR

Q6) a) Explain how data Visualization is beneficial for Business Analytics and Intelligence. **[8]**

b) Explain Features of Tableau DV tool and state phases of Tableau workflow. **[10]**

Q7) a) What is Social Media Data Analytics and state the advantages of SMA. **[9]**

b) Explain roles and responsibilities of big data analysts and data scientists. **[9]**

OR

Q8) a) What is Mobile analytics? Explain its importance with suitable example. **[9]**

b) Explain the data analysis life cycle in big data. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1810

[Total No. of Pages : 2

[6353] - 129
TE-(Information Technology Engineering)
Web App1ication Development
(2019 Pattern) (Semester - II) (314453A)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Explain event binding and property binding in angular with example **[6]**

b) What is MVC? Explain MVC architecture in detail **[6]**

c) Explain any 2 Hooks in React JS with example **[6]**

OR

Q2) a) What is TypeScript? Write typescript program which will find maximum and minimum number from array **[6]**

b) Compare functional component with class component **[6]**

c) What is Pipe? Explain with example **[6]**

Q3) a) What is NoSQL? Explain different features of MongoDB **[5]**

b) Write a code using ExpressJS to illustrate the concept of routes **[6]**

c) Explain the concept of Event Loop with suitable diagram **[6]**

OR

P.T.O.

Q4) a) What is API? Explain REST HTTP API's in detail **[5]**

b) Write code to create collection, display.and search data in mongoDB using NodeJS **[6]**

c) Explain File system module NodeJS. Write program to perform append and delete operation on file **[6]**

Q5) a) List and Explain any 3 widgets in jQuery Mobile **[6]**

b) What is Mobile-First and Mobile Web? List different Mobile Devices **[6]**

c) What is navigation? Write code to navigate from one page to another in jQuery Mobile **[6]**

OR

Q6) a) Compare jQuery with jQuery Mobile **[6]**

b) Write jQuery Mobile code to hide button once it is clicked **[6]**

c) What is content? Write code to create content in JQuery Mobile page **[6]**

Q7) a) Explain working of Elastic Load Balancer in detail **[6]**

b) What are the different components of VPC? **[5]**

c) What is elastic beanstalk and how it works? **[6]**

OR

Q8) a) What are different AWS Storage types **[6]**

b) What is cloud computing? Enlist benefits of doud computing **[5]**

c) What is elastic beanstalk and how it works? **[6]**

Total No. of Questions : 8]

SEAT No. :

PC-1811

[Total No. of Pages :2

[6353]-130

T.E. (Information Technology)

ARTIFICIAL INTELLIGENCE (Elective - II)

(2019 Pattern) (Semester - II) (314454 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.7or 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) Differentiate between Forward Chaining versus Backward Chaining. **[4]**

b) What is Knowledge Agent? What are the types of Knowledge Agent. Explain any one of it. **[6]**

c) Explain with minimum two examples Predicate Logic and Well-Formed Formula (WFF). **[8]**

OR

Q2) a) Following are some statements, represent it in the form of nodes, arcs and relationship. **[5]**

- Jerry is a cat.
- Jerry is a mammal.
- Jerry is owned by Priya.
- Jerry is brown coloured.
- All Mammals are animal.

b) Differentiate between Propositional versus First Order Predicate Logic.**[6]**

c) Write a note on Bayes Theorem and Bayesian networks. **[7]**

Q3) a) What is NLP? List the steps of in NLP? Explain Lexical Analysis with an example. **[9]**

b) What is Syntactic Parsing and its Constituents with reference to Grammar. Draw the Syntactic Parse tree for the following statements. **[8]**

P.T.O.

i) "The cat chased the mouse."

ii) "John eats an apple."

iii) "The big brown dog barks loudly."

iv) "I saw a black cat on the roof."

OR

Q4) a) Define Ambiguity in reference to Lexical, Syntactic and Semantic phases of NLP? with example. Brief about the Pragmatic Analysis in NLP. **[9]**

b) Describe the general process of building a text classification system for spell checking. Discuss the steps involved, such as data collection, feature extraction, model training, and evaluation with the help of an example.**[8]**

Q5) a) Describe Mini-Max Search Procedure with a suitable example. **[9]**

b) Illustrate Goal-Stack Planning with an example. **[9]**

OR

Q6) a) Explain the concept of alpha-beta pruning in the context of the minimax algorithm. Discuss how alpha-beta pruning improves the efficiency of the minimax algorithm by eliminating unnecessary evaluations of game tree nodes. Provide an example to illustrate the application of alpha-beta pruning in a game tree. Justify, your answers with detailed explanation.**[9]**

b) Describe Reactive Systems with the help of suitable examples. **[9]**

Q7) a) Write a note on (Any Two): **[12]**

i) Convolutional Neural Networks (CNNs)

ii) Deep belief Networks

iii) Restricted Boltzmann Machines

b) Explain in brief AI-Robotics. **[5]**

OR

Q8) a) Write brief note on (Any Two): **[12]**

i) Computer Vision in AI

ii) AI-Neural Networks

iii) AI-IOT

b) Explain in brief Tensor Flow. **[5]**

Total No. of Questions : 4]

SEAT No. :

PC-1812

[Total No. of Pages : 2

[6353] - 131
T.E. (Information Technology)
Cyber Security (Elective-Il)
(2019 Pattern) Semester - II (314454B)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Que 1 or Que 2, Que 3 or Que 4, Que 5 or Que 6, Que 7 or Que 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 cyber forensics? What are the different types of cyber forensics? **[6]**

b) What do you mean by Application Forensics Readiness? Describe any 3-web application forensic tools. **[6]**

c) What is crypto currency? Explain crimes related to bitcoins. **[6]**

OR

Q2) a) What is the process of conducting a cyber-forensic investigation? **[6]**

b) What are the differences between cyber forensics and digital forensics? **[6]**

c) Write any case study on cyber forensics and its Investigation Reports. **[6]**

Q3) a) What are the 5 phases of digital forensics? Explain. **[6]**

b) What are some common data sources for digital forensics investigations? **[6]**

c) What are Advanced Forensic Tools? Explain anyone. **[5]**

P.T.O.

OR

Q4) a) Can you give me some examples of when and where digital forensics might be used? **[6]**

b) Why would someone seek to destroy digital evidence? What techniques can they use? **[6]**

c) Write a detailed case study on Digital Forensics. **[5]**

Q5) a) What are the types of social engineering? **[6]**

b) What are the characteristics of social engineering? **[6]**

c) Explain Phishing Attack with suitable example. **[6]**

OR

Q6) a) What is spear phishing in social engineering? **[6]**

b) What are the phases in social engineering life cycle? **[6]**

c) How to prevent Insider Threats? Explain the process. **[6]**

Q7) a) What is the Cybercrime? How this crime is a distinct from other types of Crime? **[6]**

b) Write the detailed note on the cyber-crime under its IT act? **[6]**

c) Explain the International Standards maintained for Cyber Security and Security Audit. **[5]**

OR

Q8) a) What Is Cyber Stalking? Explain the legal remedies available against The Cyberstalking in India. **[6]**

b) Explain cyber terrorism and provision under the IT Act. **[6]**

c) Explain the positive aspects and weak areas of ITA 2000. **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1813

[Total No. of Pages : 2

[6353] - 132
T.E. (Information Technology)
CLOUD COMPUTING (Elective-Il)
(2019 Pattern) (Semester-II) (314454C)

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 the purpose of the Open Cloud Consortium? What are the common standards supported by open cloud Consortium? **[10]**

b) What is the use of Windows Azure? Explain main elements of Windows Azure? **[8]**

OR

Q2) a) Explain the architecture of Google App Engine with neat diagram. **[10]**

b) How are Spot Instance, On-demand Instance, and Reserved Instance different from one another? **[8]**

Q3) a) What are the three important components of HDFS? Enlist the difference between GFS and HDFS. **[9]**

b) Explain the basic components DynamoDB? Explain the advantages of DynamoDB **[9]**

OR

P.T.O.

Q4) a) Describe Google file system with neat diagram. **[9]**

b) Explain various Cloud Computing Security Controls with an example? **[9]**

Q5) a) What are different enabling technologies used in IoT. Explain any one application of Internet of things? **[9]**

b) What is ZigBee Technology. Explain different layers of the ZigBee protocol stack? **[8]**

OR

Q6) a) Explain applications of the Internet of Things used in Retailing and Supply-Chain Management. **[9]**

b) Draw an architecture of RFID along with an application. **[8]**

Q7) a) Describe the use of cloud-based smart fabrics and paints. **[9]**

b) What are the Benefits of Mobile Cloud Computing. How it is different than cloud computing. **[8]**

OR

Q8) a) Explain the Docker architecture with neat diagram. **[9]**

b) Write short note on : i) Mobile Cloud ii) Multimedia Cloud **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-1814

[Total No. of Pages : 2

[6353] - 133
T.E.
INFORMATION TECHNOLOGY
Software Modeling and Design (Elective-Il)
(2019 Pattern) (Semester-II) (314454(D))

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answers Que 1 or Que 2, Que 3 or Que 4, Que 5 or Que 6, Que 7 or Que 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 state diagram? Draw and discuss notations used for State Machine, Triggers and Ports, Transitions and conditions, Initial and Final State. **[8]**

b) Draw an activity diagram for a Passport Management System to get a new passport, an applicant has to apply on-line, get the appointment. He has to submit the documents in the passport office on the date of appointment. In case insufficient or incorrect documents, the applicant has to reapply and get a new appointment. After submission of documents, applicant's verification is done by police. On successful verification, passport is issued to the applicant. If verification is unsuccessful, applicant has to reapply for passport. **[9]**

OR

Q2) a) Elaborate fork and join in the context of activity diagram. Consider typical scenarios of College's Library Management System, Identify events performed by different users for the system, draw activity diagram. **[8]**

b) Explain state diagram? Draw and discuss notations used for State Machine, Triggers and Ports, Transitions and conditions, Initial and Final State. **[9]**

P.T.O.

Q3) a) What is component Diagram, Draw component diagram for online shopping system. **[9]**

b) Bank offers credit card and debit card to the account holders. Consider different activities to be performed by card holder and draw Class diagram with association. Map Class to tables. Draw schema diagram. **[9]**

OR

Q4) a) What is need of designing access layer. What are the factors considered while designing access layer classes. **[9]**

b) Write the purpose of deployment diagram. Draw & explain the following element of deployment diagram. **[9]**

i) Node.

ii) Artifact.

iii) Node instance.

Q5) a) Explain Façade Behavioral Patterns. Write in detail any 2 Façade Behavioral Patterns. **[8]**

b) Explain GOF design patterns. **[9]**

OR

Q6) a) What are design pattern? What are the advantages of using design pattern? Name some useful design patterns. **[8]**

b) How pure fabrication can solve issues related to high cohesion and low coupling? Explain with the help of Sales man as the scenario. **[9]**

Q7) a) What is real time software architecture? Explain the important characteristics of real time software architecture. **[9]**

b) Discuss service-oriented architecture? Explain location transparency and transparency in service oriented architecture platform **[9]**

OR

Q8) a) Write short note on: Real time software architecture and object oriented software architecture with a suitable example. **[9]**

b) Explain Designing of Product Line Architectures. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC1815

[Total No. of Pages : 2

[6353]-134
T.E. (Instrumentation & Control)
EMBEDDED SYSTEMS
(2019 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.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if required.***

Q1) a) Discuss the result of the following program in the accumulator with a neat diagram. **[9]**

```
SETB C
MOV A, #0xF0;
RRC A;
```

b) Discuss data transfer and data processing instructions in 8051 with suitable examples. **[9]**

OR

Q2) a) Discuss stack operation instructions with a suitable example. Also, discuss the result of the following program after INC and DEC. **[9]**

```
MOV R0, # 15H
MOV 15H, #12H
INC @ R0
DEC 15H
```

b) Discuss the Boolean instructions in 8051 with suitable examples. **[9]**

Q3) a) Discuss how to interface ADC (IC 0804 or 0809) with 8051 with steps or flowchart and neat interface diagram. **[9]**

b) Discuss the interface design of the RTD with 8051 with steps/flowchart and interface diagram. **[8]**

OR

Q4) a) Discuss the interface design of DAC (IC0808) with 8051 with detailed steps or flowchart or program and interface diagram. **[9]**

b) Discuss the interface design of the DC motor and suitable driver with 8051 with steps/flowchart and interface diagram. **[8]**

P.T.O.

Q5) a) For a given temerature control problem: Interface a temperature sensor (thermocouple) through suitable signal conditioning and conversion to the 8051. Display the temperature data on LCD. Also, control the heater using a relay. **[9]**

b) Discuss with a suitable diagram how the IR sensor modules are interfaced to 8051 for line tracing purposes. **[9]**

OR

Q6) a) Design application of line tracing robot using IR sensor and DC motor using block diagram. interface design, and flowchart. **[9]**

b) Discuss with step by step the various operations of the washing machine control. **[9]**

Q7) a) Explain the characteristics of embedded systems. **[9]**

b) Differentiate between Arduino and Raspberry Pi boards. **[8]**

OR

Q8) a) Write a short note on domain-specific processors. **[9]**

b) Discuss the operational & non-operational quality attributes of the embedded system. **[8]**

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Total No. of Questions : 8]

SEAT No. : [ ]

PC1816

[Total No. of Pages : 2

[6353]-135

T.E. (Instrumentation and Control Engineering)

INDUSTRIAL AUTOMATION - I

(2019 Pattern) (Semester - I) (306262)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***All questions are compulsory. Do not write anything on question paper.***
2) ***Illustrate your answer with suitable figures/sketches wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) a) Explain logical instructions of PLC with suitable example. **[8]**

b) Draw the ladder diagram using JMP instruction, to turn ON the RED bulb after 5 seconds. If switch SW 1 is pressed otherwise if switch 5W2 is pressed, turn ON GREEN bulb after 10 seconds. **[8]**

OR

Q2) a) Explain SQO instructions of PLC with suitable example. **[8]**

b) Draw the ladder diagram using MCR instruction, to check healthy condition of process by checking the status of switch SW1. If SW1 gets closed then turn OFF motor Ml after 10 seconds. And then turn OFF motor M2 after 10 seconds. **[8]**

Q3) a) Explain analog modules in PLC with any one analog module signal processing in PLC. **[9]**

b) With a neat diagram, illustrate PID modules in PLC. **[9]**

OR

Q4) a) Give the overview of any two industrial PLC. **[9]**

b) Compare various instructions of any two industrial PLC. **[9]**

P.T.O.

Q5) a) What is the need of 1-HMI? Explain the advantages of HMI. **[9]**

b) Illustrate PLC interfacing to Hydraulic &Pneumatic cirëuits. **[9]**

OR

Q6) a) What is the VFD? Explain the application of VFD. **[9]**

b) Explain the block diagram of Motion control. **[9]**

Q7) a) Explain the need of SCADA system. List out the applications and benefits of the SCADA system. **[9]**

b) Draw and explain RTU block diagram. **[9]**

OR

Q8) a) Explain the types of SCADA systems in detail. **[9]**

b) Explain any one application of SCADA system with a neat diagram. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC1817

[Total No. of Pages : 3

[6353]-136
T.E. (Instrumentation & Control Engineering)
MODERN CONTROL THEORY
(2019 Pattern) (Semester - I) (306263)

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.***
5) ***Use of calculator is allowed.***

Q1) a) Apply the Kalman's Test to check the controllability and observability of the SISO system described by the following transfer function model $\frac{Y(s)}{U(s)} = \frac{s+3}{s^2+6s+8}$. **[10]**

b) Apply the Lyapunov function $V = x_1^2 + x_2^2$ to determine the stability of the

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 2 \\ -2 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}.$$ **[7]**

OR

Q2) a) Show that the scalar function given below is positive semi definite. **[10]**

$V(x) = 4x_1^2 + 5x_2^2 + x_3^2 - 8x_1x_2 + 4x_1x_2 - 4x_2x_3$.

b) The state equations of the system are given below: **[7]**

$$\dot{x}_1 = x_2$$
$$\dot{x}_2 = -2x_1 - 3x_2 + u$$
and
$$y = x_1 + x_2$$

Check for complete state observability.

P.T.O.

Q3) a) Apply Ackermann's formula to determine the state feedback gain matrix K such that desired closed loop poles of the plant are located at $s = -1 + 2i, s = -1 - 2i$. The plant is given by $\dot{x} = Ax + Bu$ such that

$$A = \begin{bmatrix} 0 & 1 \\ -20 & -9 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$ **[12]**

b) Define the state observer and its types. **[6]**

OR

Q4) a) Apply Transformation matrix method to determine the state feedback gain matrix K such that desired closed loop poles of the plant are located at $s = -1 + 2i, s = -1 - 2i$. The plant is given by $\dot{x} = Ax + Bu$ such that

$$A = \begin{bmatrix} 0 & 1 \\ -20 & -9 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$ **[12]**

b) Define the state observer and its types. **[6]**

Q5) a) An analog signal $x(t) = 3\cos(50\pi t) + 10\sin(300\pi t) - \cos(100\pi t)$ is passed through an impulse sampler. Determine the Nyquist Rate of sampling. **[9]**

b) Explain the Tracking and Hold mode of sample and hold circuit with neat diagram. **[8]**

OR

Q6) a) Derive the transfer function of Zero Order Hold (ZOH) circuit. **[9]**

b) Draw and explain the sample data control system. **[8]**

Q7) a) Find the impulse response of the system shown in the figure 1 **[12]**

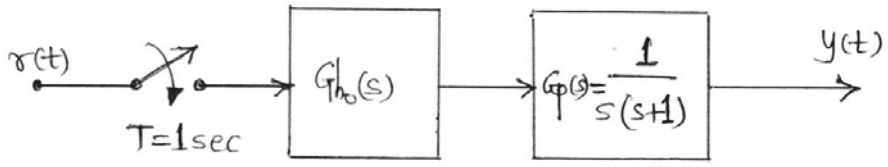

Figure 1

b) Apply the Jury's stability criterion to determine the stability of the system described by Characteristic polynomial $\Delta(z) = z^3 - 2z^2 + 1.4z - 0.1$ **[6]**

OR

Q8) a) Determine the stability of the sampled data system shown in the figure2, assume T = 1sec. **[12]**

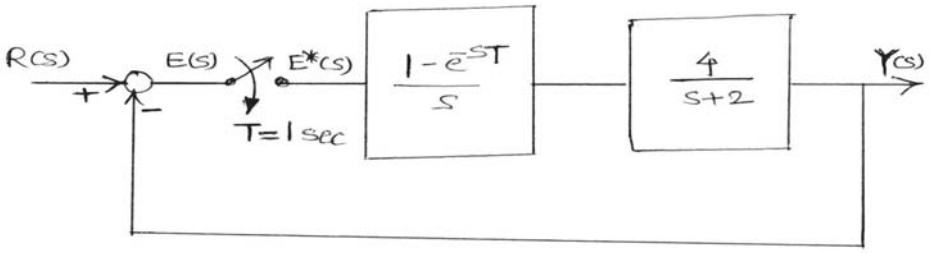

Figure 2

b) Apply the z-transform approach for solving the following difference equation assume $u(k) = 1$ *for* $k \geq 0$

$$x(k+2) - 5x(k+1) + 6x(k) = u(k), with\, x(0) = 0, x(1) = 1$$ **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1818

[Total No. of Pages : 2

[6353]-137

T.E. (Instrumentation & Control Engg.)

OPERATING SYSTEM

(2019 Pattern) (Semester - I) (306264)

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) ***Use of logarithmic tables, electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Explain address binding in Memory. **[8]**

b) Explain logical and physical address space. **[9]**

OR

Q2) a) What is difference between swapping and paging. **[8]**

b) Explain Roll of virtual memory in Operating system. **[9]**

Q3) a) Under which conditions deadlock conditions arises. **[9]**

b) Why is deadlock state more critical than starvation? Describe resource allocation graph with a deadlock, with a cycle but no deadlock. **[9]**

OR

Q4) a) Explain Deadlock prevention techniques. **[9]**

b) Explain methods to recover from dead lock. **[9]**

Q5) a) State and explain various file attributes. **[9]**

b) Explain direct and sequential access method. **[8]**

OR

P.T.O.

Q6) a) State and explain any four operations performed on directory. **[8]**

b) List allocation method and explain linked allocation in detail. **[9]**

Q7) a) What are protection goals and principles? **[9]**

b) Explain following program threats **[9]**

i) Trojan Horse

ii) Trap Door

OR

Q8) a) What are the relative merits of enforcement based solely on a kernel, as opposed to enforcement provided largely by a compiler? **[9]**

b) Explain how cryptography help to improve security? **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC-1819

[Total No. of Pages : 2

[6353] - 138
T.E. (Instrumentation & Control Engg.)
Elective-I: Mechatronics & Robotics
(2019 Pattern) (Semester - I) (306265A)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, QS 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 importance of recognition of the need and Conceptual Design for a Mechatronics System? **[6]**

b) List out the Selection criterions of Sensor, Actuator and Drivers for Actuators (any six points)? **[6]**

c) Describe the term life cycle and life cycle optimization with reference to mechatronics system? **[6]**

OR

Q2) a) What is mean by Prototyping Hardware-in-the-loop Simulation? Explain the procedure? **[6]**

b) Explain the act of Deployment of Embedded Software with an example in mechatronic systems? **[6]**

c) Explain the terms conceptual design and functional specification and give their importance? **[6]**

Q3) a) Define and explain the term Robotics and explain its concept? List out the Sensors used in Robotics (any two)? **[6]**

b) Enlist the characteristics of a robot with suitable example? **[6]**

c) Present the history of Robot in brief? Mention major developments in evolution of robot? **[6]**

P.T.O.

OR

Q4) a) What are the different types of Micro-controllers and Motors used in Robotics? Give their names, characteristics and applications? **[6]**

b) Describe types of accidents that may occur in Robotics? What are the Safety Measures in Robotics? Explain? **[6]**

c) Write a note on scope of robotics, advantages and disadvantages of it? **[6]**

Q5) a) Compare and contrast between Direct and Inverse kinematics? Also define these terms? **[6]**

b) Elaborate the concept of Artificial Intelligence in general and specific in Robots with examples? **[6]**

c) What is classes and data structure? How they are used in robotics. **[5]**

OR

Q6) a) How End effectors and Actuators make impact in the kinematics study? Explain? **[6]**

b) Define the term Degree of Freedom (DoF)? Enlist variou stypes of Grippers? Draw diagrams of it? **[6]**

c) Enlist different types of grippers, tools as an end effectors? Explain the use in brief? **[5]**

Q7) a) Design and develop the Line following Robot algorithm and program in detail? **[12]**

b) How you will design and develop Robotic arm? Explain with appropriate example? **[5]**

OR

Q8) a) Explain the Remote-controlled car programming in detail? Draw appropriate circuit and block diagram? **[12]**

b) Which are the components needed for designing of Robotics arm? Explain with example? Draw diagrams? **[5]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1820

[Total No. of Pages : 2

[6353] - 139
T.E. (Instrumentation and Control)
Elective-I (b): DATA SCIENCE
(2019 Pattern) (Semester - I) (306265 B)

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 fill marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Describe the logical operations that may be performed on arrays using Numpy. **[9]**

b) Discuss data representation charts in Matplotlib. **[9]**

OR

Q2) a) With appropriate examples, explain basic pandas operations on data frames. **[9]**

b) Use appropriate examples to illustrate line, pie and bar charts. **[9]**

Q3) a) Use appropriate examples to Illustrate line, pie and bar charts. **[8]**

b) Discuss the mean, median and mode approaches for treating missing values. **[9]**

OR

P.T.O.

Q4) a) Discuss on the outlier treatment algorithms using percentile and IQR. **[9]**

b) With suitable example give analysis of multivariate data. **[8]**

Q5) a) Demonstrate Box plot and Z score with example. **[9]**

b) How Label Encoding is used in data analysis. **[9]**

OR

Q6) a) Exhibit correlation analysis in categorical to numerical data. **[9]**

b) Discuss about the concept of feature rescaling. **[9]**

Q7) a) Explain the various components of the Tableau desktop dashboard. **[8]**

b) Discuss features of Tableau public. **[9]**

OR

Q8) a) Explain concept of Tableau online. **[9]**

b) Distinguish between tree map and heat map with its applications. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1821

[Total No. of Pages : 2

[6353] - 141
T.E. (Instrumentation and Control)
BIOMEDICAL INSTRUMENTATION
(2019 Pattern) (Semester - I) (306265 D) (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 fill marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data, if necessary.***

Section - I

Q1) a) Define Blood Pressure. Compare Direct and Indirect Type Blood Pressure Measurement System. **[10]**

b) Describe the Working Principle of any one type of Ultrasonic type Blood Flow meter with neat diagram. **[7]**

OR

Q2) a) State the Causes, Occurrence, vibration, of Heart Sounds. Draw and Discuss the working principle of Phonocardiography with neat diagram. **[10]**

b) Define Plethysmography. Draw and Discuss the working principle of Plethysmograph with neat diagram. **[7]**

Q3) a) State the function of Brainstem. With the help of neat diagram, elaborate the brain and its parts with its function. **[10]**

b) Explain the working the Neuro-Muscular Transmission with neat diagram. **[8]**

P.T.O.

OR

Q4) a) Define myoelectric voltages. Explain the working principle of Electromyography (EMG) with the help of neat diagram. **[10]**

b) With the help of neat diagram, Explain the Working Mechanism of Evoked Response EEG. **[8]**

Q5) a) Elaborate the role of inner ear in the mechanism of hearing. Explain the working of Audiometer System Bekesy with the help of neat diagram**.** **[10]**

b) With the help of neat diagram, Explain the Mechanism of Hearing. **[7]**

OR

Q6) a) Define Audiometer. Elaborate on the working of Basic Audiometer with the help of neat diagram. **[10]**

b) Describe the Anatomy of Eye with neat diagram **[7]**

Q7) a) Define the Regulation of Breathing. Explain the working of Spirometer with the help of neat diagram **[10]**

b) With the help of neat diagram. Explain the working of Nitrogen Analyzer. **[8]**

OR

Q8) a) State the function of Oxygenator. With the help of neat diagram, Explain the working of Membrane Type Oxygenators with the help of neat diagram. **[10]**

b) With the help of neat diagram, Explain the working of Airflow measurement with the help of neat diagram **[8]**

Total No. of Questions : 8]

SEAT No. :

PC1822

[Total No. of Pages :2

[6353]-142

T.E. (Instrumentation and Control Engineering)

INTERNET OF THINGS

(2019 Pattern) (Semester- II) (306268)

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 wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) How the Raspberry pi development board is different from Arduino board. **[8]**

b) Describe in detail MQTT protocol. **[9]**

OR

Q2) a) Enlist types of IoT protocols. Explain any three of them. **[8]**

b) What is IoT platform? Explain selection criteria for IoT platforms. **[9]**

Q3) a) What is identity management in IoT? Explain device centric identity management. What are its limitations? **[9]**

b) Draw the cloud computing model given by National Institute of Standards and Technology (NIST). Explain any two cloud deployment models in detail. **[9]**

OR

Q4) a) Enlist different cloud models. Explain Infrastructure-as-a-service model. **[10]**

b) Describe any 4 general and 4 essential characteristics of cloud computing. **[8]**

P.T.O.

Q5) a) Explain briefly aspects related to security issues in the deployment of IoT. Describe IoT security threats. **[9]**

b) Write a detailed note on Network and Transport layer challenges. **[8]**

OR

Q6) a) Explain different IoT routing attacks. **[8]**

b) Write a note on "Lightweight Cryptography." **[9]**

Q7) a) What is smart grid? What are its advantages? With suitable figure, explain smart grid and cloud integration. **[9]**

b) Describe the challenges in IoT Health Care sector. **[9]**

OR

Q8) a) Define smart city. Describe the challenges in it. **[9]**

b) Briefly explain the benefits and challenges of Vehicle to Everything (V2X) communication. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC1823

[Total No. of Pages : 2

[6353]-143

T.E. (Instrumentation and Control Engg.)

INDUSTRIAL AUTOMATION - II

(2019 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***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Analyze the working of Modbus protocol with respect following: **[10]**

i) Transmission mode.

ii) Frame Structure.

b) Compare the HART & Foundation Field bus protocol. **[7]**

OR

Q2) a) Describe the concept of third-party interfaces. Examine the need of OPC (Object linking and embedding for Process Control). **[10]**

b) Compare the recommended standard RS 232 & 485. **[7]**

Q3) a) Analyze the alarm and logging configuration in DCS. **[10]**

b) Elaborate the features of the Human Interface System with respect to: **[7]**

i) Alarm Display

ii) Mimic Display

iii) Trend Display

iv) Bar Chart Display

OR

Q4) a) What is mean by alarm management? Examine the different steps for alarm management system. **[10]**

b) Examine the networking and communication in DCS. **[7]**

P.T.O.

Q5) a) Develop the Functional Block Diagram (FBD) for following logic implementation: **[10]**

i) The signal state is 1 at output M3 when both OR logic operations are satisfied.

ii) The signal state is 0 at output M3 when at least one OR logic operation is not satisfied.

b) Describe the advanced function ANN. **[8]**

OR

Q6) a) Consider the following two fuzzy sets: **[10]**

$A(x) = \{(x_1,0.3), (x_2, 0.4), (x_3, 0.6), (x_4, 0.8)\}$

$B(x) = \{(x_1,0.5), (x_2, 0.6), (x_3, 0.7), (x_4, 0.9)\}$

Determine the following:

i) $A \cup B$

ii) $A \cap B$

iii) $A(x).B(x)$

iv) $A(x)–B(x)$

v) $\bar{A}(x)$

b) Describe with block diagram the advanced function MPC (Model Predictive Control). **[8]**

Q7) a) Enlist the applications of DCS in different industry. Elaborate any one in detail. **[10]**

b) Examine the role of Distributed Control System for monitoring and controlling in the Field. **[8]**

OR

Q8) a) How to use Distributed Control System in Pulp and paper environment. **[10]**

b) Justify, ERP helps organizations to automate and manage core business processes for optimal performance. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-1824

[Total No. of Pages : 2

[6353]-144

T.E. (Instrumentation & Control Engineering)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - II) (306270)

Time : 2½ Hour] *[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) ***Assume Suitable data if necessary.***
4) ***Use of Non-programmable calculator is allowed.***

Q1) a) Determine the Fourier Series of the following **[7]**

$$x(n)=4\sin\frac{2\pi n}{3}$$

b) Sketch the magnitude and phase response for the following system described by the LTI system **[10]**

$y(n) = x(n) – x(n – 1)$ Use DTFT method

OR

Q2) a) List and define any seven properties of Discrete Time Fourier Series.**[7]**

b) Sketch magnitude and phase plot for the following discrete time signal $x(n) = (0.6)^n\, u(n)$. (Use DTFT method) **[10]**

Q3) a) Determine Circular Convolution between following discrete time sequence. $x_1(n) = \{1,2,1,2\}$ and $x_2(n) = \{2,2,1,1\}$. Use DFT and IDFT method.**[12]**

b) Draw butterfly structure in DIT and DIF FFT algorithm. **[6]**

OR

P.T.O.

Q4) a) Using DIT FFT radix-2 algorithm determine DFT of following sequence $x(n)= \{1,1,2,2,3,3,4,4\}$ **[12]**

b) List and define any six properties of Discrete Fourier Transform. **[6]**

Q5) a) Design an analog Butterworth filter; For given specification **[10]**

$0.9 \leq |H(j\Omega)| \leq 1$; for $0 \leq \Omega \leq 0.2\pi$

$|H(j\Omega)| \leq 0.2$; for $0.4\pi \leq \Omega \leq \pi$

b) Discuss the Impulse Invariance Transformation used in IIR filter design. **[7]**

OR

Q6) a) Design a Chebyshev for the following specification using Bilinear Transformation; **[10]**

$0.8 \leq |H(e^{j\omega})| \leq 1$; $0 \leq \omega \leq 0.2\pi$

$|H(e^{j\omega})| \leq 0.2$; for $0.6\pi \leq \omega \leq \pi$

b) Discuss the Bilinear Transformation used in IIR filter design **[7]**

Q7) a) Design a linear phase FIR low pass filter using rectangular window by taking 7 samples of window sequence with a cutoff frequency, **[12]**

$\omega_c = 0.2\pi$ *rad/sample*.

b) List different type of window function used in FIR filter design. Sketch and discuss any two window function in brief. **[6]**

OR

Q8) a) Design a linear phase FIR high pass filter using rectangular window by taking 7 samples of window sequence with a cutoff frequency, **[12]**

$\omega_c = 0.8\pi$ *rad/sample*.

b) What are different methods of FIR filter design. Discuss one method in brief. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC-1825

[Total No. of Pages : 2

[6353] - 145
T.E. (Instrumentation & Control)
BUILDING AUTOMATION (Elective-II)
(2019 Pattern) (Semester - II) (306271A)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

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

Q1) a) Explain the concept of an Air Handling Unit (AHU) and discuss the design and functioning of its various components. **[10]**

b) Compare various heat recovery techniques utilized in AHUs. **[8]**

OR

Q2) a) Describe the design variations and operational differences between different types of AHUs. **[10]**

b) Explain the design variations and operational principles of AHUs configured for different air combinations. **[8]**

Q3) a) Explain the refrigeration cycle concept. **[10]**

b) Compare air-cooled chillers with water-cooled chillers. **[7]**

OR

Q4) a) Describe the working mechanism and mechanical configuration of different types of cooling towers used in chilled water systems. **[10]**

b) Elaborate on the working principles and design variations of various types of boilers in hot water systems. **[7]**

P.T.O.

Q5) a) Discuss how early fire alarm systems evolved into modern-day systems. **[8]**

b) Differentiate between the classifications of fire alarm systems. **[10]**

OR

Q6) a) Explain the architecture and operation of a Fire Alarm System (FAS).**[8]**

b) Discuss the classification of FAS loops. **[10]**

Q7) a) Discuss the fundamental concept of an Access Control System (ACS)**[7]**

b) Differentiate between various types of cameras used in CCTV systems**[10]**

OR

Q8) a) Provide an overview of different card technologies used in Access Control Systems. **[7]**

b) Describe the different types of Video Management Systems (VMS) used in CCTV systems. **[10]**

Total No. of Questions : 8]

SEAT No. :

PC-1826

[Total No. of Pages : 2

[6353] - 146
T.E. (Instrumentation & Control)
MACHINE LEARNING
(2019 Pattern) (Elective-II) (Semester-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 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) Describe in brief the concept of logistic regression and derive its equation. **[10]**

b) Derive Bayes Theorem and Naïve Bayes Theorem. **[8]**

OR

Q2) a) Explain in detail the concept of KNN along with its advantages and disadvantages. **[10]**

b) Explain the functions used in logistic regression. **[8]**

Q3) a) Explain Hyperplane, Support vectors and margin with the help of diagram. **[9]**

b) Explain Kernels with application. **[8]**

OR

Q4) a) Explain the concept of SVM with application. **[9]**

b) Explain separable and non-separable data with an application to SVM. **[8]**

P.T.O.

Q5) a) Define the following: **[10]**

Root node, leaf node, Gin index, entropy, pruning

b) Explain the working of Random Forest algorithm. **[8]**

OR

Q6) a) Explain advantages, disadvantages and applications of Random Forest algorithm. **[10]**

b) Describe the steps in the implementation of Decision tree algorithm. **[8]**

Q7) a) Explain working of K means clustering algorithm. **[9]**

b) Explain Silhouette method. **[8]**

OR

Q8) a) Explain model evaluation methods of unsupervised machine learning algorithms. **[9]**

b) Explain categories of Hirarchical clustering. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-1827

[Total No. of Pages :2

[6353]-147

T.E. (Instrumentation and Control Engineering)

ELECTRICAL DRIVES

(2019 Pattern) (Semester - II) (Elective - II) (306271 C)

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.7or Q8***
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) What are the different types of DC motors and how do they differ in terms of performance? **[8]**

b) What are some common controllers and firing circuits used in DC drives and how do they impact the performance of the motor? **[9]**

OR

Q2) a) How does a shunt motor differ from a series motor in terms of its characteristics and applications? **[8]**

b) What are the different types of DC drives and what factors should be considered when designing them? **[9]**

Q3) a) Draw and discuss the torque-slip characteristic of an induction motor. How does it affect motor performance? **[8]**

b) What is vector control and rotor-side control, and how do they impact the operation of AC motors in cyclo converter-fed AC drives? **[9]**

OR

Q4) a) What is the significance of torque-slip characteristics in induction motors? What are the different types of loads that an induction motor can operate with, and how does it affect its performance? **[8]**

b) What is stator frequency control, and how is it used to control the speed of an induction motor? Discuss it in detail. **[9]**

P.T.O.

Q5) a) What types of electrical drives are commonly used in compressors? Discuss with its impact on the performance and efficiency of the system. **[9]**

b) What are some common types of pumps that are powered by electrical drives. How do these drives impact the flow rate, pressure, and overall efficiency of the pumping system? **[9]**

OR

Q6) a) How are blowers and fans typically powered using electrical drives, and what are some common challenges that can arise in these applications?**[9]**

b) What types of electrical drives are commonly used in cranes and hoists, and how do these drives impact the lifting capacity and speed of the system? **[9]**

Q7) a) How do power electronic systems (Electrical drives) contribute to the overall efficiency and performance of electric vehicles, and what are the key design considerations that must be taken into account when implementing such systems? **[9]**

b) Discuss the role of DC-DC converters and DC-AC converters in the operation of electric vehicles, and evaluate the challenges associated with the implementation of these systems. **[9]**

OR

Q8) a) Discuss with example the role of DC-AC converters in electric vehicle applications, and how do they contribute to the overall performance and efficiency of the vehicle. **[9]**

b) Does battery life and performance of electric vehicles affected by electric drive used? Justify with example. **[9]**

Total No. of Questions : 8]

SEAT No. : [ ]

PC-1828

[Total No. of Pages :2

[6353]-148

T.E. (Instrumentation and Control)

ANALYTICAL INSTRUMENTATION (Elective - II)

(2019 Pattern) (Semester - II) (306271 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.7or 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) Explain the principle of working of Liquid Chromatograph with suitable block diagram. Give its applications. **[8]**

b) What are the different types of Chromatography? Enlist them. Draw the schematic diagram of Gas Chromatography and explain function of each part? **[9]**

OR

Q2) a) Explain the working principle of Katharometer or thermal conductivity meter used as detector in Gas Chromatograph. Draw diagram or circuit of it. **[8]**

b) Draw a block diagram/schematic diagram of HPLC Chromatography and explain its working principle. State any two applications of it. **[9]**

Q3) a) Explain the working of flue gas analyzer or exhaust gas analyzer using block diagram. Which are the gases measured by this technique? **[9]**

b) Draw and explain the principle of operation of Zirconium oxide based oxygen analyzer. Draw Zirconia cell in basic form. State the expression of voltage generated across the cell. **[9]**

P.T.O.

OR

Q4) a) Draw and explain the Turbidity analyzer. State the formula for calculation of turbidity. State conversion formula between ppm and NTU units. **[9]**

b) Write a note on pollution monitoring instruments. Include the CO, CO2 and Nox measuring techniques in your note? **[9]**

Q5) a) Define Osmosis and reverse osmosis. Draw a block diagram of household RO water filter. Explain in brief different filters used in it and their functions. **[9]**

b) Explain the Principle operation of Mass Spectrometer. Explain the working of Magnetic deflection mass spectrometers. **[9]**

OR

Q6) a) Define and explain the process of electro-dialysis. Why it is called ion exchange method? **[9]**

b) Explain working ofMagnetic Deflection Mass Spectrometer and prove with derivation that the radius of the orbit is a function of the m/e ratio of the particles. **[9]**

Q7) a) Draw the schematic diagram of scintillation counter and explain how it detects nuclear radiation? **[8]**

b) Explain working of Gamma Spectrometry. Draw diagram of it. **[9]**

OR

Q8) a) Explain principle of working of GM tube in detail. Draw suitable diagram of it. Compare it with Proportional Counter (any two points). **[8]**

b) Enlist the three types of particles emitted in Radioactive decay. Compare their properties /characteristics (any three points) Define the unit of radioactivity. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC1829

[Total No. of Pages : 2

[6353]-149
T.E. (Automobile)
NUMERICAL & OPTIMIZATION METHODS
(2019 Pattern) (Semester - I) (316481)

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) Find $y_{(1,3)}$ using Taylor Series method $\frac{dy}{dx} = x + y$ with $x = 1$, $y = 0$ and $h = 0.1$ Comparing with $\frac{dy}{dx} = f(x, y), y(x, 0) = y_0$ we can have $f(x,y) = x+y$, $x_0 = 1$, $y_0 = 0$, $x_n = 1.3$, $h = 0.1$. Prepare a table of x and y values. **[9]**

b) Solve the boundary value problem $\frac{d^2y}{dx^2} - 64y + 10 = 0$ Initial condition, $y(0) = 1$, $y(1) = 1$ take step size, $h = 1/3$ compute $y(1/3)$ and $y(2/3)$. **[8]**

OR

Q2) a) The relationship between x and y is given by $\frac{dy}{dx} + xy = 2$ Estimate y at $x = 5.1$ using 4th order Runge-Kutta method Assume $y = 2$ at $x = 5.0$ take step size of 0.05. **[9]**

b) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ for the following condition using Schmidt method at $x = 0$ and $x = 0.5$, $u = 1$ for all values of t at $u = 2x + 1$ for $0 < x < 0.5$. Take increment in x as 0.1 and increment in t as 0.01. Find all values of "u" for $t = 0$ to $t = 0.03$. **[8]**

Q3) a) Evaluate the integral $\int_0^{\pi} (5 + 3\sin x)dx$ using simpsons 3/8th rule. Take 6 equal subintervals. Calculate percentage error. **[9]**

b) Using Trapezoidal rule, evaluate $I = \int\int_1^2 \frac{dx\,dy}{(x+y)}$ taking four subintervals. **[9]**

OR

P.T.O.

Q4) a) Evaluate $I = \int_1^2 2x^2 / 1 + x^4$ using Simpson 3/8th Rule. **[9]**

b) Find double integration of $f(x,y) = x + y + 5$ for $x = 0$ to 2 and $y = 0$ to 2 and taking increment in both x and y as 0.5. Use trapezoidal rule. **[9]**

Q5) a) Expain Golden-section search method. **[4]**

b) Explain classification of optimization problem. **[4]**

c) Find the initial basic feasible solution for the Transportation Problem by Vogel'sapproximation method. **[9]**

	D1	D2	D3	D4	supply
O1	11	13	17	14	250
O2	16	18	14	10	300
O3	21	24	13	10	400
demand	200	225	275	250	450

OR

Q6) a) Explain Single variable unconstrained optimization. **[4]**

b) Using Newton method calculates the maximum value of the equation $2\sin x - 0.1x$ 2take initial guess 2.5 and do 3 iterations. **[4]**

c) Using golden section search method determine the maximum value of $f(x) = 2\sin x - 0.1x^2$ in the interval [0,4]. **[9]**

Q7) a) Explain Genetic algorithms. **[9]**

b) Explain Ant Colony optimization and also write its advantages, disadvantages and applications. **[9]**

OR

Q8) a) Explain particle swarm optimization and also write its advantages, disadvantages and applications. **[9]**

b) Explain Simulated annealing and also write its advantages, disadvantages and applications. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1830

[Total No. of Pages : 4

[6353]-150

T.E. (Automobile Engineering)

HEAT TRANSFER

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

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) Explain the significance of thermal boundary layer **[6]**

b) Explain the significance of following dimensionless numbers **[6]**

i) Prandtl number

ii) Reynold Number.

iii) Nusselt Number

c) Calculate appropriate Reynolds numbers and state if the flow is laminar or turbulent for the followings: **[5]**

i) The roof of coach 6 m long, travelling at 100 km/hr in air (ρ = 1.2 kg/m^3, μ=1.8 × 10^{-5} kg/ms)

ii) 0.05 kg/s of carbon dioxide gas at 400 K flowing in a 20 mm diameter pipe (μ = 1.97 × 10^{-5} kg/ms)

OR

Q2) a) Explain Local and Average heat transfer coefficient. **[6]**

b) Define the forced convection and give three practical examples of forced convection. **[5]**

c) Air at 20ºC is flowing along a heated plate at 134°C with a velocity of 3 m/s. The plate is 2m long. Heat transferred from first 40cm from the leading edge is 1.45 KW. Determine the width of the plate. **[6]**

Properties of air at 77°C: ρ=0.998 kg/m^3;

C_p=1.009KJ/KgK; ν=20.76×10^{-6} m^2/s; k=0.03W/mK

Use the following correlation

Nu_x=0.332 $Re^{0.5}$ $Pr^{0.33}$

P.T.O.

Q3) a) Write the characteristics dimension for following cases in natural convection. **[4]**

i) Vertical cylinder

ii) Horizontal cylinder

iii) Horizontal plate

iv) Sphere

b) Explain Mechanism of natural convection with example. **[4]**

c) A sheet metal air duct carries air-conditioned air at an average temperature of 10°C. The duct size is 320 mm × 200 mm and length of the duct exposed to the surrounding air at 30°C is 15 m long, Find the heat gain by the air in the duct. Assume 200 mm side is vertical surface and top surface of the duct is insulated. **[10]**

Use the following properties:

$Nu = 0.6 (GrPr)^{0.25}$ for vertical surface.

$Nu\ 0.27 (GrPr)^{0.25}$ for horizontal surface

Take the properties of the air at mean temperature of 20°C

$\rho = 1.204\ kg/m^3$; $\mu = 18.2 \times 10^{-6}\ Ns/m^2$; $\nu = 15.1 \times 10^{-6}\ m^2/s$;

k= 0.0256 W/mK and Pr=0.71.

OR

Q4) a) Differentiate between filmwise and drop wise condensation . Which type of condensation is desirable and which type of condensation occurs in actual? State. **[8]**

b) A nuclear reactor with its core constructed of parallel vertical plates 2.2 m high and 1 .4 m wide has been designed on free convection heating of liquid bismuth. The maximum temperature of the plate surface is limited to 960°C while the lowest allowable temperature of bismuth is 340°C. Calculate the maximum possible heat dissipation from both sides of each plate. For the convection coefficient, the approximate co relation is,

$Nu = 0.13 (Gr.\ Pr)^{0.333}$ ‘

Where, different parameters are evaluated at the means film temperature with standard notification. $\rho = 10000\ kg/m^3$, $\mu = 0.866 \times 10^{-3}$ kg/ms, Cp=150.7 J/kgK, k = 13.02 W/mK **[10]**

Q5) a) Draw labeled temperature profiles of the following types of heat exchangers. **[4]**

i) Parallel flow heat exchanger

ii) Counter flow heat exchanger

b) What do you mean by fouling in heat exchangers? State the causes of fouling. **[5]**

c) Consider the following parallel flow heat exchanger **[8]**

cold flow enters at 40°C: C_C= 20,000 W/K

hot flow enters at 150°C: C_h= 10,000 W/K

A=30m^2, U=500W/m^2K.

Determine the heat transfer rate and exit temperature

OR

Q6) a) What is LMTD for a heat exchanger? Derive an expression for LMTD of parallel flow heat exchanger. **[10]**

b) Explain working of a Heat pipe with Application **[7]**

Q7) a) Explain **[6]**

i) Planck's Law

ii) Wien's Displacement law

iii) Kirchhoff;s Law

b) Define Irradiation with their characteristics. **[4]**

c) Determine the heat lost by radiation per meter length of a 100 mm diameter pipe at 300°C if it is. **[8]**

i) Located in a large room of brick wall whose temperature is 20° C.

ii) Located in a 200 mm diameter brick conduit at a temperature of 20° C.

ε_{Pipe}=0.797, ε_{brick}0.93

(Assume length of pipe= 1 m)

OR

Q8) a) Define following surface Emission Properties **[6]**

i) Emissive power (E)

ii) Emissivity (ε)

iii) Monochromatic emissive power (e_λ)

b) Write a note on radiation shape factor. **[4]**

c) Two parallel planes with emissivity 0.6 are at 900 K and 300K. A radiation shield with side polished and having emissivity of 0.05, while emissivity of other side is 0.4 is proposed to be used. Which side of the shield to face the hotter plane, If the temperature of the shield kept to be minimum? Justify your answer. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PC1831

[Total No. of Pages : 2

[6353]-151
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) ***Assume suitable data if necessary.***

Q1) a) A square threaded power screw has a nominal diameter of 30 mm and pitch of 6 mm with double threads. The load on the screw is 6 KN and the mean diameter of thrust collar is 40 mm. The coefficient of friction for the screw is 0.1 and for the collar is 0.9. Determine the torque required to raise the load and torque required to lower the load. **[12]**

b) Derive an expression for torque required to lower the load in power screws. **[6]**

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) Write a short note on S-N diagram. **[7]**

b) Derive soderberg equation. **[10]**

OR

Q4) a) What are the causes of stress concentration and the methods to improve the same? **[10]**

b) A mass of 500Kg is being lowered by means of steel wire rope having cross sectional area 250mm^2. The velocity of weight is 0.5m/sec. When the length of extended rope is 20m, the sheave gets stuck up. Determine the stress induced in the rope due to sudden stoppage of sheave. Take E = 0.8×10^6Mpa. **[7]**

P.T.O.

Q5) a) Explain about herringbone gears with sketch. **[6]**

b) Design a pair of helical gears are to transmit 15KW at 10,000rpm of the pinion with PCD 80mm. The transmission ratio is 3:1. Assume α =20º FDI, β=45º. σ_d=193.2Mpa, BHN=250 for pinion and gear. Check only tangential tooth load. Y= π (0.154 – 0.912/Z_e), C_v=5.55/5.55+$V^{0.5}$ **[12]**

OR

Q6) a) Explain about spur gear nomenclature. **[6]**

b) A spur gear set to transmit 20 KW at 900rpm of pinion. The transmission ratio is 7/3:1. Take 20° FDI, Z_1=18, σ_d = 140Mpa for pinion and σ_d = 55Mpa for gear. The diameter of the pinion is 105 mm. Design number of teeth, module and face width for strength only.

Y= π (0.154 – 0.912/Z), C_v=3.05/3.05+V **[12]**

Q7) Worm & worm wheel is to transmit 10 KW with transmission ratio 20:1 and worm shaft rotates at 1440 rpm. Design the gear set. Assume single start square thread. Take σ_d= 207 Mpa, for worm and σ_d= 82.4 Mpa, for worm wheel. Form factor Y= π(0.154 – 0.912/Z). **[17]**

OR

Q8) A pair of bevel gears are connected by 20° full depth involute teeth. 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 σ_d=233.4 Mpa, BHN=200 for pinion and σ_d=172.6 Mpa, BHN=150 for gear. Form factor Y = π (0.154 – 0.912/Z_e), C_v= 6.1/6.1+V. **[17]**

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Total No. of Questions : 8]

SEAT No. :

PC1832

[Total No. of Pages :2

[6353]-152

T.E. (Automobile)

AUTOMOBILE ELECTRICAL AND ELECTRONICS

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

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 wherver necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Write down the Principle and Construction of starter motor. **[6]**

b) Explain with neat sketch the starter motor characteristics. **[6]**

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

OR

Q2) a) Explain the construction and working of alternator. **[8]**

b) Explain the working of Wind shield wiper. **[10]**

Q3) a) Write a short note on Injection timing control. **[5]**

b) Write down the design considerations of Starter Motor. **[5]**

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

OR

Q4) a) Write a short note on Steering wheel angle sensor. **[5]**

b) Explain working of Oil pressure gauge. **[5]**

c) What are the different types of actuators? Explain any one. **[7]**

P.T.O.

Q5) a) Explain with neat sketch Airflow rate sensor. **[5]**

b) Explain with neat sketch Motorized Actuators. **[5]**

c) What are the different types of Sensors? Explain any one. **[7]**

OR

Q6) a) Explain MPFI system with neat sketch. **[5]**

b) Write down the difference between cold start and warm start system. **[5]**

c) Write short note on CI Engine management system. **[7]**

Q7) a) Explain CRDI system with neat sketch. **[6]**

b) Explain Collision avoidance system with layout. **[6]**

c) Write short note on Smart Parking Assist System (SPAS). **[6]**

OR

Q8) a) Explain Radar warning system. **[6]**

b) What is Driver State monitoring? Explain in brief. **[6]**

c) Explain MPFI system with neat sketch. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC-1833

[Total No. of Pages : 2

[6353] - 153

T.E. (Automobile/Mechanical Engineering)

ADVANCED FORMING AND JOINING PROCESSES

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

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***All questions are compulsory i.e. 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 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

P.T.O.

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]**

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. : ____

PC-1834

[Total No. of Pages : 2

[6353]-154
T.E. (Mechanical) (Automobile Engineering)
MACHINIGN SCIENCE & TECHNOLOGY
(2019 Pattern) (Semester - I) (302045-B) (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) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain and classify grinding wheels selection factors. **[10]**

b) Explain any one lapping process with neat sketch and state its applications. **[7]**

OR

Q2) a) Explain Ball burnishing process with neat sketch. State its advantage and applications. **[10]**

b) Explain grinding wheel designation : 35–A–46–M–3–S–33 **[7]**

Q3) a) Compare of jigs and fixtures with minimum five points. Write industry significance for jig and Fixture.(Minimum Five points) **[10]**

b) With neat sketch describe the concept of degree of freedom. Explain the six point location principle with neat sketch. **[8]**

OR

Q4) a) Write any six principles of clamping and draw labeled sketch of strap clamp. **[10]**

b) Explain with neat sketch inspection fixture. **[8]**

Q5) a) Evaluate the phase of drawing interpretation in proces planning activity.**[9]**

OR

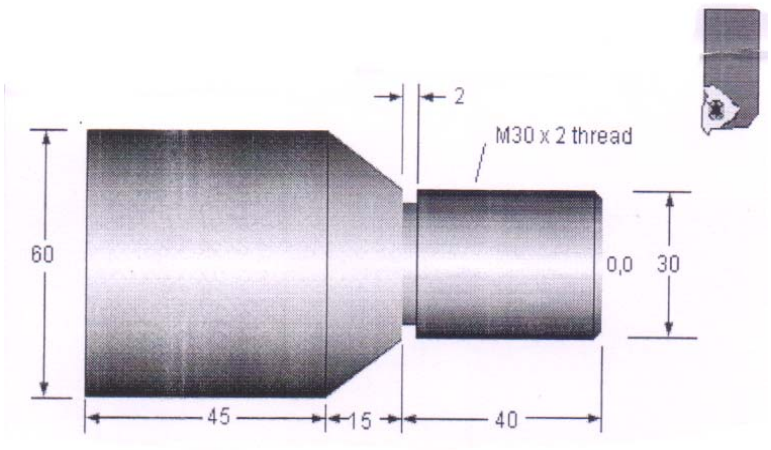
b) Explain production equipment & tooling selection in process planning.**[8]**

P.T.O.

Q6) a) Two different types of machining processes process-1 and process-2 can be used for the same job. Evaluate economics of process planning and selection of optimal process for this case. **[9]**

b) Explain with flowchart process selection in process planning. **[8]**

Q7) a) Generate CNC part programming for the below part which requires only threading operation as shown. **[10]**



b) Explain the steps involved in CNC part programming. **[8]**

OR

Q8) a) Explain with neat diagram Linear interpolation and Circular interpolation methods used for CNC part program. **[10]**

b) "Tool length Compensation in CNC part programming is necessary." Explain the statement with neat diagram. **[8]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. :

PC1835

[Total No. of Pages :3

[6353]-155

T.E. (Automobile Engg.)

AUTOMOTIVE REFRIGERATION AND AIR CONDITIONING

(2019 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.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figure 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 physiological hazards resulting from heat. **[6]**

b) Explain factors affecting Effective temperature. **[6]**

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

OR

Q2) a) Explain different types of Air Filters. **[6]**

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

c) Explain temperature control systems. **[6]**

Q3) a) Define following Psychrometric Properties. **[8]**

i) WBT
ii) Dew point depression
iii) Partial pressure of water vapour
iv) Relative humidity

b) A sling psychrometer has following readings;
DBT = 30°C; WBT = 20°C and barometer reading = 740 mm of Hg. 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.

OR

P.T.O.

Q4) a) Explain in detail sensible heating and sensible coiling processes. **[10]**

b) 800 m^3/min of recirculated air at 22°C DBT and 10°C DPT is to be mixed with 300 m^3/min of fresh air at 30°C DBT and 50% RH. Determine enthalpy, specific humidity and DPT of mixture. **[7]**

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

Outside design condition : 35°C DBT, 27°C WBT

Room design condition : 26°C DBT, 19°C WBT

Room sensible heat gain : 11.1 kW

Room latent heat gain : 3.9 kW

By-pass factor of colling coil used = 0.2

The 25% fresh air by mass is mixed with 75% return air before entry to cooling coil. Determine :

a) ADP of cooling col

b) Supply air DBT and WBT

c) Moisture removed by cooling coil

d) Refrigeration load on cooling coil.

OR

Q6) 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 colling 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 :

a) ADP of cooling col

b) Supply air temperature

c) Fresh air mass flow rate

d) Refrigeration load on cooling coil.

Q7) a) Explain Refrigerant Handling. **[6]**

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

c) Explain refrigerant charging. **[5]**

OR

Q8) a) Explain initial vehicle inspection. **[6]**

b) Explain Odour removal in AC. **[6]**

c) Explain Automotive AC system flushing. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC1836

[Total No. of Pages :2

[6353]-156

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) ***Draw the neat sketches wherever required***

Q1) a) Explain the basic requirements of wheels. **[8]**

b) Explain the construction of Pressed Steel Disc wheel neat sketch. **[10]**

OR

Q2) a) Explain self energizing brake with neat sketch. **[10]**

b) Explain the following. **[8]**

i) Brake fade

ii) Stopping distance

iii) Brake balance

iv) Brake torque

Q3) a) Explain the construction and working of Electromagnetic clucth with neat sketch. **[10]**

b) What are the functions and requirements of clutch? **[7]**

OR

Q4) a) Explain the working of sliding mesh gearbox with neat sketch. **[10]**

b) What are the resistances the vehicle has to face? Explain. **[7]**

P.T.O.

Q5) a) List out the types OF Axle & Explain Semi - Floating axle. **[10]**

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

OR

Q6) a) Explain the need of differential in vehicle & Explain about differential locking. **[10]**

b) Explain about Non slip differential and differential lubrication. **[8]**

Q7) a) Discuss the construction and working of fluid flywheel with sketch. **[10]**

b) Explain the construction & working of Wilson epicyclic gear train. **[7]**

OR

Q8) a) Explain semi - automatic transmission with features. **[10]**

b) What are advantages and disadvantages of CVT? **[7]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1837

[Total No. of Pages : 4

[6353]-157

T.E. (Automobile)

DESIGN OF ENGINE COMPONENT

(2019 Pattern) (Semester - II) (316487)

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) Explain with a neat diagram the valve gear mechanism for vertical engine. **[7]**

b) The conical valve of an I.C. engine is inside a valve port of 46 mm diameter and is subjected to a maximum gas pressure of 3.5 N/mm^2. The safe stress in bending for the valve material is 50 MPa. The valve is made of steel for which k = 0.42. The angle at which the valve disc seat is tapered is 45°. **[10]**

Determine:

i) Width of valve seat;
ii) Valve head diameter;
iii) Thickness of the valve head;
iv) Stem diameter; and,
v) Maximum lift of the valve.

OR

Q2) a) What are the functions of automobile cooling systems? **[6]**

b) The lubricating oil from a diesel engine flows through an oil cooler at the rate of 5.5 liters per minute. If the oil enters the cooler at a temperature of 355K and leaves the cooler to enter the engine at 283 K, how much heat energy is extracted from the oil per second? Assume specific heat capacity of oil = 200 J/kg K and Mass of 1 litre of the oil = 0.85 kg. **[5]**

c) Explain splash type of lubrication system used in IC Engines. **[6]**

P.T.O.

Q3) a) Differentiate between Flywheel and Governor. **[4]**

b) A machine is driven by a motor, which exerts a constant torque. The resisting torque of the machine increases uniformly from 500 N-m to 1500 N-m through a 360° rotation of the driving shaft and drops suddenly to 500 N-m again at the beginning of the next revolution. The mean angular velocity of the machine is 30 rad/s and the coefficient of speed fluctuations is 0.2. A solid circular steel disk, 25 mm thick, is used as flywheel. The mass density of steel is 7800 kg/m^3 while Poisson's ratio is 0.3. Calculate the outer radius of the flywheel disk and the maximum stresses induced in it. **[13]**

OR

Q4) a) The turning moment diagram for a petrol engine is drawn to the following scales: Turning moment, 1 mm = 5 N-m; Crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line, taken in order are 295, 685, 40, 340, 960, 270 mm^2. Determine the mass of 300 mm diameter flywheel rim when the coefficient of fluctuation of speed is 0.3% and the engine runs at 1800 r.p.m. Also determine the cross-section of the rim when the width of the rim is twice of thickness. Assume density of rim material as 7250 kg / m^3. **[14]**

b) State different types of stress in Flywheel. **[3]**

Q5) a) Explain Hydrodynamic lubrication with neat diagram. **[8]**

b) The following data is given for a 360° hydrodynamic bearing : radial load = 3.2 kN, journal speed = 1490 rpm, journal diameter = 50 mm, bearing length = 50 mm, radial clearance = 0.05 mm, viscosity of lubricant = 25 cP Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing, calculate: (i) coefficient of friction: (ii) power lost in friction; (iii) minimum oil film thickness; (iv) flow requirement in litres/min; and (v) temperature rise. **[10]**

$\left(\frac{l}{d}\right)$	ε	$\left(\frac{h_o}{c}\right)$	S	ϕ	$\left(\frac{r}{c}\right)f$	$\left(\frac{Q}{rcnl}\right)$	$\left(\frac{Q_s}{Q}\right)$	$\left(\frac{p}{p_{max}}\right)$
∞	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

OR

Q6) a) Explain dynamic load carrying capacity of bearing. **[6]**

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 shaft rotates at 1200 rpm. The expected life L_{10h} of the bearing is 20000 h. The minimum acceptable diameter of the shaft is 75 mm. Select a suitable ball bearing for this application. Assume initial trial value from table as Y = 1.5 for $\left(\frac{F_a}{F_r}\right) > e$.

[12]

X and Y factors for single-row deep groove ball bearings

$\left(\frac{F_a}{C_0}\right)$	$\left(\frac{F_a}{F_r}\right) \le e$		$\left(\frac{F_a}{F_r}\right) > e$		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

Principal bearing dimensions			Basic load ratings		Designation
Inner diameter d(mm)	Outer Diameter D (mm)	Width B (mm)	Dynamic load capacity C (N)	Static load capacity C_o (N)	
75	130	25	66300	40500	6215
	160	37	112000	72000	6315
	190	45	153000	114000	6415

Q7) a) State cylinder arrangement in multi-cylinder engines with neat sketch. **[8]**

b) The cylinder of a four-stroke diesel engine has the following specifications: Brake power = 3.75 kW, Speed = 1000 rpm, Indicated mean effective pressure = 0.35 MPa, Mechanical efficiency = 80%, length of stroke to bore diameter ratio =1.5. Determine the bore diameter, length of the stroke and speed of piston. **[10]**

OR

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

a) Mechanical fuel pump testing,

b) Distributor dwell-angle

c) Oscilloscope engine analyzers

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Total No. of Questions : 8]

SEAT No. :

PC-1838

[Total No. of Pages :2

[6353]-158

T.E. (Automobile Engineering)

Automotive Aerodynamics and Body Engineering (Elective - II)

(2019 Pattern) (Semester - II) (316488 - 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.7or Q8.***
2) ***Figures to the right side indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Write down the Fundamentals of wind tunnel technique. **[9]**

b) Explain in details about. **[9]**

i) Large full-scale wind tunnels

ii) Small full-scale wind tunnels

iii) Climatic tunnels

OR

Q2) a) Discuss the effect of aerodynamic noise on the motion of a road vehicle. **[9]**

b) Write a Note on CFD methodology — Application to vehicle aerodynamics. **[9]**

Q3) a) What are the methods of improving space in cars? Discuss. **[8]**

b) Write down the Methods of improving visibility. **[9]**

OR

Q4) a) Describe Sheet metal as auto body material with its advantages and disadvantages. **[8]**

b) List out the points to be considered while designing a driver's seat. **[9]**

P.T.O.

Q5) a) What are the possible locations of engine in a bus body layout? **[8]**

b) Describe the dimensions of driver seat in relation to control. **[9]**

OR

Q6) a) Write a Note on design of chassis frame. **[8]**

b) Explain the constructional details of a conventional bus body. **[9]**

Q7) a) List out the points to be considered for Impact protection from steering controls. **[9]**

b) Describe the symmetric & asymmetric vertical loads in car. **[9]**

OR

Q8) a) What is the Use of energy absorbing system in automobiles? Explain in detail. **[9]**

b) Write down the importance of Bumper in automobile. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1839

[Total No. of Pages :2

[6353]-159

T.E. (Automobile Engineering)

Automotive Materials

(2019 Pattern) (Semester - II) (316488 - B) (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.7or Q8***
2) ***Figures to the right side indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Describe the Spray up process. **[9]**

b) Explain the Reinforcement of fibres in composites. **[8]**

OR

Q2) a) Compare Pultrusion with Compression moulding. **[9]**

b) Explain the Resin transfer moulding. **[8]**

Q3) a) Discuss the sequences of application of paint on automotive body. **[9]**

b) Explain the properties and composition of glass. **[9]**

OR

Q4) a) Describe the use of nanoparticles in paints to make them self- cleaning. **[9]**

b) Explain the various approaches in tempering of glass for shatter resistance. **[9]**

Q5) a) Explain the Electro- or magneto-rheological engine mounts. **[9]**

b) Explain the powder metallurgy process for making disc brake pads. **[8]**

P.T.O.

OR

Q6) a) Describe the use of ceramics as fuel injectors in automotive engines. **[9]**

b) Discuss the use of ER fluids in dampers in automobiles. **[8]**

Q7) a) Describe the materials developments by Land Rover. **[9]**

b) Explain the criteria for selection of materials for different systems in automobiles. **[9]**

OR

Q8) a) Discuss the Ashby charts. **[9]**

b) Explain the developments in materials by Honda. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC1840

[Total No. of Pages : 3

[6353]-160
T.E. (Mechanical - Sandwich engg.)/(Mechanical engg.)
NUMERICAL & STATISTICAL METHODS
(2019 Pattern) (Semester - I) (302041)

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) ***Use of scientific calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Solve $\int_0^{\frac{\pi}{2}} e^{\sin x} dx$ using three-point Gauss Legendre formula. **[8]**

b) Evaluate $\int_6^{14}\int_1^5 (x-y+1)\,dx\,dy$ using Simpson's 1/3rd rule with number of strips for x & y equal to 4. **[10]**

OR

Q2) a) Evaluate $I = \int_1^2 \frac{\sin x}{x} dx$ using Simpson's 3/8th rule with 6 equal subintervals. **[8]**

b) Draw the flowchart of Simpsons 1/3rd Rule. **[5]**

c) Solve $I = \int_0^{\pi} \sin x\,dx$ using Trapezoidal rule. Take $n = 6$. **[5]**

Q3) a) Draw a flow chart to fit data in a power equation of type $y = ax^b$. **[5]**

b) A material is tested for cyclic fatigue failure whereby a stress in N/mm^2, is applied to the material and the number of cycles needed to cause failure is measured. The results are in table below:

N, cycles	1	10	100	1000	10000	100000	1000000
Stress, (N/mm^2)	1131	1058	993	801	651	562	427

When a log-log plot of stress versus cycles is generated, the data trend shows linear relationship (Straight line). Use the method of least squares to find the equation of the straight line. **[8]**

c) Draw flowchart for Lagrange interpolation method. **[5]**

OR

P.T.O.

Q4) a) A set of x values and respective y values are given below. Using Lagrange interpolation method, find the value of x *at* y =0.42 and y at x =17. **[8]**

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

b) Kinematic Viscosity of water (v) is related to temperature (T) in the following manner: **[10]**

T(ºC)	0	4	8	12	16	20	24
v $(10^{-2}m^2/sec)$	1.7923	1.5676	1.3874	1.2396	1.1168	1.0105	0.9186

Use method of least squares to fit the parabolic equation of the form $v = a+bT+cT^2$ for the data. Use Gauss elimination method to solve the simultaneous equations for a,b and c.

Q5) a) Calculate the first four moments about the mean of the given distribution. Also find β1 and β2. **[8]**

x	2.0	2.5	3.0	3.5	4.0	4.5	5.0
f	4	36	60	90	70	40	10

b) Ten competitors in a musical test were ranked by three judges in the following order. **[9]**

1st judge	1	6	5	10	3	2	4	9	7	8
2nd judge	3	5	8	4	7	10	2	1	6	9
3rd judge	6	4	9	8	1	2	3	10	5	7

Use rank correlation coefficient to discuss which pair of judges has nearest approach to common liking in music.

OR

Q6) a) Compute Karl Pearson's coefficient of correlation for the following heights in inches of fathers (x) and their sons (y). **[9]**

X	65	68	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

b) Discuss the following terms **[8]**

i) Coefficient of variation

ii) Central moments

iii) Skewness

iv) Kurtosis

Q7) a) Find the probability that a leap year has 52 Sundays. **[8]**

b) Three bags contain 3 red, 7 black: 8 red, 2 black, and 4 red & 6 black balls respectively. 1 of the bags is selected at random and a ball is drawn from it. If the ball drawn is red, find the probability that it is drawn from the third bag. **[9]**

OR

Q8) a) In a distribution of 'NSM' marks exactly normal, 10% of students are under 40 and 5%are over 80. Find the mean and standard deviation of the distribution. [$A_1 = 0.4$, $Z_1 = 1.29$, $A_2 = 0.45$, $Z_2 = 1.65$] **[9]**

b) A can hit the target 1 out of 4 times, B can hit the target 2 out of 3 times and C can hit the target 3 out of 4 times. Find the probability of **[8]**

i) at least two hit the target

ii) At most two hit the target

iii) No one hitting the target

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Total No. of Questions : 8]

SEAT No. : ____

PC1841

[Total No. of Pages : 4

[6353]-161

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

HEAT AND MASS TRANSFER

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

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.7or 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) Differentiate between Thermal Boundary layer and Hydrodynamic boundary layer. **[6]**

b) Explain significance of Nusselt number. **[2]**

c) Light oil in a tank is maintained at a temperature of 35°C by means of steam condensing in a 3.5 cm diameter coil immersed in the tank. The steam maintains the coil surface temperature at 95°C. Assuming the coil pipes to be horizontal cylinder, determine the outside surface heat transfer coefficient. The properties of oil at 65°C are density, ρ = 855kg / m^3, Specific heat C_p = 2005 J/kg K, K = 0.133W/mK, dynamic viscosity μ=0.00827 Ns/m^2, β =7.2 × 10^{-4} K^{-1}. **[10]**

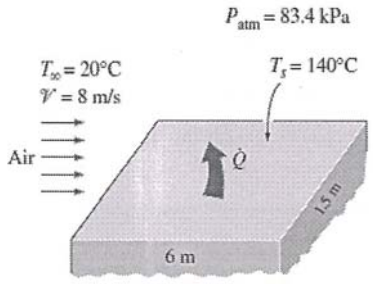
Use following Correlation $Nu = 0.53 (Gr.Pr)^{0.25}$.

OR

P.T.O.

Q2) a) Explain pool boiling and Regimes of pool boiling. **[8]**

b) The local atmospheric pressure in Denver, Colorado (elevation 1610 m), is 83.4 kPa. Air at this pressure and 20°C flows with a velocity of 8 m/s over a 1.5 m × 6 m flat plate whose temperature is 140°C (Figure). Determine the rate of heat transfer from the plate if the air flows parallel to the (i) 6 m long side and (ii) the 1.5 m side. **[10]**



Properties . k = 0.02953 W/m °C Pr = 0.7154 $\upsilon_{@}$ 83.4kPa =2.548 × 10^{-5} m^2/s Use the Correlation for Turbulent Flow $Nu=(0.037\ Re_L^{0.8} - 871)Pr^{1/3}$

Q3) a) Explain the following. **[10]**

i) Stefan's Boltzmann's law

ii) Wiens Displacement law

iii) Kirchoffs law

iv) Plank's law

b) A sphere of radius 5cm is concentric with another sphere. Find the radius of the outer sphere so that the shape factor of outer sphere with respect to the inner sphere is 0.6. Let shape factor of inner with respect to the outer sphere is 1. **[7]**

OR

Q4) a) What do you understand by surface resistance and space resistance?**[8]**

b) Determine the radiant heat exchange in W/m^2 between two large plates of emissivities 0.8 and 0.3 held at temperatures of 1000 K and 500 K respectively, if a thin copper plate of emissivity 0.1 is introduced as a radiation shield between the two plates. Use σ = 5.67 × 10^{-3} W/m^2K^4**[9]**

Q5) a) Define: **[8]**

i) Mass Diffusion velocity
ii) Molar Diffusion velocity
iii) Mass Diffusion Flux
iv) Molar Diffusion Flux

b) A steel rectangular container having walls 16mm thick is utilized to store hydrogen gas at elevated pressure. The molar concentrations of hydrogen in the steel at the inside and outside surfaces are 1.2 kg mole/m^3 and zero respectively. Assuming the diffusion coefficient for hydrogen in steel as 0.248×10^{-12} m^2/s, Calculate the molar diffusion flux for hydrogen through the steel. **[9]**

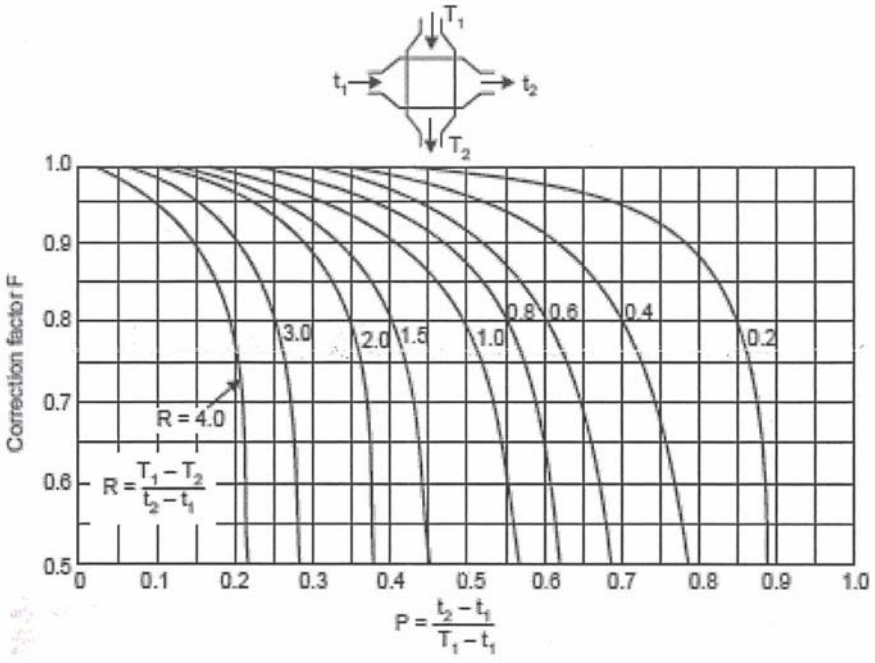
OR

Q6) a) State and explain Fick's law for mass diffusion. **[8]**

b) Pipe carrying ammonia at 1 bar and 40° C is vented into a large tank containing dry air at 1 bar and 40° C to avoid pressure build up. The pipe is 5 mm in diameter and 5 m long. Determine the rate of diffusion of air into the ammonia stream. Take D= 0.28×10^{-4} m^2/s as diffusion coefficient or mass diffusivity. **[9]**

Q7) a) Derive an expression for LMTD of a Parallel flow heat exchanger. **[8]**

b) A cross flow heat exchanger with both fluids unmixed is used to heat water flowing at a rate of 20 kg/s from 25°C to 75°C using gases available at 300°C to be cooled to 180°C. The overall heat transfer coefficient has a value of 95 W/m^2K. Determine the area required and mass flow rate of air. For gas C_p = 1005 J/kgK. **[10]**



OR

Q8) a) Define following terms. **[10]**

i) Fouling factor

ii) Capacity ratio

iii) Effectiveness

iv) NTU

v) Over all heat transfer coefficient

b) In a counter-flow double pipe heat exchanger; water is heated from 25°C to 65 by oil with a specific heat of 1.45 kJ/kg K and mass flow rate of 0.9 kg/s. The oil is cooled 230 °C to 160 °C. If the overall heat transfer coefficient is 420 W/m^2°C, calculate the following **[8]**

i) The rate of heat transfer

ii) The mass flow rate of water and

iii) The surface area of the heat exchanger.

Total No. of Questions : 8]

SEAT No. :

PC1842

[Total No. of Pages : 4

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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 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) Explain self-locking and overhauling conditions of power screw. **[6]**

b) A machine vice, as shown in Fig. 1 has single-start, square threads with 22 mm nominal diameter and 5 mm pitch. The outer and inner diameters of the friction collar are 55 and 45 mm respectively. The coefficients of friction for thread and collar are 0.15 and 0.17 respectively. The machinist can comfortably exert a force of 125 N on the handle at a mean radius of 150 mm. Assuming uniform wear for the collar, calculate; **[12]**

i) the clamping force developed between the jaws; and

ii) the overall efficiency of the clamp.

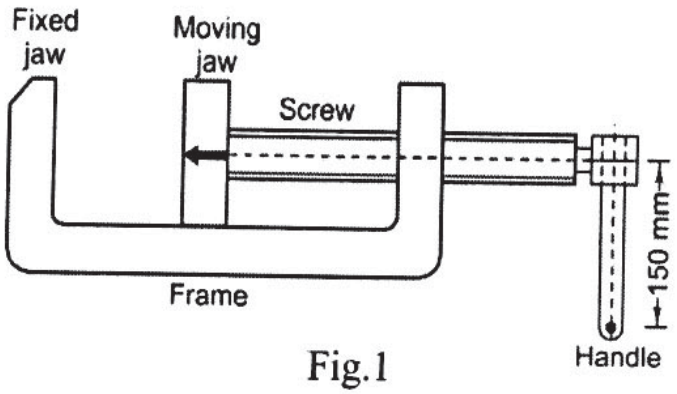

Fig.1

OR

P.T.O.

Q2) a) Derive an expression for efficiency of self-locking screw for square thread. **[6]**

b) The nominal diameter of a triple-threaded square screw is 50 mm, while the pitch is 8 mm. It is used with a collar having an outer diameter of 100 mm and inner diameter as 65 mm. The coefficient of friction at the thread surface as well as at the collar surface can be taken as 0.15. The screw is used to raise a load of 15 kN.Using the uniform wear theory for collar friction,Calculate: **[12]**

i) torque required to raise the load;

ii) torque required to lower the load; and

iii) the force required to raise the load, if applied at a radius of 500 mm.

Q3) a) Explain with neat sketch Modified Goodman diagram. **[5]**

b) A forged steel bar, 50 mm in diameter, is subjected to a reversed bending stress of 250N/mm^2. The bar is made of steel 40C8 (S_{ut} = 600 N/mm^2). Calculate the life of the bar for a reliability of 90%. Assume Surface finish factor K_a = 0.44, For 50 mm diameter, K_b = 0.85 For 90% reliability, K_c = 0.897. **[12]**

OR

Q4) a) Draw time- stress curves for fluctuating stress, completely revered stress. **[5]**

b) A cantilever beam made of cold drawn steel 20C8 (Sut = 540 N/mm^2) is subjected to a completely reversed load of 1000 N as shown in Fig 2. The notch sensitivity factor 'q' at the fillet can be taken as 0.85 and the expected reliability is 90%. Determine the diameter 'd' of the beam for a life of 10000 cycles. Assume surface finish , size and reliability factors are 0.78,0.85 and 0.897 respectively. Also assume K_t = 1.35. **[12]**

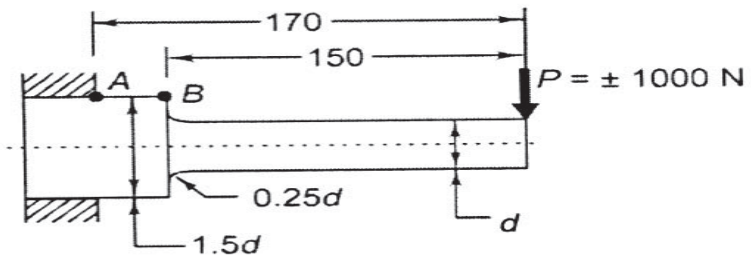

Fig 2.

Q5) a) Write a note on bolt of uniform strength and explain the methods for achieving bolts of uniform strength. **[5]**

b) A steel plate subjected to a force of 5 kN and fixed to a channel by means of three identical bolts is shown in Fig.3. The bolts are made from plain carbon steel 45C8 (S_{yt} = 380 N/mm^2) and the factor of safety is 3. Specify the size of bolts. **[12]**

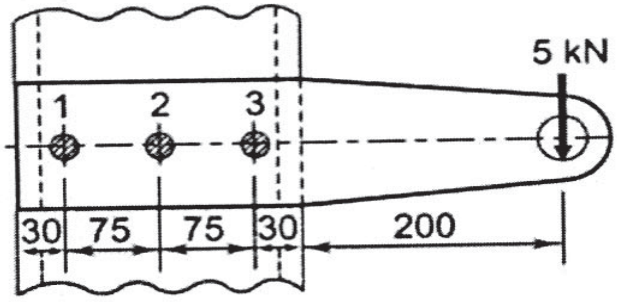

Fig.3

OR

Q6) a) Explain with suitable sketch the type of fillet joints. **[5]**

b) A steel plate, 100mm wide and 10 mm thick, is joined with another steel plate by means of single transverse and double parallel fillet welds, as shown in Fig.4 The strength of the welded joint should be equal to the strength of the plates to be joined. The permissible tensile and shear stresses for the weld material and the plates are 70 and 50 N/mm^2 respectively. Find the length of each parallel fillet weld. Assume the tensile force acting on the plates as static. **[12]**

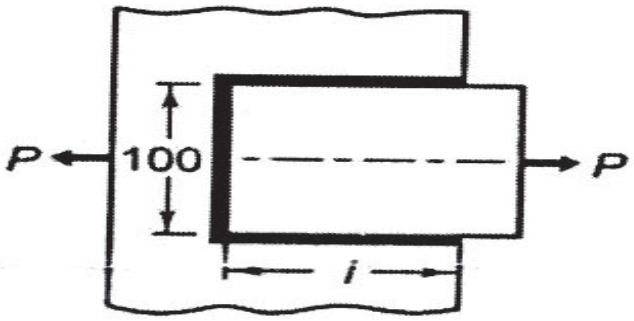

Fig.4

Q7) a) Explain the following terms related to the helical compression spring along with the equations required to calculate it. **[6]**

i) Solid Length

ii) Compressed length

iii) Free Length

b) Derive load- stress and load- deflection equations for helical compression spring. **[12]**

OR

Q8) a) Explain resultant stiffens of springs for parallel and series connections.**[6]**

b) A helical compression spring, made of circular wire, is subjected to an axial force, which varies from 2.5 kN to 3.5 kN. Over this range of force, the deflection of the spring should be approximately 5 mm. The spring index can be taken as 5. The spring has square and ground ends. The spring is made of patented and cold-drawn steel wire with ultimate tensile strength of 1050 N/mm^2 and modulus of rigidity of 81370 N/mm^2. The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength **[12]**

Design the spring and calculate;

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) required spring rate.

❋ ❋ ❋

Total No. of Questions : 8]

SEAT No. :

PC1843

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

MECHATRONICS

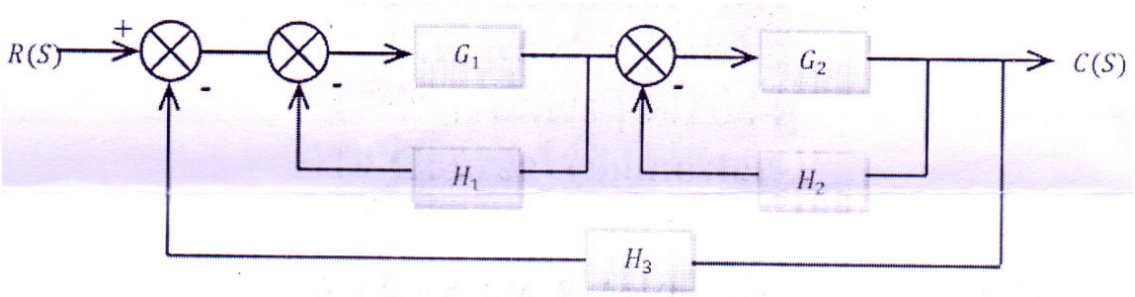
(2019 Pattern) (Semester-I) (302044)

Time : 2 ½Hours] *[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 electronic pocket calculator is allowed.***

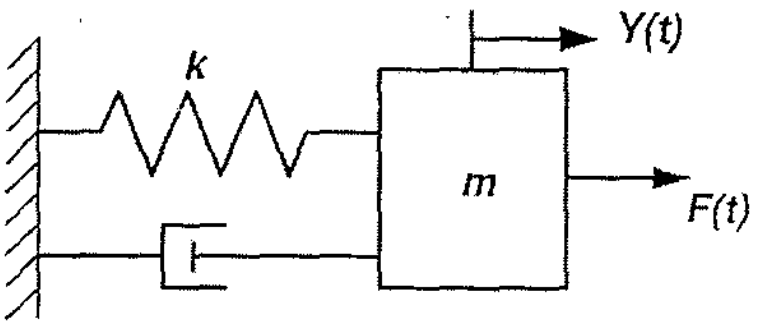
Q1) a) Find Overall Transfer Function For Following Block Diagram Representation using Block Diagram Reduction Technique. **[10]**



b) Differentiate Between Open Loop and Closed Loop Control System.**[7]**

OR

Q2) a) For the System Shown in Fig. Assume m=mass=1 kg, k=stiffness=2N/m, and d=damping =0.5 Ns/m. Also, F- Force input in N and Y= Displacement output in m. For this system **[10]**



P.T.O.

i) Derive transfer function Y(s)/ F(s)

ii) Identify the location of poles and zeros

iii) Comment on stability of the system.

b) Using a suitable block diagram explain the application of a closed loop control system in temperature control in household refrigerator. **[7]**

Q3) a) For The Transfer Function $G(s)=\frac{200}{s^2+2s+200}$, Find Peak Time, Rise Time, Delay Time, Settling Time **[10]**

b) Define the Following Terms and Draw Transient Response mentioning following terms for second order mechanical system. **[8]**

i) Delay Time

ii) Rise Time

iii) Peak Time

iv) Peak Overshoot

v) Settling Time

OR

Q4) a) The Transfer Function of a system is $\frac{C(s)}{R(s)}=\frac{1}{(s+3+7j)(s+3-7j)}$, Draw the pole zero plot and Find Following for Unit Step input **[10]**

i) Damping Ratio

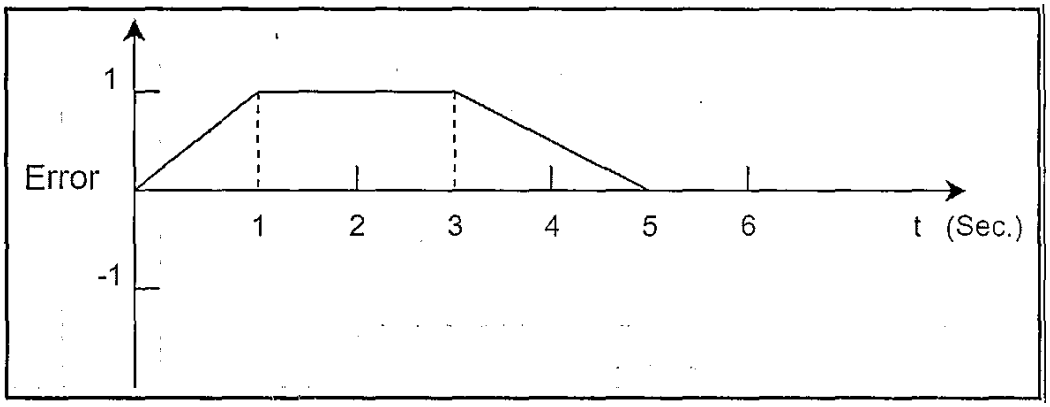
ii) Damped Natural Frequency

iii) Settling Time

iv) Peak Time

b) Differentiate Time Response Analysis and Frequency Response Analysis. **[8]**

Q5) a) Fig. shows an error time graph. Sketch PD Controller Output w.r.t. time Kp=5, Kd=0.5 %/sec. and P(0)=30 %. **[10]**



b) Draw a suitable diagram and Derive equation of PID(Proportional ,Integral and Derivative) Controller Output in parallel form. **[7]**

OR

Q6) a) The equation of error is $e=0.5\,t+0.03t^2$. With $K_p=5$, $K_D=0.5$ and P(0)=50 %. Sketch the graph of the controller output Vs time for Proportional Derivative Controller (Parallel Form) From t=0 to t=2 sec. **[10]**

b) Using 'Suitable block diagram, Explain the working of PI Controller with its advantages. **[7]**

Q7) a) Develop Ladder Diagram to meet Following Objectives: **[10]**

Given 2 push to ON buttons(PB1, PB2) Red and green lamps,

i) When PB1 is pushed, RED lamp should be ON and it will continue to be ON till PB2 is pushed.

ii) When PB2 is pushed GREEN lamp should be ON and it will continue to be ON till PB1 is pushed.

iii) If PBl and PB2 both are pushed simultaneously both light should be OFF.

b) Draw a suitable block diagram and explain architecture of a PLC. **[8]**

OR

Q8) a) Given four normally open switches (P1, P2 ,S1 & S2) ,with DC motor (M) write a PLC Program to satisfy following objectives. **[10]**

i) When P1(Start Button) is pushed the Cycle Shall Start. The Cycle Shall continue to remain ON until P2(Stop Button) is pushed.

ii) When S1 is pushed and S2 is not pushed then Motor is ON clockwise direction.

iii) When S2 is pushed and Sl is not pushed then Motor is ON in counter clockwise direction.

iv) When P2 is pushed the program stops.

b) Write a short note on following in context with PLC. **[8]**

i) Counters

ii) Latching

Total No. of Questions : 8]

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T.E. (Mechanical)

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

(2019 Pattern) (Semester- II) (302049)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

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

Q1) a) Explain the concept of a random forest classifier. Discuss how it works and why it is considered a powerful ensemble learning technique. **[8]**

b) Discuss the limitations and challenges of the K-Means Clustering algorithm. How does it work? Provide examples of scenarios where K-Means may not perform well. **[9]**

OR

Q2) a) Explain the Principle & Working of Logistic Regression with neat Sketch & State its Advantages & Disadvantages. **[8]**

b) Given following dataset, Find out it is likely that Blue Jeans from Brand X would be on Sale Using Rayes Classifier. **[9]**

Colour	Cloth Type	Brand	On Sale?
Blue	Jeans	Y	Yes
Blue	Shirt	X	No
Blue	Jeans	Y	Yes
Black	Jeans	Y	Yes
Black	Jeans	X	No
Black	Shirt	X	Yes
Black	Shirt	Y	Yes
Blue	Jeans	Y	No
Black	Jeans	X	Yes
Blue	Shirt	X	Yes

P.T.O.

Q3) a) Explain the steps involved in the development of the ML (Classification or Regression) model. **[10]**

b) Explain different performance evaluators used for interpretation/ assessment of classification models. Explain 2×2 confusion matrix and explain its terminology. Explain Cohen's Kappa, F Score, ROC Curve.**[8]**

i) Accuracy

ii) Precision

iii) Recall

iv) F1 Score

OR

Q4) a) From the below confusion matrix, determine accuracy, recall,precision,F 1-score, True Positive Rate (TPR), False Positive Rate (FPR), True Negative Rate (TNR), and False Negative Rate (FNR). Interpret the Result: **[10]**

		Actual Values	
		1	0
Predicted Values	1	540	150
	0	110	200

b) What is meant by "Hyper parameter tuning" and how it is used to make a machine learning algorithm work better? Explain tuning of Hyper parameters for any one specific algorithm. **[8]**

Q5) a) What is Convolutional Neural Network (CNN)?Explain activation functions in CNN? **[10]**

b) Explain working of deep learning with an example and list out its advantages and disadvantages. **[8]**

OR

Q6) a) A neuron with 4 inputs has the weights 0.3, 0.2, 01, 0.5 and bias 0. The activation function is linear, say the function $f(x) = 2x$. If the inputs are 0.8, 0.3, 0.2, 0.1 compute output and compare it with a neuron with same input parameters but with tanh and sigmoid activation function and interpret the result. **[10]**

b) Write a short note on **[8]**

i) Markov Decision Process

ii) Artificial Neural Network

Q7) a) Explain any one mechanical engineering application where image-based classification can be adopted. **[8]**

b) Explain human and machine interaction. **[9]**

OR

Q8) a) How AI & ML used for Material Inspection with example? **[8]**

b) Explain in detail how machine learning is used for fault detection in the manufacturing industry. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC1845

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T.E. (Mechanical Engg.)

COMPUTER AIDED ENGINEERING

(2019 Pattern) (Semester-II) (302050)

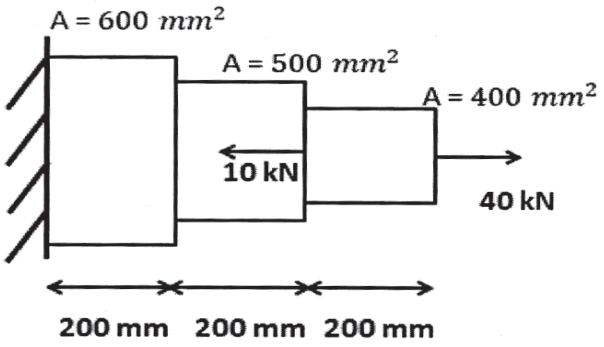
Time : 2 ½Hours] *[Max. Marks : 70*

Instructions to the candidates:

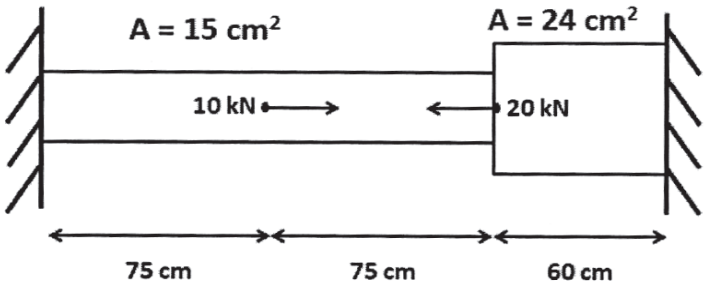
1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat Diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) A stepped bar as shown in figure. Find the nodal displacement, element stress and support reaction. **[12]**

Consider E = 200 GPa



b) For a stepped bar as shown in figure determine load vector (Force matrix). **[6]**



Consider:

$$E = 20 \times 10^6 N / cm^2$$

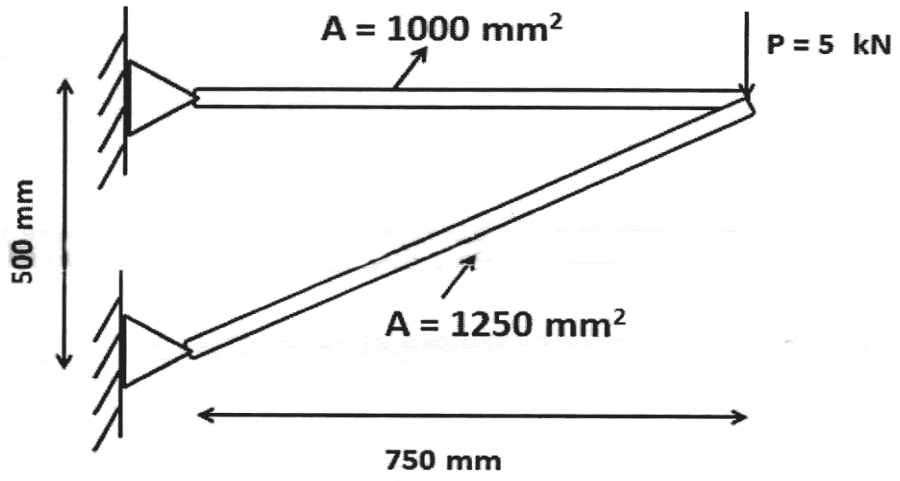
$$\Delta t = 10\ ^{o}C$$

$$\alpha = 11 \times 10^{-6} cm / cm\ ^{o}C$$

OR

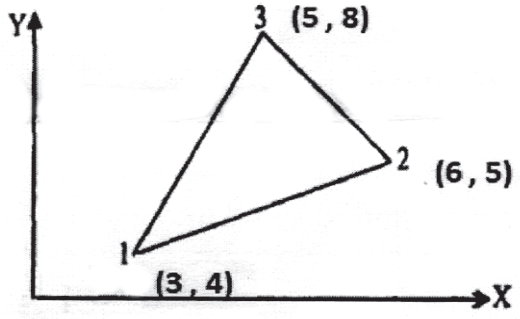
P.T.O.

Q2) a) The loading and other parameters for a two bar truss element is shown in below figure. Determine nodal displacement for it. Consider E = 200 GPa **[12]**



b) State and explain the concept of minimum potential energy approach.**[6]**

Q3) a) Determine element strains for the CST element as shown in figure **[12]**



The nodal displacement are found as

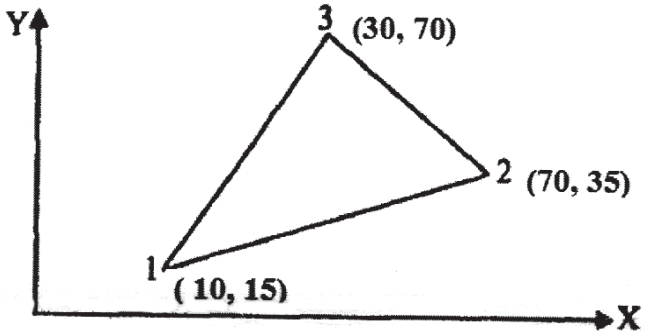
$u_1 = 0.002$ cm, $u_2 = 0.001$ cm $u_3 = -0.003$ cm

$v_1 = 0.001$ cm $v_2 = -0.004$ cm $V_3 = 0.007$ cm

b) How to verify (check) accuracy and validate the result in Computer Aided Engineering? **[6]**

OR

Q4) a) A CST element has nodal coordinates are (10, 15), (70,35) and (30, 70) for node 1, 2 and 3 respectively. The element has material property as E= 200 GPa and $\mu = 0.3$ **[12]**



The deflection observed in these nodes are;

$u_1 = 0.01$ mm, $u_2 = 0.03$ mm $u_3 = -0.02$ mm

$v_1 = -0.02$ mm $v_2 = 0.02$mm $v_3 = 0.05$ mm

Assume Plane stress condition.

Determine:

i) The Stresses

ii) The stains

b) Explain what is meant by Plane Stress and Plane Strain condition. **[6]**

Q5) a) Explain nonlinear analysis. Also compare it with linear analysis. **[9]**

b) Explain different types of non-linearity in CAE. **[8]**

OR

Q6) a) Explain modal analysis, harmonic analysis and transient analysis to study the dynamic properties of the structures. **[9]**

b) Explain the following terms in dynamic analysis **[8]**

- Time domain analysis
- Frequency domain analysis

Q7) a) Explain in detail what different types of analysis need to be consider for the analysis of Aircraft structure. **[9]**

b) Explain CAE based applications in following areas: **[8]**

• Computational Fluid Dynamics

• Injection molding of Plastics

OR

Q8) a) What is Explicit analysis? Write the comparison of Explicit and implicit method. **[9]**

b) What is NVH? Illustrate the applications of Computer Aided Engineering (CAE) in Noise, Vibration and Harness with examples. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1846

[Total No. of Pages : 3

[6353]-168

T.E. (Mechanical)

DESIGN OF TRANSMISSION SYSTEM

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

Time : 3 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) State the Advantages and limitations of Hydrodynamic Bearing? **[4]**

b) What is bearing characteristic number as applied to the journal bearing? Explain with neat sketch. **[6]**

c) A single row deep groove ball bearing subjected to following work cycle, If L_{10h} = 12000 hrs. at 95% reliability Find dynamic load carrying capacity at 90% reliability; and system reliability if such six bearings are there? **[7]**

F_r (kN)	F_a (kN)	X	Y	Race Rotating	C_s	Speed rpm	% Time
10	3.0	0.56	2	Inner	1.00	400	40
5.5	1.0	1	0	Outer	1.25	800	30
---	---	---	---	Inner	---	600	30

OR

P.T.O.

Q2) a) State the assumptions and write the Reynold's equation for 2-D flow and explain the significance of each term in it? **[6]**

b) Following data is given for a belt drive, Diameter of pulley 250 mm, Shaft diameter 20 mm, power transmitted 5 kW at 720 rpm. Ratio of belt tensions 3:1. Take load factor 3. Pulley is placed at center of shaft with belt tensions acting vertically downwards. Life of bearings 10000 hours for 95% of reliability. Find dynamic load carrying capacity at 90% of reliability. **[4]**

c) Derive the Stribecks equation for basic static capacity of bearings. State the assumption made. **[7]**

Q3) a) What is the condition of self-locking in differential band brake? Why should it be avoided in speed-control brakes? **[4]**

b) Explain Band brake with neat sketch? Find the effort applied at the end of lever for simple band brake. **[6]**

c) Draw a figure for is internal expanding shoe brake and write the assumptions on which its analysis depends? State the observations made when the vehicle will be travelling in 'reverse' for anti-clockwise rotation of brake drum? **[7]**

OR

Q4) a) Draw neat sketch diagram of single plate clutch and explain construction and working. **[4]**

b) What are the two theories applied to friction plates? Why clutches are usually designed on the basis of uniform wear? **[6]**

c) Draw neat sketch diagram of Centrifugal plate clutch and explain construction and working. State the advantages, disadvantages and practical applications of Centrifugal clutch? **[7]**

Q5) a) What are the various laws for stepped regulation of speeds in multi-speed gear boxes? State the advantages and disadvantages for them. **[6]**

b) What is structural formula? Write any three structural formulae for twelve speed gear box. **[6]**

c) Draw structural diagrams for the following structural formula and identify the optimum structural formula out of them. Draw the gearing diagram for the optimum structural formula. **[6]**

i) 2(1) 3(2); ii) 2(3) 3(1); iii) 3(2) 2(1); iv) 3(1) 2(3)

OR

Q6) a) State the law of geometric progression used in machine tool gearbox design. State its advantages and disadvantages. **[6]**

b) Compare different laws of regulation of speed in multispeed gear box.**[6]**

c) Find the range ratio, progression ratio and spindle speeds for the following data, Nmin = 100 rpm; Nmax = 1800 rpm and Number of speed steps = 8. Also draw all possible structure diagrams. **[6]**

Q7) a) Explain the important factors considered in the design of Hybrid Electric Vehicles components? **[6]**

b) Define Degree of Hybridization. Explain in details Micro Hybrid and Mild Hybrid. **[6]**

c) Explain Power Split Device with neat sketch? **[6]**

OR

Q8) a) What are the advantages and disadvantages of Hybrid Electric Vehicles?**[6]**

b) Explain Series Configuration of Hybrid Electric Vehicles with the help of Block diagram? **[6]**

c) Explain how the performance analysis carried in Series and parallel of Hybrid Electric Vehicles? **[6]**

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC-1847

[Total No. of Pages :2

[6353]-169

T.E. (Mechanical)

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.7or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic pocket calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain the Squeeze casting process of fabrication of a metal matrix composite in detail. **[6]**

b) Give the advantages and drawbacks of metal matrix composites over polymer matrix composites. **[6]**

c) Describe liquid infiltration process with a neat sketch. **[6]**

OR

Q2) a) Explain interface and wettability of metal matrix composites. **[6]**

b) List three kinds of metal matrix composites and write typical reinforcements used in particle type metal matrix composites. **[6]**

c) Describe with neat sketch the In-situ process of fabrication of a metal matrix composite with its advantages. **[6]**

Q3) a) A glass/epoxy lamina consists of 70% fiber volume fraction. **[6]**

Determine,

i) Density of lamina

ii) Mass fractions of the glass and epoxy

iii) The volume of composite lamina if the mass of the lamina is 4 kg.

iv) Volume and mass of glass and epoxy

Take, Density of fiber(ρf) is 2500 kg/(m^3,) and density of matrix(ρm) is 1200 kg/m^3.

P.T.O.

b) Find the major and minor Poisson's ratio of a glass/epoxy lamina with 70% fiber volume fraction. Take Poisson's ratio of fiber(ϑ_f) is 0.2, Poisson's ratio of matrix(ϑ_m) is 0.3, Young's modulus of fiber(E_f) is 85 GPa and Young's modulus of matrix(E_m) is 3.4 GPa. **[6]**

c) Explain the fatigue property of composite materials. **[5]**

OR

Q4) a) What is a void fraction? What are the properties it governs? **[6]**

b) Derive the rule of mixture equation. **[6]**

c) What do you mean by micro-mechanics and macro-mechanics of lamina? **[5]**

Q5) a) Describe with the help of a neat sketch the fatigue testing of polymer matrix composite. **[6]**

b) Discuss common mechanical tests for composites mentioning the purpose of each test. **[6]**

c) Explain any two non-destructive testing for polymer matrix composites. **[6]**

OR

Q6) a) List the various international and national test standards developed to test mechanical properties of a lamina. **[6]**

b) What is R-curve in fracture toughness test? Interpret its significance in double cantilever beam specimen with the help of load-displacement diagram. **[6]**

c) Sketch the schematic representation of V-Notched beam shear test composite and describe the test with regard to ASTM D5379. **[6]**

Q7) a) State any three advantages and three disadvantages of using glass-Epoxy Composite in Aircraft. **[6]**

b) Write any three reasons why Composites are preferred in sports equipment? Which composites will be preferred for helmets used in hockey? **[6]**

c) Write any three advantages of Composite material over wood in building a boat? What will be preferred as a resin for building boat? **[5]**

OR

Q8) a) State any six properties of Composites that makes it a better material than steel for building application. **[6]**

b) Name the composite that can make the automobile lightweight? State any four advantages of the vehicle being light weight? **[6]**

c) Why is glass/carbon fiber preferred in blade aerofoil of a Light Combat Aircraft? State the significance of Orientation of fiber in the blade aerofoil of a Light Combat Aircraft. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC-1848

[Total No. of Pages : 2

[6353] - 170
T.E. (Mechanical Engineering)
SURFACE ENGINEERING
(2019 Pattern) (Semester - II) (Elective - II) (302052 - 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) ***Use of Logarithmic tables, slide rule, electronic pocket calculator is allowed.***
5) ***Assume suitable data jf necessary.***

Q1) a) Define Diffusion. Explain difffusion process with example. State applications of diffusion process. **[9]**

b) State 'Ficks' first and second law of diffusion in detail. **[8]**

OR

Q2) a) Describe the induction hardening process and its advantages in surface hardening. **[7]**

b) Draw reat labeled sketch of the following surface hardening processes and mention medium used, temperature range, case depth and time required for each process. **[10]**

i) Pack Carburizing Process

ii) Liquid Nitriding Process

Q3) a) Why coating is required to increase corrosion resistance of components? List various types of corrosion resistance coating methods. **[8]**

b) Explain "Ion Implantation Process" with respect to definition, schematic diagram, process, applications, advantages and limitations. **[10]**

OR

P.T.O.

Q4) a) Explain the sputter deposition process and its role in producing nanostructured ceramic coatings for wear resistance. **[8]**

b) Discuss Electroless Copper, Gold and Nickel coating How they differ from electrolytic coating process **[10]**

Q5) a) Explain cold spray coating process. State the advantages, limitations and application. **[7]**

b) What do you mean by Anodic and Cathodic type of coating? Explain following processes in detail **[10]**

i) Galvanizing process

ii) Cladding Process

OR

Q6) a) Explain the spraying process for applying inorganic coatings and its advantages in surface protection. **[7]**

b) Explain the purpose and characteristics of the following organic coating systems. **[10]**

i) Anti-Dust Coatings

ii) Hard-Facings

Q7) a) Explain how embrittlement can occur in coatings and suggest approaches to enhance coating flexibility **[8]**

b) What are general causes of coating defects? Write causes and remedies for the following coating defects. **[10]**

i) Bubbling

ii) Pin-Holing

iii) Blistering

iv) Cratering

OR

Q8) a) List the methods of Film Thickness Measurements. Explain Destructive film thickness measurement proess in detail **[9]**

b) What are the requirement and use of spectroscopic anal

ysis of modified surfaces? List applications of it. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1849

[Total No. of Pages :3

[6353]-171

T.E. (Mechanical S/W)

FUNDAMENTALS OF COMPUTER-AIDED ENGINEERING

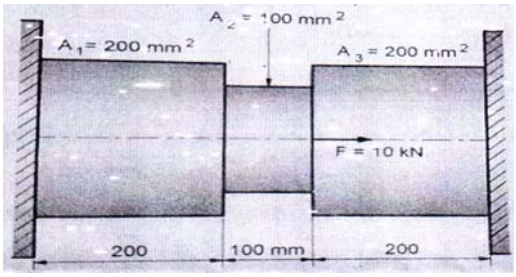
(2019 Pattern) (Semester - I) (302061)

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) ***Assume suitable data if required.***
4) ***Use of a non-programmable scientific calculator is allowed.***

Q1) a) An axial stepped bar shown in below figure, is subjected to an axial load of 10 kN. If the material of the bar is uniform and has a modulus of elasticity as 200 GPa, determine: (i) The nodal displacements, (ii) The stresses in each element; and (iii) The reactions at the supports. **[12]**



b) Write a short note of Rayleigh-Ritz method. **[5]**

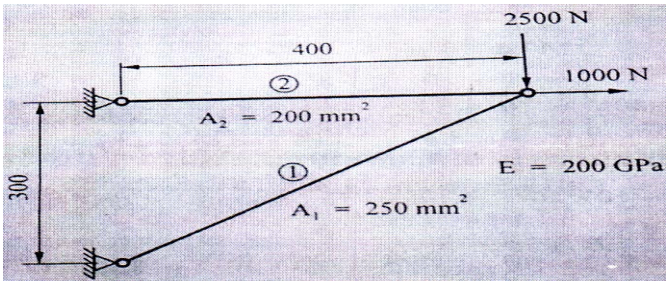
OR

Q2) The arrangement of a two bar truss is shown in the below figure. The modulus of elasticity for material is 200 GPa. Using the finite element method, determine: **[17]**

i) Nodal displacements

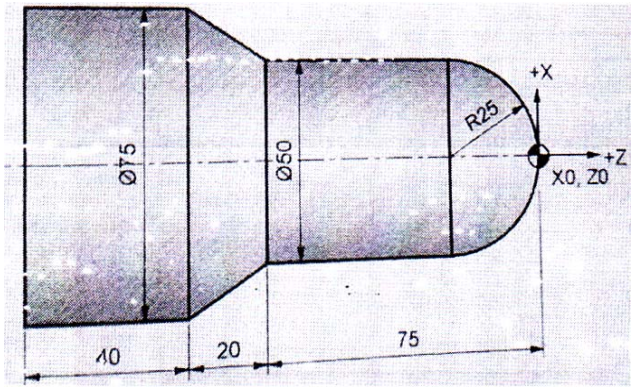
ii) Stress in each element

iii) Reaction force at the support.



P.T.O.

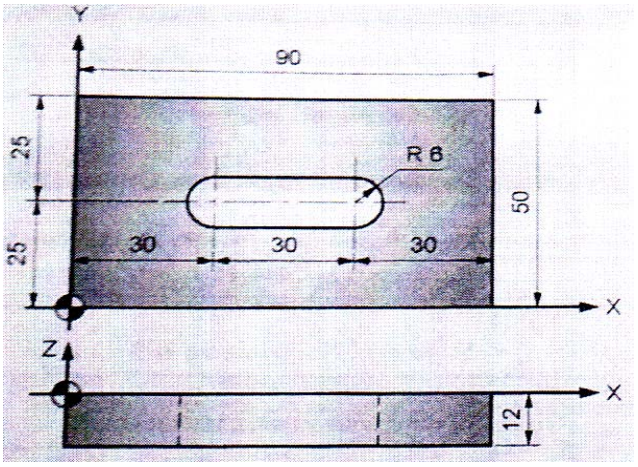
Q3) a) Write a part program using G and M code to turn mild steel job as shown in below figure. Use canned cycles for both rough turning and finishing. Take feed rate of 0.5 mm/rev and spindle speed of 200 RPM. **[12]**



b) Explain various elements of NC machine tool system with block diagram. **[5]**

OR

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



b) Explain open loop and closed loop type NC machines with sketches and applications. **[5]**

Q5) a) Explain the types of robots on the basis of configuration with block diagrams. **[9]**

b) Explain four islands of automation of computer integrated manufacturing. **[9]**

OR

Q6) a) Explain the Flexible manufacturing systems based on type of layouts. **[9]**

b) Classify various types of actuators. Explain any one type of actuator with neat sketch. **[9]**

Q7) a) What is Computational Fluid Dynamics (CFD)? Explain the three dimension of fluid dynamics. **[9]**

b) Explain in brief about how to view and interpret the CAE results. **[9]**

OR

Q8) a) What are the common mistakes made by CAE Engineers? **[9]**

b) Enlist the CAE software used for different application of CAE. Write at least 10 software with their applications. **[9]**

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC1850

[6353]-172

[Total No. of Pages :2

T.E. (Mechanical Sandwich)

PROCESS PLANNING & TOOL SELECTION (Self - Study - I)

(2019 Pattern) (Semester- II) (302066)

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 logarithmic tables, slide rule, Steam table, Psychrometric Chart. And electronic pocket calculator is allowed.***
4) ***Figure to the right indicate full marks.***
5) ***Assume Suitable data, if necessary.***

Q1) a) Discuss the concept of standardization and interchangeability. **[8]**

b) How can supporting operation be distinguished from auxiliary operation? **[9]**

OR

Q2) a) Define work-piece control, what are the variables which interfere with work- piece control? Discuss. **[8]**

b) What are the advantages and disadvantages of combining operations? **[9]**

Q3) a) What do you know about 3-2-1 principle? Explain with figure. **[8]**

b) What do you mean by 'Commercial tooling, 'Regular tooling' and Special tooling? **[9]**

OR

Q4) a) Distinguish between General Purpose Machine (GPM) and Special Purpose Machine (SPM) with examples. **[8]**

b) What are the constraints in tool selection? Which are the most influencing factors in order to determine the tool performance? **[9]**

P.T.O.

Q5) a) What are the process variables considered in calculation of machining time? How do you calculate machining time for drilling operation? **[8]**

b) How do you calculate machining time for Turning and drilling operations? Explain with suitable sketch. **[9]**

OR

Q6) a) What are the three classifications of part that are used in a make or buy scenario? **[8]**

b) What are the factors involved in calculation of machining time. How to Calculate cycle time? **[9]**

Q7) a) What information does the process picture provide? List some of the possible uses of process picture. **[9]**

b) Discuss various steps involved in manual process planning. **[10]**

OR

Q8) a) Explain the benefits of computer aided process planning (CAPP). **[9]**

b) Explain the Automatic Time Standard system (ATS) in CAPP. **[10]**

Total No. of Questions : 8]

SEAT No. : ____

PC1851

[Total No. of Pages : 2

[6353]-173

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) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
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) Explain matrix interface. State different interface measurement techniques for composites. Explain pull out test. **[10]**

b) Explain the process of squeeze casting of metal matrix composites. State it's advantages & disadvantages. **[8]**

OR

Q2) a) Explain the purpose of reinforcement and specify the characteristics along with suitable examples. Elaborate rule of mixtures in regards with composites. **[9]**

b) Explain the process of stir casting of MMC. State it's applications, advantages & limitations. **[9]**

Q3) a) With neat sketch explain high energy rate forming process along with its advantages and limitations. **[9]**

b) Explain the process of isostatic pressing. Discriminate between hot and cold isostatic pressing. **[8]**

OR

Q4) a) Draw a neat sketch of hydroforming process. Explain in detail construction and working. Name common applications of the process. **[9]**

b) Elaborate the process with the applications, advantages and limitations Magnetic pulse forming process. **[8]**

P.T.O.

Q5) a) State the principle of friction stir welding process and explain the construction and working. **[10]**

b) Write a short note on Cold metal transfer process and applications. **[8]**

OR

Q6) a) Write a short note on welding automation in aerospace, nuclear and transport vehicle area with examples. **[9]**

b) With neat sketch explain working of atomic hydrogen welding process, advantages and limitations. **[9]**

Q7) a) State and explain the advantages of non-conventional machining processes over conventional machining processes. **[8]**

b) Explain the construction and working of Electrochemical machining process. **[9]**

OR

Q8) a) Briefly explain the principle and working of ultrasonic machining process. State its advantages and limitations. **[8]**

b) 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]**

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Total No. of Questions : 8]

SEAT No. : [ ]

PC1852

[Total No. of Pages : 3

[6353]-174
T.E. (Automation and Robotics)
DESIGN OF ROBOT ELEMENTS
(2019 Pattern) (Semester - I) (302521)

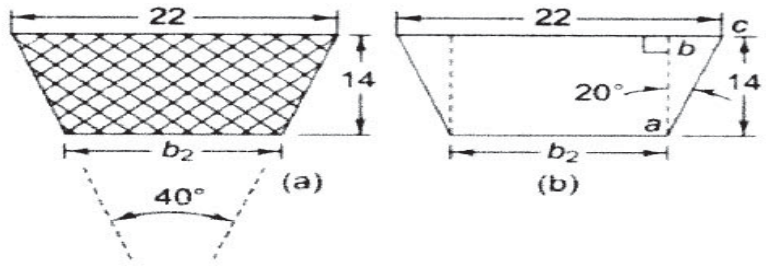
Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Draw neat labeled diagrams wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Use of non programmable electronic calculator is permitted.***
4) ***Assume suitable data, if necessary.***

Q1) a) The following data is given for a V-belt drive connecting a 20kW motor to a compressor. The center distance between pulleys is 1 m and the dimensions of the cross-section of the belt are given in Figure. The density of the composite belt is 0.97g/cc and the allowable tension per belt is 850N. How many belts are required for this application? **[11]**

	Motor-pulley	*Compressor-pulley*
Pitch diameter (mm)	*300*	*900*
Speed (rpm)	*1440*	*480*
Coefficient of friction	*0.2*	*0.2*

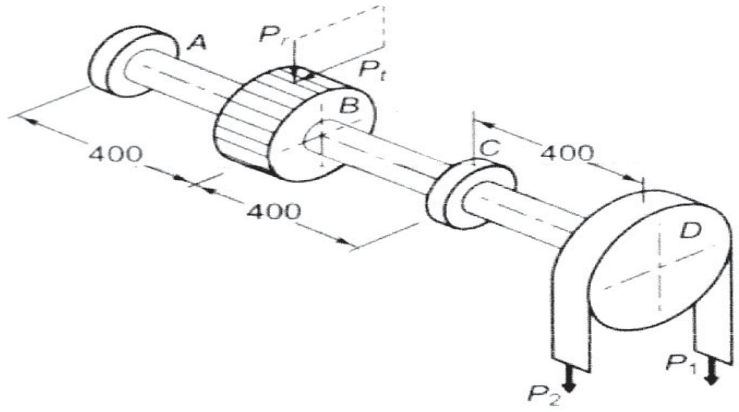


b) Derive equations for center distance, length of belt for open belt drive.**[7]**

OR

P.T.O.

Q2) a) A transmission shaft supporting a spur gears B and the pulley D is shown in Figure. The shaft is mounted on two bearings A and C. The diameter of the pulley and the pitch circle diameter of the gear are 450 mm and 300mm respectively. The pulley transmits 20kW power at 500 rpm to the gear. P_1 and P_2 are belt tensions in the tight and loose sides, While P_t and P_r are tangential and radial components of gear tooth force. Assume, $P_1 = 3P_2$ and $P_r = P_t \tan(20^o)$ The gear and pulley are keyed to the shaft. The material of the shaft is steel 50C4 (S_{ut} = 700 and S_{yt} = 460N/mm^2). The factors k_b and k_t of the ASME code are 1.5 each. Determine the shaft diameter using the ASME code. **[11]**



b) Explain significance of equivalent bending moment and equivalent twisting moment. **[7]**

Q3) a) What do you mean by integrated end effector attachment. Explain with neat labelled diagram. **[8]**

b) Write basic design process of gripper. **[9]**

OR

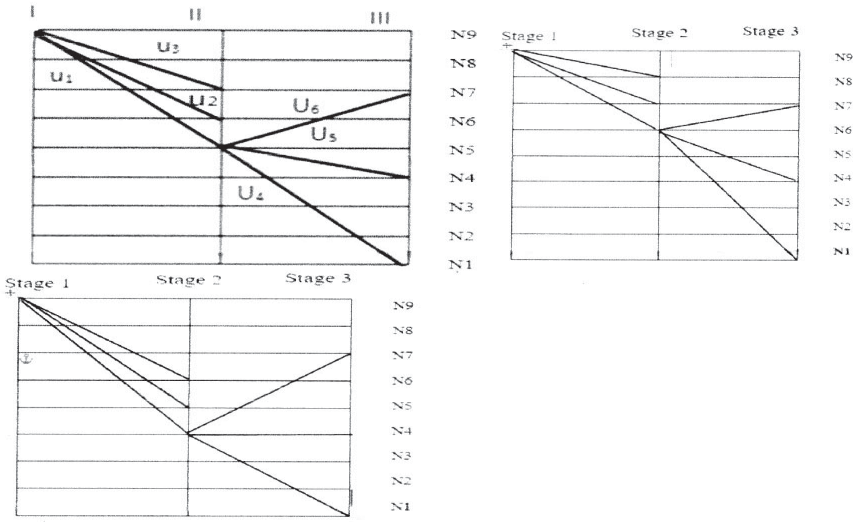
Q4) a) Write a note on remote compliance center design with neat labelled diagram. **[9]**

b) What do you mean by payload in the design of robots. Explain payload force analysis with neat diagram and mathematical equations. **[8]**

Q5) Design a nine-speed gear box having N_{min}= 100rpm and N_{max}= 630 rpm. Assume motor speed 1400 rpm. The design should include structural diagram, ray diagram, speed chart, gearing diagram and number of teeth of the gear. (Gearing diagram is not essential). **[18]**

OR

Q6) a) A 3×3 Gear box is transmitting a power of 10 KW. Choose the best ray diagram based on minimum summation of shaft diameters made of same material with permissible shear stress of 36 N/mm^2. Use GP ratio of 1.26 and Lowest speed N_1=100RPM. **[10]**



b) Write a note on general recommendation for developing the gearing diagram. Explain with suitable example. **[8]**

Q7) a) A ball bearing is operating on a work cycle consisting of three parts-a radial load of 3000 N at 1440 rpm for one quarter cycle, a radial load of 5000N at 720 rpm for one half cycle, and radial load of 2500 N at 1440 rpm for the remaining cycle. The expected life of the bearing is 10,000h. Calculate the dynamic load carrying capacity of the bearing. **[7]**

b) A taper roller bearing has a dynamic load capacity of 26kN. The desired life for 90% of the bearings is 8000 h and the speed is 300 rpm. Calculate the equivalent radial load that the bearing can carry. **[5]**

c) Explain load life relationship in rolling contact bearing. **[5]**

OR

Q8) a) Design a full hydrodynamic journal bearing with the following specification for machine tool application. Journal diameter = 75mm, radial load = 10kN, journal speed = 1440 rpm, minimum oil film thickness = 22.5 microns, inlet temperature = 40^{o}C, bearing material = babbitt. Determine the length of the bearing and select a suitable oil for this application. Assume permissible bearing pressure for the application is 2 MPa. **[10]**

b) Derive Petroff's Equation for sliding contact bearing. **[7]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1853

[Total No. of Pages : 3

[6353]-175

T.E. (Automation and Robotics)

ROBOT KINEMATICS AND DYNAMICS

(2019 Pattern) (Semester - I) (302522)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer four questions from the following Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Draw neat labeled diagrams wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of non programmable electronic calculator is permitted.***
5) ***Assume Suitable/Standard data if necessary.***

Q1) a) Define forward kinematics and inverse kinematics in the context of robotic motion. How are these concepts used to describe the movement of robotic systems? **[9]**

b) Derive the equation for three link robot (2DOF) considering inverse kinematics with geometrical method. **[9]**

OR

Q2) a) Discuss the limitations of inverse kinematics in controlling robotic systems. What factors can affect the accuracy and reliability of inverse kinematics calculations? **[9]**

b) Discuss the concept of tool configuration in a five-axis articulated robot, providing a detailed explanation of its significance and implications for robotic applications. **[9]**

Q3) a) How does the kinematic structure of a robot affect its workspace? Provide examples of different kinematic configurations and their impact on workspace. **[9]**

b) What is a “pick and place” operation in robotics, and What are the main challenges associated with pick and place operations in industrial settings? **[8]**

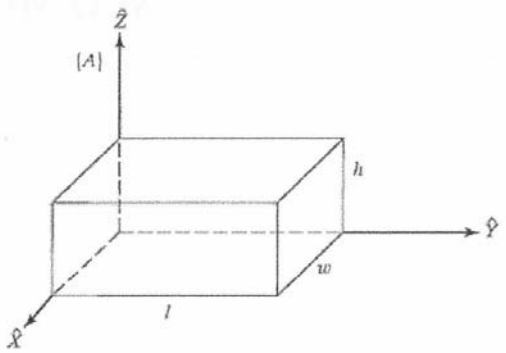
OR

P.T.O.

Q4) a) Define the terms "path" and "trajectory" in the context of robotics. How do these concepts relate to the movement of a robotic system? **[9]**

b) Discuss the role of coordinate transformations in the Cartesian space approach. How are these transformations used to define positions and orientations? **[8]**

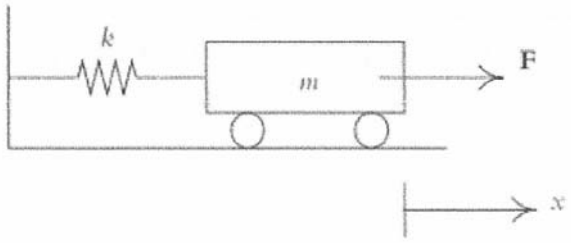
Q5) a) Find the inertia tensor for the rectangular body of uniform density p with respect to the coordinate system shown in Figure. **[9]**



b) Explain the difference between forward dynamics and inverse dynamics in the study of robot manipulator dynamics, and how are these calculations used in practice? **[9]**

OR

Q6) a) Derive the force-acceleration relationship for the 1-DOF system shown in Figure using both the Lagrangian mechanics as well as the Newtonian mechanics. Assume the wheels have negligible inertia. **[9]**



b) How do the joint torques and forces affect the motion and behavior of a robots end-effector, and how are they computed in the context of manipulator dynamics? **[9]**

Q7) a) What are the key hardware components of a joint controller system? How do these components work together to control the movement of robotic joints? **[9]**

b) Explain the concept of computational speed. How is it different from clock speed or processing power? **[8]**

OR

Q8) a) How does the choice of sensors, actuators, and motors impact the hardware architecture of a robot, and what considerations are made when selecting these components for specific robotic applications? **[9]**

b) What types of sensors are typically used in joint controller systems, and how do they interface with the hardware for accurate feedback and control? **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PC1854

[Total No. of Pages : 3

[6353]-176
T.E. (Automation and Robotics)
COMPUTER AIDED ENGINEERING AND MANUFACTURING
(2019 Pattern) (Semester - I) (302523)

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 indicate full marks.***
4) ***Use of non programmable electronic calculator is permitted.***
5) ***Assume suitable/standard data if necessary.***

Q1) a) Evaluate the stiffness matrix for the CST element shown in fig.1a. Coordinates are in mm. Assume Plain stress conditions. Take E=200 GPa, γ = 0.3, Thickness = 1cm Nodal displacements are given as: u_1 =1mm; u_2 = 0.5 mm; u_3 = 2 mm; v_1= 1mm; v_2 = 0; v_3 = 1mm **[15]**

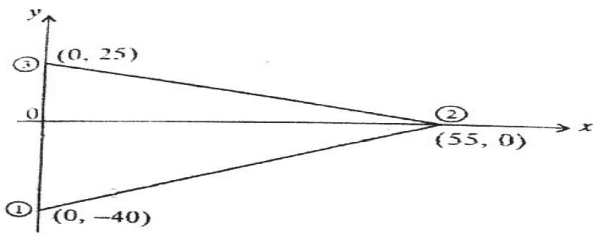


fig. 1a

b) Explain the concept of isoparametric formulation in the CST element.**[3]**

OR

Q2) a) The stresses at node points 1,2 and 3 are 90,120 and 160 MPA respectively. Determine the stress at point P for the coordinates as shown in fig. 2a. **[15]**

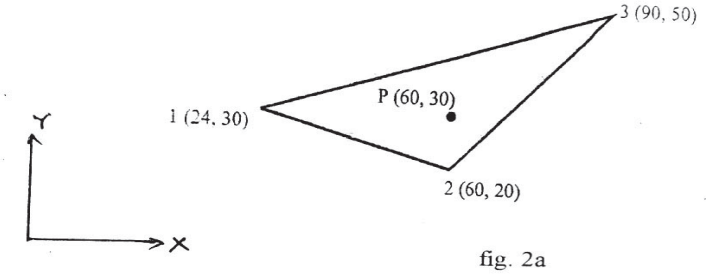


fig. 2a

b) Describe the key components and characteristics of a parametric model in CAE. **[3]**

P.T.O.

Q3) a) Write a manual part program for the component shown in fig. 3a. Assume the raw product as cast iron and the machining is to achieve the various dimensions. **[12]**

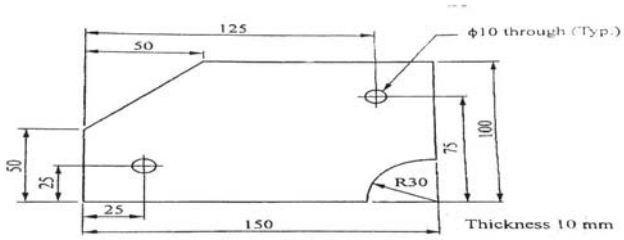


fig. 3a

b) Explain the concept of tool geometry compensation in CNC machining and its significance in achieving accurate and precise part dimensions.**[5]**

OR

Q4) a) Write a manual part program to machine the contour for the component shown in fig. 4a. and drill a hole. The thickness of component is 18mm. Assume suitable data. **[12]**

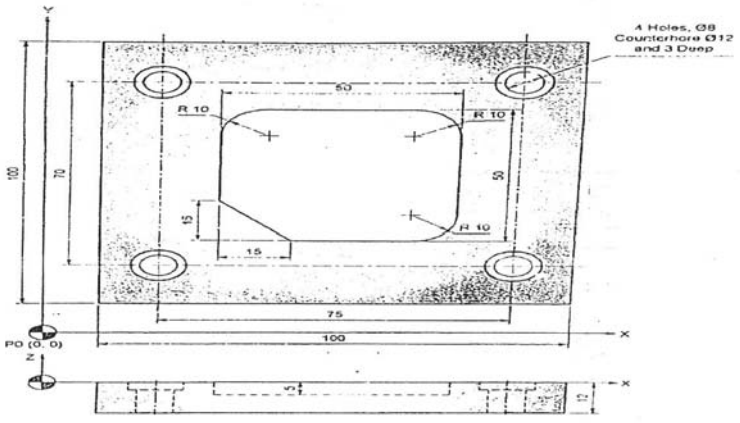


fig. 4a

b) Distinguish closed loop NC system with open loop system. **[5]**

Q5) a) What are the types of manufacturing layout in cellular manufacturing and explain them briefly. **[10]**

b) Describe the DMAIC (Define, Measure, Analyze, Improve, Control) framework and its application in Six Sigma projects. **[8]**

OR

Q6) a) How does cellular manufacturing contribute to improving productivity and reducing lead times in manufacturing operations? **[10]**

b) Explain the concent of Kanban and its role in supporting Just-in-Time production. **[8]**

Q7) a) A machine shop is planning to perform a channel milling operation on a workpiece. The workpiece dimensions are as follows:

Length of workpiece = 200mm

Width of workpiece = 100mm

Depth of channel = 20mm

The cutting speed for the milling operation is 200 meters per minute, and the feed rate is 0.1mm per tooth. The machine has four teeth on the milling cutter. Calculate the machining time required to complete the channel milling operation. **[10]**

b) Discuss the role of technology and automation in process planning and its impact on cost control. **[7]**

OR

Q8) a) i) If margin of safety is ₹2,40,000 (40% of sales) and profit volume ratio is 30% of XY Limited, calculate its

1) break even point and

2) amount of profit on sales of ₹9,00,000.

ii) X limited has earned a contribution of ₹2,00,000 and net profit of ₹1,50,000 on sales of ₹8,00,000. What is its margin of safety?

iii) The ratio of variable cost to sales is 70%. The break even point occurs at 60% of the capacity sales. Find the capacity sales when fixed costs are ₹90,000. Also compute profit at 75% of the capacity sales. **[10]**

b) Explain the concept of value engineering in process planning and its benefits in cost reduction. **[7]**

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Total No. of Questions : 8]

SEAT No. :

PC1855

[Total No. of Pages : 2

[6353]-177

T.E. (Automation and Robotics)

Signal Processing and Conditioning

(2019 Pattern) (Semester-I) (302524)

Time : 2 ½Hours] *[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 indicate full marks.***
4) ***Use of non programmable electronic calculator is permitted.***
5) ***Assume Suitable/Standard data if necessary.***

Q1) a) With the help of neat diagrams explain interfacing of any one Actuator to Data Acquisition system. **[8]**

b) Explain signal communication and the types of data transmission. **[9]**

OR

Q2) a) With the help of neat diagram explain working of the 4 bit R-2R type DAC. **[8]**

b) A 4-bit SAR type ADC has reference voltage of 16 volts. If the ADC is supplied with an analog input of 11.2 volts, determine the equivalent digital output with the help of neat circuit diagram. Also draw a graph of output waveform. **[9]**

Q3) a) Draw and explain Ladder Logic programming for any three logic gates. **[9]**

b) Draw and explain Architecture of PLC. **[9]**

OR

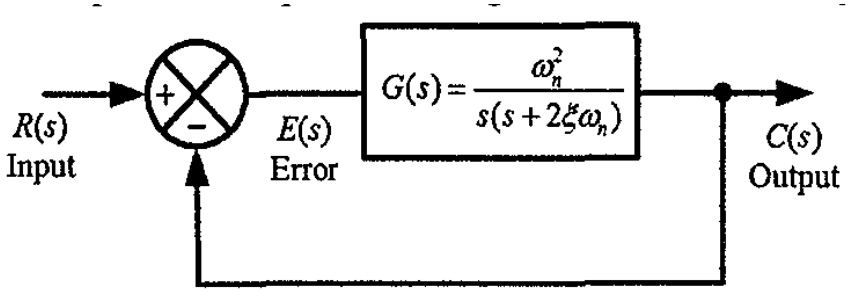
Q4) a) Write at least 9 aspects to be considered while selection of a PLC for the application. **[9]**

b) Explain a PLC ladder diagram for Bottle filling machine with the help of neat diagram of this system. **[9]**

P.T.O.

Q5) a) Using Suitable diagram explain Unit step response analysis via transient response specifications. **[8]**

b) Draw pole zero map for following second order control system. **[9]**



OR

Q6) a) Sketch pole- zero plot of the system. **[8]**

$$G(s)=\frac{s+1}{s^2\left(s^2+5s+6\right)}$$

b) Write a short note on Bode Plot, Gain margin and Phase margin with the help of neat diagram. **[9]**

Q7) a) Explain Proportional (P), Integral (I) and Derivative (D) control actions. **[9]**

b) Explain Manual tuning of PID control with variation in different values of control parameters and plot the respective graphs. **[9]**

OR

Q8) a) Draw and explain PD and PID control systems in parallel form. **[9]**

b) Explain Linear Quadratic Control (LQR) with equations. Also draw a block diagram for robot application using LQR Controller. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

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[Total No. of Pages : 3

[6353]-179

T.E. (Automation & Robotics)

OPTIMIZATION TECHNIQUES

(2019 Pattern) (Semester - I) (302525B) (Elective - I)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Solve Q1 or Q2, Q3 or Q4, Q5or Q6, Q7 or Q8.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of electronic calculator is allowed.***
4) ***Assume Suitable data if necessary.***

Q1) a) Define simulation. Explain Monte Carlo Techniques of Simulation. **[5]**

b) Solve the following all integer programming problems using the branch and bound method. **[12]**

Maximize $Z = 2x_1 + 3x_2$

Subject to constraints $6x_1 + 5x_2 \leq 25$

$x_1 + 3x_2 \leq 10$

$x_1, x_2 \geq 0$ and integers

OR

Q2) a) What is Integer Programming? State its types. **[5]**

b) Solve the following Integer LP problem using Gomory's Cutting Plane method. **[12]**

Max $Z = x_1 + x_2$

Subject To $3x_1 + 2x_2 \leq 5$

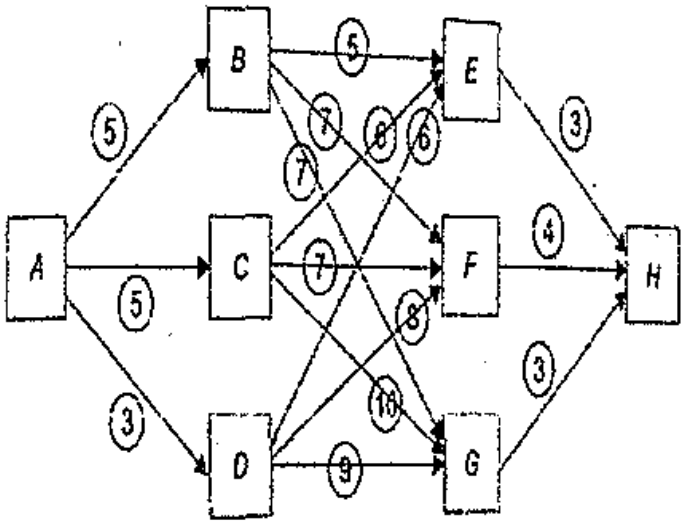
$x_2 \leq 2$

$x_1, x_2 \geq 0$ and are integers

P.T.O.

Q3) a) Explain the concept of Particle Swarm Optimization. **[5]**

b) A sales, manager is planning.a.business tour from Mumbai to Kolkata. He intends to cover one town from each of the company's different marketing zones on the route. The network shows the three intermediate stages and three possible choices of route at all but the last cities. The travel time between the two cities inclusive of the working time is given below the arrows between the cities. Which intermediate cities should he visit to minimize the time required to get from A to H. **[10]**



c) Give generalized model for goal programming. **[3]**

OR

Q4) a) State applications of simulated annealing. **[6]**

b) A company produces motorcycle seats. The company has two production lines. The production rate for line 1 is 50 seats per hour and for line 2 it is 60 seats per hour. The company has entered into a contract to daily supply 1,200 seats daily to another company. Currently, the normal operation periad for each line is 8 hours. The production manager of the company is trying to determine the best daily operation hours for the two lines. He has set the priorities to achieve his goals, as given below : **[6]**

P1: Produce and deliver 1,200 seats daily.

P2: Limit the daily overtime operation hours of line 2 to 3 hours.

P3: Minimize the underutilization of the regular daily operation hours of each line. Assign differential weights based on the relative productivity rate.

P4: Minimize the daily overtime operation hours of each line as much as possible. Assign differential weights based on the relative cost of overtime. It is assumed that the cost of operation is identical for the two production lines.

Formulate this problem as a Goal Programming model and then solve it by using the graphical method.

c) Name basic concepts involved in dynamic programming. **[6]**

Q5) a) List down methods of MCDM and also explain any two methods briefly? **[8]**

b) Explain SAW method with stepwise procedure in detail. **[9]**

OR

Q6) a) Write the steps of analytical network process. **[6]**

b) What is PROMTHEE? Enlist various applications. **[6]**

c) Discuss in detail about Analytic Hierarchy Process AHP? **[5]**

Q7) a) Define and discuss modern optimization techniques? List its applications. Also write disadvantages of ANN. **[9]**

b) Enlist modern optimization techniques and elaborate any two with suitable examples. **[9]**

OR

Q8) a) Explain the concept of Ant Colony Optimization. Explain the mutation in Genetic Algorithm. **[10]**

b) How the Fuzzy Optimization technique is applied on any engineering system? **[8]**

♦ ♦ ♦

Total No. of Questions : 8]

SEAT No. : ____

PC1857

[6353]-180

[Total No. of Pages :2

T.E. (Automation and Robotics Engineering)

SENSORS AND VISION SYSTEMS IN ROBOTS

(2019 Pattern) (Semester- II) (302527)

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) Draw the structure of human eye and explain any eight parts of eye. **[8]**

b) Draw and Explain components of a general-purpose image processing system. **[9]**

OR

Q2) a) Explain Adjacency, Connectivity, Regions and Boundaries using arrangement of pixels. **[8]**

b) Draw and Explain Stereo Imaging Model and calculate equation of disparity. **[9]**

Q3) a) Explain Gray Level Transformation and its types with Transformation Curves. **[9]**

b) Explain Mechanics of Linear Spatial filtering with neat diagram of kernel. **[9]**

OR

Q4) a) Explain smoothing (low pass) spatial filter and its two types of kernels. **[9]**

b) Sketch Laplacian kernels used for image sharpening using second order derivative equations. **[9]**

P.T.O.

Q5) a) Explain Edge Linking using Hough Transform. **[8]**

b) Explain the basics of Intensity Thresholding using intensity Histogram. **[9]**

OR

Q6) a) Explain Region segmentation using K-means Clustering and its algorithm. **[8]**

b) Explain Topological Descriptor using suitable examples. **[9]**

Q7) a) Write Installation and testing of ROS camera Drivers. **[9]**

b) Explain ROS to Open CV - The CV bridge Package. **[9]**

OR

Q8) a) Explain Open CV image processing library. **[9]**

b) Explain image processing using MATLAB programming. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

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[Total No. of Pages :3

T.E. (Automation and Robotics)

ARTIFICIAL INTELLIGENCE IN ROBOTS

(2019 Pattern) (Semester- II) (302528)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Draw neat labeled diagrams wherever necessary.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of non-programmable electronic calculator is permitted.***
4) ***Assuem Suitable/Standard data if necessary.***

Q1) a) What is feature? What do you mean by feature engineering? Explain various processes involved in the feature engineering. **[8]**

b) Write a note on different data wrangling techniques employed in the data pre-processing. **[9]**

OR

Q2) a) Explain the different encoding techniques used in the data pre-processing. **[7]**

b) Refer the following datasheet and write the python code for the followings: **[10]**

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa
...	...	...	...	...	...	...
145	146	6.7	3.0	5.2	2.3	Iris-virginica
146	147	6.3	2.5	5.0	1.9	Iris-virginica
147	148	6.5	3.0	5.2	2.0	Iris-virginica
148	149	6.2	3.4	5.4	2.3	Iris-virginica
149	150	5.9	3.0	5.1	1.8	Iris-virginica

i) Write a python code for the encoding of the feature ‘Species’.

ii) Write a python code for the detection of outliers for any feature by Inter Quantile Range (IQR).

P.T.O.

Q3) a) Write a note on following algorithms **[10]**

i) Random Forest

ii) Logistic Regression

b) Explain the assumptions in the linear regression with respect to how to check the assumption and how to handle the assumption. **[8]**

OR

Q4) a) Write a note on types of logistic regression. Distinguished between linear and logistic regression. **[8]**

b) Calculate information gain for the features 'outlook', 'temperature', 'humidity' and 'windy'. Refer following datasheet. **[10]**

	outlook	temperature	humidity	windy	play
0	overcast	hot	high	False	yes
1	overcast	cool	normal	True	yes
2	overcast	mild	high	True	yes
3	overcast	hot	normal	False	yes
4	rainy	mild	high	False	yes
5	rainy	cool	normal	False	yes
6	rainy	cool	normal	True	no
7	rainy	mild	normal	False	yes
8	rainy	mild	high	True	no
9	sunny	hot	high	False	no
10	sunny	hot	high	True	no
11	sunny	mild	high	False	no
12	sunny	cool	normal	False	yes
13	sunny	mild	normal	True	yes

Q5) a) Explain different approaches used in implementation of reinforcement learning. **[5]**

b) Draw fully connected deep learning network and explain elements of the deep learning. **[5]**

c) Explain feedforward vs backpropagation implemented in the ANN. **[7]**

OR

Q6) a) Write applications of reinforcement learning with suitable examples. **[5]**

b) Explain key constituents of reinforcement learning with neat labelled sketch. **[7]**

c) Distinguish between machine learning and deep learning. **[5]**

Q7) a) Explain evaluation metrices in the classification problems with suitable examples, **[10]**

i) Confusion matrix

ii) Accuracy

iii) Precision

iv) Recall

v) F1 score

vi) Microaverage

vii) Weighted-average

b) Describe in details steps involved in the development of classification problems. **[8]**

OR

Q8) a) Explain in details linear SVM and non-linear SVM. **[9]**

b) Write a note on human machine interaction. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1859

[Total No. of Pages : 2

[6353] - 182
T.E. Automation and Robotics
Modeling and Simulation
(2019 Pattern) (Semester - II) (302529)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer two 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 permited***
5) ***Assume Suitable/Standard data if necessary.***

Q1) a) Use the linear congruential method to generate a sequence of random numbers with X_0 = 27, a= 17, c = 43, and m = 100. Here, the integer values generated will all be between zero and 99 because of the value of the modulus. These random integers should appear to be uniformly distributed the integers zero to 99. Random numbers between zero and 1 can be generated by $R_i=X_i / m$, i=1,2 ..... **[10]**

b) List out techniques for identifying data distribution. Explain any one of them. **[7]**

OR

Q2) a) Explain timing and relationship of validation, verification and establishing credibility. **[9]**

b) Define random number and list the properties of it. Explain any one technique for generating random numbers. **[8]**

Q3) a) What are the different techniques for generating random variates? Explain any one of them. **[9]**

b) List out the potential issues to overcome in output data analysis. **[9]**

P.T.O.

OR

Q4) a) Explain terminating simulation with any two examples in detail. **[8]**

b) Explain inverse transform technique for uniform and Weibull distribution with detailed procedure. **[10]**

Q5) a) Explain vehicle system with regard to material handling system and also list its input parameters that should be considered when designing and implementing them. **[9]**

b) Explain the components of manufacturing system. **[8]**

OR

Q6) a) What are the different performance measures used in manufacturing systems. **[10]**

b) Write a short note on- Flexible Manufacturing System. **[7]**

Q7) a) Define simulation software and list out its key features. Also mention few popular simulation software used in different domains. **[6]**

b) Compare simulation software with the programming languages. **[6]**

c) Explain object oriented simulation package. **[6]**

OR

Q8) a) Explain the features needed in programming the discrete-event type simulation model. **[6]**

b) Explain the classification of simulation software with example:. **[6]**

c) What is general purpose software package? Explain any one example of it. **[6]**

Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages :2

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[6353]-183

T.E. (Automation & Robotics)

Machining Science & Technology (Elective II)

(2019 Pattern) (Semester - II) (302530 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.***

Q1) a) Explain in details Mechanism of tool wear with neat sketch. **[9]**

b) A tool life 80 minutes is obtained at a speed of 30 m/min and 8 minutes in 60 m/min. Determine the following: **[9]**

i) Tool life Equation.

ii) Cutting speed for 4 minutes of tool life.

OR

Q2) a) What are the modes of tool wear? Write a short note on crater wear and flank wear. **[9]**

b) The following observations have been noted in a machining process. Cutting speed (V) 25 m/min 35 m/min, ToolTime (T) 90 minutes 20 minutes Find **[9]**

i) 'n' and 'C'

ii) Recommend the cutting speed for desired tool life of 60 minutes.

Q3) a) Explain in detail requirements of dynamometer. **[9]**

b) What is lathe tool dynamometer, explain its construction and working with neat sketch. Write its applications. **[8]**

OR

Q4) a) What is the need of measurement of cutting forces? **[8]**

b) Write a classification of cuting force dynamometers. Explain any two of them. **[9]**

P.T.O.

Q5) a) Explain in details Economics of machining. **[9]**

b) Suppose a turning operation is to be performed with HSS tooling on mild steel, with Taylor tool life parameters n=0.125, C = 70 m/min. Work part length = 500mm and diameter = 100 mm. Feed =0.25 mm/rev. Handling time per piece = 5.0 min, and tool change time =2.0 min. Cost of machine and operator = 30 rupees /hr, and tooling cost = 3 rupees per cutting edge, find (a) cutting speed for maximum production rate, and (b) cutting speed for minimum cost (c) the hourly production rate and cost per piece for the cutting speeds computed. **[9]**

OR

Q6) a) Derive equation for optimum cutting speed and tool life for minimum cost. **[9]**

b) A high-speed steel tool is used to turn a steel work part that is 300 mm long and 80 mm in diameter. The parameters in the Taylor equation are: n = 0.13 and C = 75 (m/min) for a feed of 0.4 mm/rev. The operator and machine tool rate = 30 rupees/hr, and the tooling cost per cutting edge = 4 rupees. It takes 2 min to load and unload the work part and 3.5 min to change tools. Determine (a) cutting speed for maximum production rate, (b) cutting speed for minimum cost, (c) tool life of cutting in (a) and (b), (d) cycle time and cost per unit of product in (a). **[9]**

Q7) a) Write a short note on Modern Machining Techniques. **[9]**

b) Describe in detail Electrical Discharge Machining (EDM) with working principle, diagram, construction, working, and application. **[8]**

OR

Q8) a) Differentiate between conventional and non-conventional machining process. **[9]**

b) Describe in detail Ultrasonic Machining (USM) with working principle, diagram, construction, working, and application. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC-1861

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[6353]-184

T.E. (Automation and Robotics)

MAINTENANCE AND SAFETY ENGINEERING

(Elective - II) (2019 Pattern) (Semester - II) (302530- 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 indicate full marks.***
4) ***Assume Suitable data, if necessary.***
5) ***Use of non programmable electronic calculator is permitted.***

Q1) a) What is Planned and unplanned Maintenance? Explain in details. **[9]**

b) Explain Condition Base Maintenance System. **[9]**

OR

Q2) a) What is Vibration Monitoring? What are its causes, identification and monitoring? **[9]**

b) Differentiate between Preventive Maintenance, Predictive Maintenance. **[9]**

Q3) a) Explain the factors involved in effective planning of maintenance work. **[9]**

b) What are the various methods of scheduling work? **[8]**

OR

Q4) a) Explain the Short term and Long Term Maintenance plans. **[9]**

b) Write a short note on 1. Annual Overhauls 2. Renovation 3. Revamping and 4. Modernization. **[8]**

Q5) a) What are the methods for Accidents preventions? **[9]**

b) What do you mean by Job Safety Analysis? Explain in detail. **[9]**

P.T.O.

OR

Q6) a) What is Safety Survey? Write the steps involved in safety survey. **[9]**

b) What are the Onsite offsite Emergency Plans? Why it is necessary? **[9]**

Q7) a) Explain the procedure for Ensuring Safety in planning, Building and Operating Plants. **[9]**

b) What points are considered in Construction and Commissioning of Plants? Explain in details. **[8]**

OR

Q8) a) Why safety measures are required in plant? Classify Safety measure? **[9]**

b) Demonstrate Personal Safety and Personal Protective Equipment? **[8]**

Total No. of Questions : 8]

SEAT No. :

PC1862

[Total No. of Pages : 2

[6353]-185
T.E. (Biotechnology)
ANALYTICAL TECHNIQUES
(2019 Pattern) (Semester - I) (315461)

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 calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) How does electrophoresis work? What are the components of an electrophoresis system? **[10]**

b) Which method can be used to separate DNA molecules by size? Why? **[8]**

OR

Q2) What do you mean by SDS PAGE? Discuss in detail the working process of SDS PAGE accompanied by a neat sketch. **[18]**

Q3) a) Define Sedimentation? What are the factors effecting Sedimentation? Discuss in detail. **[10]**

b) What is a Centrifuge? Discuss in brief the types of baskets used in Centrifuge. **[7]**

OR

Q4) a) What is rate of filtration? What are the factors effecting rate of filtration? **[10]**

b) Give an account on the working of a continuous rotary filter. **[7]**

P.T.O.

Q5) Explain UV-visible light spectroscopy with a neat diagram. What are the applications of UV-Visible spectroscopy? **[18]**

OR

Q6) Describe the functioning of the following detectors in short: **[18]**

i) Photovaltaic cell detector

ii) Photomultiplier Tubes detector

Q7) Explain the principle of IR spectroscopy. Describe the instrumentation used in IR spectroscopy with the help of a neat sketh. **[17]**

OR

Q8) Give an introduction to Nuclear Magnetic Resonance spectroscopy (NMR) and its use in the identification of molecules. **[17]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1863

[Total No. of Pages : 3

[6353]-186

T.E. (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 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 (30°C) to 373 K (100°C). Calculate the heat that must be transferred. **[8]**

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: **[6]**

i) Latent heat of fusion

ii) Latent heat of sublimation

c) State and explain the terms Latent heat and sensible heat. **[4]**

OR

Q2) a) State and explain in details different forms of energy. **[6]**

b) A stream flowing at a rate of 15000 mol/h containing 25 mole % N_2 and 75 mole % H_2 is to be heated from 298 K (25°C) to 473 (200°C). Calculate the heat that must be transferred using C_p^0 data given below: **[12]**

$C_p^0 = a + bT + cT^2 + dT^3$, kJ/(kmol.k)

Gas	a	$b \times 10^3$	$C \times 10^6$	$d \times 10^9$
N_2	29.5909	– 5.41	13.1829	– 4.968
H_2	28.6105	1.0194	– 0.1476	0.769

P.T.O.

Q3) a) Define yield, selectivity and conversion. **[6]**

b) Calculate the yield Y_{X/O_2} . (g dw cell/g O_2) and $Y_{x/s}$ (g dw cell/g substrate) for the following biological reaction **[11]**

$C_6H_{12}O_6 + 1.473\ O_2 + 0.782\ NH_3 \rightarrow 0.909\ (C_{4.4}H_{7.3}N_{0.8}6O_{1.2}) + 3.854H_2O + 2\ CO_2$

Glucose Biomass

OR

Q4) a) Acetobacter Aceti bacteria convert ethanol to acetic acid under aerobic condition using the reaction: **[7]**

$C_2H_5OH + O_2 \rightarrow CH_2COOH + H_2O$

What is the maximum amount of C_2H_5OH required?

b) Define: **[3]**

i) Molar mass

ii) Gram mole

c) A feed containing 60 mole % A, 30 mole % B and 10 mole % inerts a enteras reactor. 80 % of original A reacts according to the following reaction:

$2A + B \rightarrow C$

Find the composition of product stream on mole basis. **[7]**

Q5) a) For a given reaction the gross heating value (GHV) of gaseous propane at 298 K(250C) is 2219.71 KJ/mol. Calculate the net heating value (NHV) of propane.

$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$ **[9]**

b) Calculate heat of formation of liquid 1-3 butadiene at 298.15 K (25°C) using the following data: **[9]**

Data: Standard heat of formation of CO_2 (g)= –393.51 KJ/mol

Standard heat of formation of H_2O (1) = –285.83 KJ/mol

Standard heat of combustion of C_4H_6 (1) at 298.15 K (25°C) = –2520.11 kJ/mol

OR

Q6) a) Define the following terms: **[6]**

i) Enthalpy

ii) Specific heat

iii) Heat capacity

iv) Thermochemistry

b) Calculate the enthalpy change between reactants and products if both are at 298.15 K (25°C) if 60 mol CO_2 is produced according to the following reaction: **[6]**

$2C_4H_{10}\ (g) + 13O_2\ (g) \rightarrow 8CO_2\ (g) + 10H_2O\ (l)$

Data:	
Component	ΔH_r^0, kJ/mol at 298.15 K (25°C)
C_4H_{10} (g)	- 125.79
CO_2 (g)	- 393.51
H_2O (l)	- 285.83

c) What is the enthalpy of 150 g formic acid at 70°C and 1 atm relative to 25°C and 1 atm? **[6]**

C_p for formic acid in temperature range of interest is 0.524 cal/g °C.

Q7) a) What is ultimate analysis of coal explain in details. **[5]**

b) What is Net Calorific value and Gross Calorific value? **[5]**

c) An oil sample is found to contain 77.0 % C, 22.7 % H_2 and 0.3 % S (by mass). Its GCV at 298.15 K is measured to be 45,071 kJ/kg oil. Calculate its NCV at 298.15 K. Latent heat of H_2O vapour= 2442.5 kJ/kg water. **[7]**

OR

Q8) a) How is the coal classified? Write in details about classification of coal.**[5]**

b) What is combustion? Classify fuels. What is calorific value of fuels?**[12]**

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Total No. of Questions : 8]

SEAT No. :

PC1864

[Total No. of Pages : 2

[6353]-187
T.E. (Biotechnology)
GENETIC ENGINEERING
(2019 Pattern) (Semester - I) (315463)

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.***

Q1) a) Describe principle and applications of PCR in cloning . **[9]**

b) Differentiate between genomic libraries and cDNA libraries. **[9]**

OR

Q2) a) Describe construction of genomic libraries. **[9]**

b) How are genomic libraries screened? Add a note on immunological screening & its significance. **[9]**

Q3) a) Define vectors and write idle properties of vectors used in gene cloning.**[9]**

b) Illustrate the methodology used in *Saccharomyces cerevisiae* cloning.**[8]**

OR

Q4) a) Describe principle and applications of cloning in Gram positive bacteria. **[9]**

b) Write short note on YAC's. **[8]**

Q5) a) Write principle and applications of Electroporation. **[10]**

b) Describe Particle bombardment gene transfer method with its applictions. **[8]**

OR

P.T.O.

Q6) a) Describe principle strategies used for transformation of animal cells with its significance. **[10]**

b) Write short note on Transfection. **[8]**

Q7) a) What is Humulin? How it is produced and used? **[8]**

b) Describe principle and applications of rDNA technology in Agriculture. **[9]**

OR

Q8) a) What is the application of DNA technology in plant crop improvement? Justify with examples. **[8]**

b) Elaborate DNA diagnostics method and applications. **[9]**

* * *

Total No. of Questions : 8]

SEAT No. :

PC1865

[Total No. of Pages : 2

[6353]-188

T.E. (Biotechnology)

INTRODUCTION TO IMMUNOLOGY

(2019 Pattern) (Semester-I) (315464)

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.***

Q1) a) What is an immunogen? With appropriate examples discuss four important properties of antigen. **[12]**

b) Give applications of monoclonal antibody. **[6]**

OR

Q2) a) With the help of labeled diagram represent the structures of antibody IgG, IgA, 1gM. **[12]**

b) Write a short note on Epitope. **[6]**

Q3) a) Discuss the process of antigen presentation in cell mediated immunity. **[10]**

b) Write a note on Complement system. **[7]**

OR

Q4) a) With the help of diagram differentiate between Class I and Class II MHC molecules. **[15]**

b) Name any one Antigen presenting cell. **[2]**

Q5) a) Enlist types of Hypersensitivity reactions and describe anaphylaxis in detail. **[12]**

b) Write a short note on autoimmune Thyroiditis. **[6]**

OR

P.T.O.

Q6) a) Write short notes on (ANY TWO) **[12]**

i) Contact dermatitis,

ii) DTH

iii) IgE

b) Write on SLE. **[6]**

Q7) a) You are developing an ELISA kit for the detection of Corona virus in patients serum samples. Name the reagents you will be providing in a kit and process flow chart. **[12]**

b) Write a note on Attenuated vaccines. **[5]**

OR

Q8) a) With the help of labeled diagram describe primary and secondary IR. How is it used in Vaccines. **[12]**

b) Write a note on adjuvants. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC-1866

[Total No. of Pages : 2

[6353] - 189
T.E. (Biotechnology)
Elective-I A: Enzyme Technology
(2019 Pattern) (Semester - I) (315465 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) ***Use of Calculator is allowed.***
5) ***Assume Suitable data, if necessary.***

Q1) **Answer the following :** **[18]**

a) Differentiate between

i) PLP and TPP

ii) Cofactor and Prosthetic group

b) Write a note on Coenzyme A and Biotin

OR

Q2) **Answer the following :** **[18]**

a) Describe the role of Coenzyme A in the oxidation of fatty acids

b) Write a note on Pyridoxal phosphate

Q3) **Answer the following :** **[17]**

a) Describe the feedback inhibition with suitable example.

b) Describe the allosteric inhibition with an example.

OR

P.T.O.

Q4) **Answer the following :** **[17]**

a) Distinguish between competitive inhibition and allosteric inhibition

b) What are the applications of enzyme inhibition?

Q5) **Answer the following :** **[18]**

a) Enlist the synthetic and bio polymers which are routinely used for immobilization of enzyme

b) Differentiate between adsorption and covalent method of immobilization.

OR

Q6) **Answer the following :** **[18]**

a) Describe the entrapment method of immobilization. Explain the disadvantages of the same.

b) What are the advantages and disadvantages of immobilized enzymes.

Q7) **Answer the following :** **[17]**

a) Depict a diagram showing all components of biosensor.

b) Enlist any eight pharmaceutical application of immobilized enzymes.

OR

Q8) **Answer the following :** **[17]**

a) What are the advantages and disadvantages of enzyme immobilization in food industry?

b) Give any five applications of immobilized enzymes with one examples of each.

Total No. of Questions : 8]

SEAT No. :

PC-1867

[Total No. of Pages : 2

[6353] - 191
T.Y. B. Tech Biotechnology
AGRICULTURAL BIOTECHNOLOGY
(2019 Pattern) (Semester - I) (315465 C) (Elective-I)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Figures to the right side indicate full marks.***

Q1) a) Describe concept of cellular totipotency and add note on different cell culture methods with its examples. **[9]**

b) What are secondary metabolites? How they are produced by PTC. **[9]**

OR

Q2) a) What do you mean by suspension culture? Explain the principle, and applications of cell suspension culture. **[9]**

b) Explain the concept of Cryopreservation and its applications in PTC **[9]**

Q3) a) Briefly explain Amplified Fragment Length Polymorphism (AFLP) markers with its applications. **[9]**

b) Write, principle and applications of Marker Assisted Selection for crop improvement **[8]**

OR

P.T.O.

Q4) a) Describe concepts of DNA markers with its applications. **[9]**

b) Write, short note on **[8]**

i) Genomics and

ii) Proteomics

Q5) a) Explain genetics and biochemistry of nitrogen fixation. **[10]**

b) Describe AzoIla and Anabena symbiotic association. **[8]**

OR

Q6) a) Write, in brief methodology used for biofertilizer production and add note on its applications. **[10]**

b) Write short notes on **[8]**

i) Phosphate solubilizing microbial fertilizers

ii) Biopesticides

Q7) a) Briefly describe patent in agriculture. **[8]**

b) What is the Cartagena protocol on Biosafety? **[9]**

OR

Q8) a) Enlist the regulatory authorities and biosafety committees in India for GMO products **[8]**

b) Describe the functional role of Genetic Engineering Appraisal Committee (GEAC) **[9]**

Total No. of Questions : 8]

SEAT No. :

PC1868

[Total No. of Pages : 2

[6353]-192
T.E. (Biotechnology Engineering)
FERMENTATION TECHNOLOGY
(2019 Pattern) (Semester-II) (315471)

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.***

Q1) a) Describe the detail process of Streptomycin production. **[6]**

b) What is vitamin? Explain the production of vitamins B2 & B12 through fermentation. **[6]**

c) Write note on bakers yeast production. **[6]**

OR

Q2) a) Illustrate the process of production and recovery of streptomycin with neat sketch. **[6]**

b) What is fermentation? Describe the fermentative production of ethanol. **[6]**

c) What are antibiotics? Describe the process of fermentative production of penicillin. **[6]**

Q3) a) What are enzymes? Enlist the different sources of enzymes and discuss their applications in various sectors. **[9]**

b) Describe the fungal protein production through solid state fermentation. **[8]**

OR

Q4) a) What is immobilization? Describe the various techniques of immobilization the for cells and enzymes. **[9]**

b) Write note on Single Cell Protein (SCP) production. **[8]**

P.T.O.

Q5) a) Explain in detail about submerged liquid fermentation with applications. **[8]**

b) What is bioreactor? Describe the advantages, disadvantages and applications involved in solid liquid fermentation and solid state fermentation. **[10]**

OR

Q6) a) Discuss in detail about plug flow reactor and fluidized bed reactor with applications, advantages and disadvantages with neat sketch. **[10]**

b) What is solid state fermentation? Describe its design and working with neat sketch. **[8]**

Q7) a) Discuss the concept of Good Manufacturing Practices (GMP) in detail. **[8]**

b) Discuss the phenomenon of Inoculum development and sterilization in detail. **[9]**

OR

Q8) a) What is scale up process? Discuss its objectives and types of scale up processes in the field of fermentation technology. **[8]**

b) Write note on enhancement of fermentation efficiency by taking the case study of ethanol economics. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC1869

[Total No. of Pages : 2

[6353]-193

T.E. (Biotechnology)

MASS TRANSFER

(2019 Pattern) (Semester - II) (315472)

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) Why crystallization is an important operation in downstream processing? **[9]**

b) Explain in detail various methods of supersaturation. **[9]**

OR

Q2) a) Define following terms: **[8]**

i) Saturation/Saturated solution

ii) Magma

iii) Yield of Crystallization

iv) Mother liquor

b) Explain mechanism of crystallization? How crystal formation takes place? How crystal formation varies based on rate of cooling? **[10]**

Q3) a) Write a short note on: **[8]**

i) Fractional distillation

ii) Vacuum Distillation.

b) If we consider $y = \alpha x/1 + (\alpha\text{-}1)\, x$ in terms of relative volatility, then derive Rayleigh equation in terms of relative volatility. **[9]**

OR

Q4) a) What are azeotropes? Explain types of azeotropes? **[8]**

b) What is the optimum reflux ratio? Draw and explain diagram showing relationship of cost versus reflux ratio. **[9]**

P.T.O.

Q5) a) Write a short note on various column internals. **[9]**

b) What is feed plate and feed line and how thermal conditions of the feed are introduced based on q-value? Explain it with the help of graph. **[9]**

OR

Q6) a) Define Dalton's law and Roult's law. Explain how these laws are applicable in distillation. **[9]**

b) Draw fractionating column. Give major units of column and explain in detail continuous distillation process. **[9]**

Q7) a) What is the difference between absorption and stripping? Why absorption is much preferred operation? **[9]**

b) How HTU and NTU are correlated with ideal tray/plate in distillation column? **[8]**

OR

Q8) a) Write a short note on solvent selection in gas absorption operation. **[5]**

b) 5000 kg/hr of a SO_2-Air mixture containing5% by volume SO_2 is to be scrubbed with 1,00,000 kg/hr of water in a packed bed tower. The exit concentration of SO_2 is reduced to 0.15%. The tower operates at 1atm. The equilibrium relationship is given by, Y = 20X, Where Y = Mole of SO_2/ Mole of air and X = Mole of SO_2/Mole of water. If the packed height of the tower is 420 cm, estimate the height of transfer unit (HTU). **[12]**

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Total No. of Questions : 8]

SEAT No. :

PC-1870

[Total No. of Pages : 3

[6353]-194

T.E./B.Tech. (Biotechnology)

BIOSEPARATION ENGINEERING

(2019 Pattern) (Semester - II) (315473)

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 includicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Write a short note on temperature swing adsorption with one case study. **[6]**

b) Adsorption of an organic solute on activeted silica gel gave the following data after equalibration. **[12]**

S (mg/cm^3)	0.0139	0.089	0.066	0.047	0.037
Ca (mg/g)	0.03	0.026	0.0225	0.021	0.018

Fit the data to an adsorption isotherm and calclulate the constants.

OR

Q2) a) What are the different types of adsorbents used in various applications? Give some examples. **[9]**

b) Discuss the principle and practice of batch adsorption with few examples. **[9]**

Q3) a) Explain different peak broadening effects. How Van Deemter plot co-relates peak broadening effect? **[9]**

b) A solute X of a sample mixture is not retained on the colum and elutes out at 4 minutes after injection. Another solute in the same sample mixture Y elutes out at 12 minutes. The mobile phase flow rate is 20 ml/min. Calculate the values of Vm, capacity factor k' for the solute Y in the mobile and stationary phases. **[8]**

P.T.O.

OR

Q4) a) Calculate the retention volumes, capacity factors and relative retention of two solutes giving packs 1 and 2 with retention times of 3.5 and 5.0 mintues respectively on an adsorption colum at a flow rate of 2.2 ml/min. The t_0 value is 1.5 min. **[8]**

b) What is FID? Explain how this detector work in GC? **[9]**

Q5) a) Explain the term in detail rejection co-efficient? **[9]**

b) Write short note on hollow fiber membrane module and explain the term rejection co-efficient. **[9]**

OR

Q6) a) Discuss the princple and operational aspects of microfiltration. **[9]**

b) What is Dialysis? How is useful in bioseparations? Explain with 1-2 examples. **[9]**

Q7) a) What are the characteristics of biopreocesses? State major challenges in bioseparation engineering? **[9]**

b) What are different proten precipitation techniques used? Describe techniques with one example. **[8]**

OR

Q8) a) Write a short note on molecular sieves with 1-2 examples. **[9]**

b) Write a short note on reactive extraction? What is the difference between reactive extraction and distillation? **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC-1871

[Total No. of Pages :2

[6353]-196

T.E. B. Tech.(Biotechnology)

Elective-II : FOOD BIOTECHNOLOGY

(2019 Pattern) (Semester - II) (315474 - 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) Answer the following : **[18]**

a) What is the significance of drying in food preservation.

b) Enlist and define different pasteurization methods.

OR

Q2) Answer the following : **[18]**

a) Give an overview of freezing processes in food preservation.

b) Explain the operation principles of HTST systems.

Q3) Answer the following : **[17]**

a) Explain the role of algae in sustainable food production and nutrition.

b) Analyze the advantages and limitations of solid-state fermentation for food applications.

OR

Q4) Answer the folowing : **[17]**

a) Explain any one application of microbial-derived flavors in food products.

b) What are some effective optimization strategies for improving microbial growth and increasing metabolite production in Soild State Fermentation (SSF)?

P.T.O.

Q5) Answer the following ***:*** **[18]**

a) Describe how enzymes contribute to dough development, texture enhancement, and shelf-life extension in bakery products.

b) How are enzymes used in meat processing? Explain brif.

OR

Q6) Answer the following : **[18]**

a) Discuss how enzymes facilitate starch conversion, sugar production, and clarity enhancement in beer.

b) Evaluate the challenges in enzyme production for various food applications.

Q7) Answer the following : **[17]**

a) Explain mechanical methods used for solid waste treatment, such as shredding and screening.

b) Write a short note on the following two food waste disposal methods-chemical and biological.

OR

Q8) Answer the following : **[17]**

a) Describe the following physical methods used for waste disposal in the food industry-landfilling and incineration.

b) Discuss the application of activated sludge process in treating liquid wastes from food processing plants.

Total No. of Questions : 8]

SEAT No. : ____

PC1872

[Total No. of Pages : 3

[6353]-198
T.E. (Printing Engineering)
PRINT STATISTICS
(2019 Pattern) (Semester - I) (308281)

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) Analyze the following data and comment on the same. **[17]**

Pigment Percentage	Ink Contrast
17	40
19	57
22	43
20	62
18	48
21	52

OR

Q2) From the given data, arrange the data, prepare frequency distribution table and draw the Histogram only and comment on the same. **[17]**

0.912	0.910	0.904	0.905	0.910	0.911
0.914	0.912	0.910	0.913	0.908	0.914
0.907	0.909	0.913	0.912	0.909	0.913
0.902	0.906	0.909	0.907	0.906	0.908
0.915	0.909	0.910	0.911	0.912	0.909
0.910	0.909	0.908	0.910	0.909	0.907

Note 1:- From G Chart, the recommended number of groups should be 7 for Number of measurements between 30 to 40. And divide the range of the data by number of groups (7), to find out the class interval, and round it off to 3rd decimal value to form the groups.

P.T.O.

Q3) Prepare X - MR chart from the given data **[18]**

Sample No.	1	2	3	4	5	6	7	8	9	10
Measurements	.0218	.0243	.0232	.0256	.0247	.0255	.0282	0.261	.0244	.0252

Sample No.	11	12	13	14	15	16	17	18	19	20
Measurements	.0265	.0267	.0254	.0238	.0249	.0275	.0265	.0232	.0294	.0281

Note: Use n = 2

Shewhart's Constants: E2 = 2.659, D3 = 0, D4 = 3.267

OR

Q4) Make two Pareto Charts for the data given in the following table, one for the number of defectives and one for dollar loss. In each case, include a cumulative percentage graph as well. **[18]**

Department	Defectives	Dollar Loss
A	20	100
B	120	60
C	80	800
D	100	500
E	50	200
F	30	90

Q5) Explain in detail with suitable examples, data dispersion, its measurable characteristics, standard distribution and its +/–3 zones with suitable diagram. And also explain how standard deviation is more important than range. **[17]**

OR

Q6) From the following data, draw appropriate diagrams and also comment on the same (any two) **[17]**

a) Target 22 mm, Tolerance +/–2 mm, process mean 23 mm, LCL 20mm, UCL 26 mm.

b) Target 530, process mu 532, standard deviation 8, LSL 505, USL 560.

c) Design specification 5.5, s = 1 .5, mu 6, specification width 8.

Q7) What is Process Capability Analysis? Explain in detail with index values and formulas and appropriate diagram. **[18]**

OR

Q8) Explain in detail the Six Sigma Methodology. **[18]**

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Total No. of Questions : 8]

SEAT No. :

PC1873

[Total No. of Pages : 2

[6353]-199

T.E. (Printing Engineering)

OFFSET PRINTING TECHNIQUES

(2019 Pattern) (Semester - I) (308282)

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) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) Provide an overview of the modulus of elasticity of paper. **[6]**

b) Discuss auto registration control systems used in printing processes. **[6]**

c) Explain the purpose and usage of angle bars in printing equipment. **[6]**

OR

Q2) a) Explain the components of a single-sheet offset feeder system. **[8]**

b) Discuss the various mechanisms employed for sheet transfer in sheet-fed offset presses. **[5]**

c) Explore the features and functionalities of double diameter and triple diameter impression cylinders. **[5]**

Q3) Describe the two types of inking systems used in sheet-fed presses, accompanied by clear diagrams. **[17]**

OR

Q4) a) Differentiate between conventional and hybrid UV offset inking units. **[9]**

b) Provide an explanation of the conventional dampening system in offset presses, including a diagram. **[8]**

P.T.O.

Q5) a) Define the behavior of ink in heatset presses. **[5]**

b) Detail one type of folder commonly utilized in web offset presses. **[6]**

c) Explain the fundamental principle behind IR dryers in web offset printing, supported by a diagram. **[6]**

OR

Q6) a) Highlight the distinctions between heat set and cold-set presses. **[5]**

b) Describe the process of setting temperatures based on ink coverage and substrate in dryers used in web offset printing. **[6]**

c) Discuss the basic operating principle of UV dryers in web offset printing. **[6]**

Q7) a) Explore the issues related to web instability encountered in printing presses. **[6]**

b) Define web tension control and its significance in printing processes. **[6]**

c) Explain the functioning of closed-loop systems used for register control in printing presses. **[6]**

OR

Q8) a) Describe the operational principles of the Sheet-fed Offset Stream Feeder System. **[6]**

b) Detail the functions of reel stands and the mechanisms involved in handling reels in a web offset machine. **[6]**

c) Elaborate on the process of transferring sheets in sheet-fed offset printing, specifically from the swing gripper to the delivery unit. **[6]**

Total No. of Questions : 8]

SEAT No. : ____

PC1874

[Total No. of Pages : 2

[6353]-200
T.E. (Printing)
COLOR SCIENCE AND MEASUREMENT
(2019 Pattern) (Semester - I) (308283)

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) ***Assume suitable data if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) What is additive color system? **[6]**

b) Where additive color system is used? **[6]**

c) Which color system is applicable to printing? **[5]**

OR

Q2) a) Draw Munsell color system. **[6]**

b) Explain Munsell color system. **[5]**

c) Comment on color systems based on uniform color perception. **[6]**

Q3) a) Compare various color measuring instruments. **[6]**

b) Explain the working of spectrophotometer. **[6]**

c) What is pint density? How print density is measured? **[6]**

OR

Q4) a) Comment on viewing geometry. **[6]**

b) Discuss working of Densitometer. **[6]**

c) What are measurement modes available for color measuring instruments? **[6]**

P.T.O.

Q5) a) Explain viewing conditions required for visual 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) Comment on instrumental color assessment. **[5]**

c) Discuss color deviation. **[6]**

Q7) a) Compare Dyes and pigments. **[6]**

b) What is mesmerism? **[6]**

c) What is application of kubelka Munk Theory for color matching? **[6]**

OR

Q8) a) Explain Kubelka Munk Theory. **[6]**

b) Compare different colorants. **[6]**

c) What are different types of metamerism? **[6]**

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Total No. of Questions : 8]

SEAT No. :

PC1875

[Total No. of Pages : 2

[6353]-201

T.E. (Printing)

INK TECHNOLOGY

(2019 Pattern) (Semester-I) (308284)

Time : 2 ½Hours] *[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 right indicate full marks.***
3) ***Assume suitable data if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Categories a Shear thinning and shear thickening liquids. **[6]**

b) Identify the factors which affects the rheological behavior of printing inks. **[6]**

c) Explain in brief the influence of ink Rheology on printing quality. **[6]**

OR

Q2) a) Draw a stress and strain curve diagram and explain printing ink on the diagram. **[6]**

b) Derive the Thixotropy in terms of printing inks. **[6]**

c) Write your review on Viscometer and Viscosity of ink. **[6]**

Q3) a) Identify the factors affecting ink drying. **[5]**

b) With the suitable examples of ink explain the methods of ink drying. **[6]**

c) Compare UV and IR curing. **[6]**

OR

Q4) a) Write your review on UV ink drying. **[5]**

b) Write short review on microwave drying. **[6]**

c) Compare evaporation and absorption drying. **[6]**

P.T.O.

Q5) a) Categories the printing substrates and their ink requirements in terms of adhesion and gloss and drying methods. **[6]**

b) Classify the Printing inks and their end use. **[6]**

c) Explain in brief the factors to be considered while formulating printing inks. **[6]**

OR

Q6) a) Describe the ink manufacturing process and different methods for pigment dispersal. **[6]**

b) Explain in brief the printing process and their ink ingredients and ink formulation. **[6]**

c) What is the purpose of driers (Additives) in ink formulation? **[6]**

Q7) a) Write short note on analysis of Ink component. **[5]**

b) Write review on VOC. **[6]**

c) Write review on Gloss. **[6]**

OR

Q8) a) Explain in brief the purpose to check the glass of ink. **[5]**

b) Explain in brief the solid contents of ink and the purpose of solid contents in ink. Explain the method to calculate the % f solid content. **[6]**

c) Explain in brief the ink flow of ink and the purpose of ink flow for printing inks. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC-5119

[Total No. of Pages : 2

[6353] - 202R
T.E. (Printing Engineering)
CYBER SECURITY
(2019 Pattern) (Semester - I) (308286 A) (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.***

Q1) a) Explain the following terms – Ransomware, Adware, Spyware **[6]**

b) What is an Operating System? Describe in brief about the Kali Linux OS. Name a few security tools present in Kali Linux along with their use cases **[12]**

OR

Q2) a) What is a computer virus? Write the code for a notepad virus and explain how it works. **[9]**

b) What security measures can be taken by an individual to stay safe from android hacking? **[9]**

Q3) a) What is meant by booting? Differentiate between soft boot and hard boot. Is it possible to use multiple OS on a single machine? If yes, How? **[9]**

b) What are the different methods of password cracking? Explain how is windows password cracked using “utilman.exe”. **[9]**

OR

P.T.O.

Q4) a) Explain in detail how an android device can be hacked. **[8]**

b) How can you detect if your device has been hacked? **[9]**

Q5) a) Explain the following terms with suitable examples–Spear Phishing, Smishing, Vishing, Whaling. **[12]**

b) Name and explain any 6 points to identify a phishing email **[6]**

OR

Q6) a) How is "The Harvester" tool used for reconnaissance? Explain the modus operandi of a social engineering attack. **[8]**

b) How can you detect and prevent falling prey to phishing, vishing and smishing attacks? **[10]**

Q7) a) Explain the historical background, Object, Extent Scope and Commencement of the Information Technology Act. **[10]**

b) What is Stalking? What are the legal actions which can be taken against stalking as per the IT ACT in India? **[7]**

OR

Q8) a) What is Cybercrime? How is it different from other types of crimes? **[10]**

b) Explain Cyber Terrorism and Cyber bullying. **[7]**

Total No. of Questions : 8]

SEAT No. :

PC-1877

[Total No. of Pages : 2

[6353] - 203
T.E. (Printing Engineering)
Wood, Glass and Metal Based Packaging
(2019 Pattern) (Semester - I) (308286 B) (Elective-I)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
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 not 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 **[7]**

OR

Q4) a) Explain Pressure Test, and Density Test of glass packaging. **[7]**

b) Explain chemical resistance testing of glass packaging. **[8]**

P.T.O.

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]**

Total No. of Questions : 8]

SEAT No. :

PC1878

[Total No. of Pages : 2

[6353]-205
T.E. (Printing Engineering)
FLEXO PRINTING TECHNIQUES
(2019 Pattern) (Semester-II) (308289)

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

Q1) a) How to prepare a conventional photopolymer plate for Flexo press. **[17]**

b) Discuss Environmental concerns in Flexo industry.

c) Explain UV light source used in plate making process.

OR

Q2) a) Discuss Standardization of Conventional Flexo Plate. **[17]**

b) Why we use developing solution and explain different type of washout solution.

c) Explain Term : Post Exposure and Light Finishing.

Q3) a) How to printability effects by varying dots. **[18]**

b) Explain the working principle of Argon laser with neat and clean diagram.

c) Define laser Ablation technique.

OR

Q4) a) Explain Digital Workflow in detail. **[18]**

b) Explain the working principle of He - Ne laser with neat and clean diagram.

P.T.O.

Q5) a) Explain wide web press in detail with diagram. **[17]**

b) Explain UV dryer in detail with diagram.

c) Explain flexography process with diagram.

OR

Q6) a) Explain narrow web press in detail with diagram. **[17]**

b) Explain EB dryer in detail with diagram.

c) Discuss on flexography product and application.

Q7) a) Explain different method of anilox engraving. **[18]**

b) Discuss anilox volume carrying capacity and cell count.

c) Explain different method of Anilox cleaning.

OR

Q8) a) Describe the anilox maintenance and storage. **[18]**

b) Explain different ink metering system used in flexography.

c) Explain Doctor Blade in flexography with diagram.

■■■■

Total No. of Questions : 8]

SEAT No. : [ ]

PC1879

[Total No. of Pages : 1

[6353]-206

T.E. (Printing)

COLOR MANAGEMENT

(2019 Pattern) (Semester - II) (308290)

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.***

Q1) Explain in detail. **[18]**

a) Concept of soft proofing.

b) Conditions required for soft proofing.

OR

Q2) Why is monitor profiling significant in color management? Discuss the features and benefits of monitor profiling. **[18]**

Q3) Explain in detail significance and features of printer profiling. **[17]**

OR

Q4) Write short notes on; **[17]**

a) Saturation Intent.

b) Gamut mapping.

Q5) What is concept of hard proof? Explain hard proofing process. **[18]**

OR

Q6) Explain device link profile and color conversion through device link profile. **[18]**

Q7) With respect to visual color evaluation, write short note on: **[17]**

a) Grey balance setting.

b) Tonal reproduction curves.

OR

Q8) Discuss in details concept of visual color evaluation and viewing condition for evaluation. **[17]**

ⓘⓘⓘⓘ

Total No. of Questions : 8]

SEAT No. :

PC-1880

[Total No. of Pages : 4

[6353]-207
T.E. (Printing)
DESIGN OF EXPERIMENTS
(2019 Pattern) (Semester - II) (308291)

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 indicates full marks.***
3) ***Assume suitable data if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain Type I and Type II error. **[9]**

b) Write a short note on hypothesis. **[9]**

OR

Q2) a) Write short note on Null and Alternate Hypothesis with suitable example. **[9]**

b) What do you mean by sampling. Explain Random sampling. **[9]**

Q3) a) The Low color strength is a problem observed in Screen printing. State the cause problem. **[8]**

b) What is ANOVA and what is its significance in statistical testing. **[9]**

OR

Q4) Set up an analysis of variance table for the following per acre production data for three varieties of wheat, each grown on 4 plots and state if the variety differences are significant. **[17]**

Plot of land	Per acre production data		
	Variety of wheat		
	A	B	C
1	6	5	5
2	7	5	4
3	3	3	3
4	8	7	4

P.T.O.

Q5) 7, 7, 9, 8, 10

19, 20, 21, 20, 22

21, 21, 17, 19, 20

8, 7, 8, 9, 10

Calculate mean, median, mode, standard deviation of the above given data. **[18]**

OR

Q6) Design of a full factorial experiment at 2-levels of any screen-printing parameters/ Factors with appropriate sampling plan. Explain response. **[18]**

Q7) a) Differentiate control charts for variable and attributes. Explain the significance of the Control Charts **[9]**

b) Explain the significance of the Cause and Effect diagram **[8]**

OR

Q8) Following are the problems observed in Offset printing. State the cause of all the problems. **[17]**

a) Density increase

b) Dot gain

c) Poor contrast

d) Low color strength

♦ ♦ ♦

Table 2: Critical Values of Student's *t*-Distribution

d.f.	Level of significance for two-tailed test					d.f.
	0.20	0.10	0.05	0.02	0.01	
	Level of significance for one-tailed test					
	0.10	0.05	0.025	0.01	0.005	
1	3.078	6.314	12.706	31.821	63.657	1
2	1.886	2.920	4.303	6.965	9.925	2
3	1.638	2.353	3.182	4.541	5.841	3
4	1.533	2.132	2.776	3.747	4.604	4
5	1.476	2.015	2.571	3.365	4.032	5
6	1.440	1.943	2.447	3.143	3.707	6
7	1.415	1.895	2.365	2.998	3.499	7
8	1.397	1.860	2.306	2.896	3.355	8
9	1.383	1.833	2.262	2.821	3.250	9
10	1.372	1.812	2.228	2.764	3.169	10
11	1.363	1.796	2.201	2.718	3.106	11
12	1.356	1.782	2.179	2.681	3.055	12
13	1.350	1.771	2.160	2.650	3.012	13
14	1.345	1.761	2.145	2.624	2.977	14
15	1.341	1.753	2.731	2.602	2.947	15
16	1.337	1.746	2.120	2.583	2.921	16
17	1.333	1.740	2.110	2.567	2.898	17
18	1.330	1.734	2.101	2.552	2.878	18
19	1.328	1.729	2.093	2.539	2.861	19
20	1.325	1.725	2.086	2.528	2.845	20
21	1.323	1.721	2.080	2.518	2.831	21
22	1.321	1.717	2.074	2.508	2.819	22
23	1.319	1.714	2.069	2.500	2.807	23
24	1.318	1.711	2.064	2.492	2.797	24
25	1.316	1.708	2.060	2.485	2.787	25
26	1.315	1.706	2.056	2.479	2.779	26
27	1.314	1.703	2.052	2.473	2.771	27
28	1.313	1.701	2.048	2.467	2.763	28
29	1.311	1.699	2.045	2.462	2.756	29
Infinity	1.282	1.645	1.960	2.326	2.576	Infinity

Table 4(a): Critical Values of *F*-Distribution (at 5 per cent)

ν_2 \ ν_1	1	2	3	4	5	6	8	12	24	∞
1	161.4	199.5	215.7	224.6	230.2	234.0	238.9	243.9	249.1	243.3
2	18.51	19.00	19.16	19.25	19.30	19.33	19.37	19.41	19.45	19.50
3	10.13	9.55	9.28	9.12	9.01	8.94	8.85	8.74	8.64	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.04	5.91	5.77	5.63
5	6.61	5.79	5.41	5.19	5.05	4.95	4.82	4.68	4.53	4.36
6	5.99	5.14	4.76	4.53	4.39	4.28	4.15	4.00	3.84	3.67
7	5.59	4.74	4.35	4.12	3.97	3.87	3.73	3.57	3.41	3.23
8	5.32	4.46	4.07	3.84	3.69	3.58	3.44	3.28	3.12	2.93
9	5.12	4.26	3.86	3.63	3.48	3.37	3.23	3.07	2.90	2.71
10	4.96	4.10	3.71	3.48	3.33	3.22	3.07	2.91	2.74	2.54
11	4.84	3.98	3.59	3.36	3.20	3.09	2.95	2.79	2.61	2.40
12	4.75	3.88	3.49	3.26	3.11	3.00	2.85	2.69	2.51	2.30
13	4.67	3.80	3.41	3.18	3.02	2.92	2.77	2.60	2.42	2.21
14	4.60	3.74	3.34	3.11	2.96	2.85	2.70	2.53	2.35	2.13
15	4.54	3.68	3.29	3.06	2.90	2.79	2.64	2.48	2.29	2.07
16	4.49	3.63	3.24	3.01	2.85	2.74	2.59	2.42	2.24	2.01
17	4.45	3.59	3.20	2.96	2.81	2.70	2.55	2.38	2.19	1.96
18	4.41	3.55	3.16	2.93	2.77	2.66	2.51	2.34	2.15	1.92
19	4.38	3.52	3.13	2.90	2.74	2.63	2.48	2.31	2.11	1.88
20	4.35	3.49	3.10	2.87	2.71	2.60	2.45	2.28	2.08	1.84
21	4.32	3.47	3.07	2.84	2.68	2.57	2.42	2.25	2.05	1.81
22	4.30	3.44	3.05	2.82	2.66	2.55	2.40	2.23	2.03	1.78
23	4.28	3.42	3.03	2.80	2.64	2.53	2.38	2.20	2.01	1.76
24	4.26	3.40	3.01	2.78	2.62	2.51	2.36	2.18	1.98	1.73
25	4.24	3.38	2.99	2.76	2.60	2.49	2.34	2.16	1.96	1.71
26	4.22	3.37	2.98	2.74	2.59	2.47	2.32	2.15	1.95	1.69
27	4.21	3.35	2.96	2.73	2.57	2.46	2.31	2.13	1.93	1.67
28	4.20	3.34	2.95	2.71	2.56	2.45	2.29	2.12	1.91	1.65
29	4.18	3.33	2.93	2.70	2.54	2.43	2.28	2.10	1.90	1.64
30	4.17	3.32	2.92	2.69	2.53	2.42	2.27	2.09	1.89	1.62
40	4.08	3.23	2.84	2.61	2.45	2.34	2.18	2.00	1.79	1.51
60	4.00	3.15	2.76	2.52	2.37	2.25	2.10	1.92	1.70	1.39
120	3.92	3.07	2.68	2.45	2.29	2.17	2.02	1.83	1.61	1.25
∞	3.84	2.99	2.60	2.37	2.21	2.10	1.94	1.75	1.52	1.00

ν_1 = Degrees of freedom for greater variance.

ν_2 = Degrees of freedom for smaller variance.

Total No. of Questions : 8]

SEAT No. : [ ]

PC-1881

[Total No. of Pages :2

[6353]-208

T.E. (Printing Enginering)

Maintenance management of Printing Machines

(2019 Pattern) (Semester - II) (308293 (A) (Elective - II)

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 indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) Explain following:

a) KAIZEN methodologies. **[6]**

b) Selection procedure for the Replacement or Repair polices. **[6]**

c) Roller Copperizing. **[6]**

OR

Q2) a) Define condition-based maintenance and How to do condition-based maintenance in printing industry? **[6]**

b) What is thermography in condition monitoring and role of condition monitoring in printing industry? **[7]**

c) Explain the vibration testing and their fault detection system? **[5]**

Q3) Define followings:

a) Air leak detectors and their applications. **[5]**

b) Data mining techiques. **[5]**

c) Key Performance Indicators (KPIs) **[7]**

OR

Q4) Explain in detail Total Productive Maintenance (TPM) and its pillars, objectives in industrial maindenance management and also explain role of TPM in packaging industy. **[17]**

P.T.O.

Q5) Write down difference between the preventive and corrective maintenance and also explain the crucial steps involved in establishing a preventive and corrective maintenance program? **[17]**

OR

Q6) a) Explain in detail about the Overall Equipment Effectiveness (OEE) and its significance in packaging industry maintenance management. **[7]**

b) Explain in detail about Re rubberizing and its significance in packaging industry maintenance management. **[10]**

Q7) a) What is Compressor? Discuss the importance of Compressor in printing and packaging industry. **[9]**

b) How can improve occupational health and safety measures for the printing industry? **[9]**

OR

Q8) a) How to do preventive maintenance in printing industy? **[9]**

b) What are the need for preventive and corrective maintenance in printing industry? **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC-1882

[Total No. of Pages : 2

[6353]-209

T.E. (Printing)

BASIC COMMUNICATION SYSTEMS & ELECTRONIC INSTRUMENTATION

(2019 Pattern) (Semester - II) (308293B)(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 indicate full marks.***
3) ***Assume suitable data, if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Describe the components involved in RFID tag. What are the different frequencies used in RFID systems? **[9]**

b) Desribe the DSSS and FHSS along with advantages. **[9]**

OR

Q2) Describe the applications of RFID in the Pritning Industry. **[18]**

Q3) Explain what is the hidden node problem in the Wi-Fi communication system. Discuss IEEE 802.11 Standards. **[17]**

OR

Q4) a) State the different methods of the Measurements. **[9]**

b) Describe the classification of Transducers. **[8]**

Q5) Describe Selection criteria for sensors and actuators involved in measurement system. **[18]**

OR

Q6) a) Explain the working principle of LVDT. **[9]**

b) Describe any Optical transducer and Its applications. **[9]**

P.T.O.

Q7) Describe the applications of temperature sensors in the printing industry. **[17]**

OR

Q8) Describe in detail working principle of thermocouple and RTD. **[17]**

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Total No. of Questions : 8]

SEAT No. :

PC-1883

[Total No. of Pages : 2

[6353]-210
T.E. (Printing)
E-PUBLISHING
(2019 Pattern) (Semester - II) (308293C) (Elective - II)

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 are the features of Robust Computing? **[10]**

b) Draw Graphical representation of Types of Computing. **[8]**

OR

Q2) a) Explain Frontend and Backend Web Development with its structure. **[10]**

b) Explain Semantic Web and its features. **[8]**

Q3) a) Explain advantages and disadvantages of File Processing system and database system. **[10]**

b) Draw the diagram of Database Architecture. **[7]**

OR

Q4) a) Explain various types of Online Media Writing. **[10]**

b) Compare GIF and PNG file formats. **[7]**

Q5) Develop a sitemap for newly started Travel Company. Highlight the homepage menu and discuss 2 different types of hierarchy you can use for this website. **[18]**

OR

Q6) Develop a Questionnaire for online Perfume Shopping brand. Define the objective of the questionnaire and expected result of the questionnaire. **[18]**

P.T.O.

Q7) a) What HTML, XML and CSS? What is Metadata? **[10]**

b) Write HTML Program to display following table of marks obtained out of 25 **[7]**

Roll Number	Subject 1	Subject 2	Subject 3
1001	18	15	19
1002	22	20	18
1003	19	17	16

OR

Q8) a) What are the roles and responsibilities of Website Administrators in Content Management System? **[10]**

b) Draw the workflow diagram of ATM machine to withdraw the cash **[7]**

Total No. of Questions : 8]

SEAT No. :

PC1884

[Total No. of Pages : 2

[6353]-211
T.E. (Production Engineering)
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 wherever necessary.***
2) ***Use of electronic pocket calculator is allowed.***
3) ***Assume suitable data if necessary.***

Q1) a) Define quality and explain cost of internal and external failure. **[8]**

b) A manufacturer uses injection moulding machine to produce a plastic insulation barrier. He inspects 115 barriers daily, picked up randomly from the production, and determines the number of rejects by visual inspection the results of daily inspection of 115 barriers for 10 days are given below. **[10]**

Day	1	2	3	4	5	6	7	8	9	10
No. of rejects	6	11	10	11	13	6	8	10	14	11

Construct a suitable chart to analyse the quality of production. Name the chart and state whether the process is in control?

OR

Q2) a) What is sampling inspection? Explain in detail single sampling inspection. **[8]**

b) A subgroup of 5 items is taken from the manufactured items. Afier 24 subgroups the values of $\bar{x}$ and R were found to be $\sum \bar{x} = 275$ and $\sum R = 6.5$. The specification limits for the part are 20.6 ± 0.25. Assuming the process is in control, what conclusion would you draw about the ability of the process to produce the items within the specified limits? Take $A_2 = 0.577$, $D_3 = 0$, $D_4 = 2.115$, $d_2 = 2.326$ for subgroup size of 5. **[10]**

P.T.O.

Q3) a) Write short note on Quality of Service and value of Quality. **[9]**

b) What is Q.F.D.? Explain house of quality. **[9]**

OR

Q4) a) Write a short note on Pareto Chart. **[9]**

b) Describe the contributions of Deming in the area of total quality management. **[9]**

Q5) a) Define Force. Explain in detail Direct and Indirect methods of force measurement. **[7]**

b) Explain in detail Readout-Recording stage in generalized measuring system. **[10]**

OR

Q6) a) Explain in detail the following features of measuring instrument **[10]**

i) Hysteresis

ii) Precision

b) Differentiate between active and passive sensors with example. **[7]**

Q7) a) Explain any one measuring instrument used for - Stress and Strain? **[8]**

b) What are the different types of dynamometers? Explain with neat sketch Prony Brake type dynamometer in Torque measurement. **[9]**

OR

Q8) a) Explain with neat sketch LVDT type of transducer for force measurement. **[8]**

b) Explain in detail laws of thermocouple. **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1885

[Total No. of Pages : 2

[6353]-212
T.E. (Production)
MATERIAL FORMING TECHNOLOGY
(2019 Pattern) (Semester - I) (311082A)

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, and Q.7or 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) Explain in detail stock preparation in drawing operation. **[9]**

b) Calculate the drawing load required to achieve 45% reduction in area on a 5mm diameter copper wire, given the yield stress of metal is 225N/mm^2, the die angle is 11° and coefficient of friction is 0.07. If the wire is passing through the die at 2.5m/s, calculate the HP required assuming 100% efficiency. **[8]**

OR

Q2) a) Determine the maximum reduction possible in wire drawing, tube drawing and strip drawing assuming following data, **[9]**

i) Die angle 20°,

ii) Plug angle = 15°,

iii) Coefficient of friction at die, $\mu = 0.12$,

iv) Coefficient of friction at plug, $\mu = 0.09$.

b) With neat sketch describe the different zone of wire drawing die. What are the materials used in wire drawing dies? **[8]**

Q3) a) Explain working of Sendzimir cluster rolling mill and planetary rolling mill with neat sketch, application, advantages and limitation. **[12]**

b) What are the defects in rolling process? Explain their causes and remedies. **[6]**

OR

Q4) a) Determine the deformed radius of curvature of a chilled iron of 700mm diameter, rolling cooper strip of 700mm wide, 35mm thick, given 20% reduction. The yield stress of cooper is 210N/mm^2. (Poisson's ratio = 0.35 and young's modulus = 2.01MN/mm^2). **[7]**

P.T.O.

b) What do the terms “angle of bite,”“forward Slip,”‘backward slip,”“entry plan,”“exit plan,” and “neutral plane” signify in the context of rolling? Describe using sketch. **[6]**

c) Describe the differences between a two-high and two-high reversible rolling mill using a net sketch. **[5]**

Q5) a) What is an impact extrusion? Elaborate different types of impact extrusion with figure. **[9]**

b) Write short note (any Two) **[8]**

i) Tube extrusion

ii) Defect in extrusion

iii) Lubrication in extrusion

OR

Q6) a) What are different between direct and indirect extrusion **[8]**

b) An Aluminum billet of 150mm diameter and 1m long is extruded to the tube shape shown in fig. Calculate: **[9]**

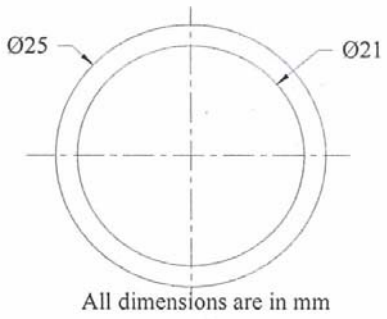
i) Extrusion Ratio

ii) CCD

iii) Shear (Shape) Factor

iv) Work done

The flow stress of Aluminum is 70N/mm^2 and coefficient of friction between billet and container is 0.15.



All dimensions are in mm

Q7) a) Explain with neat sketch working principal of Electro hydraulic forming. **[9]**

b) Elaborate with figure Electromagnetic forming. **[9]**

OR

a) Explain different types of Explosive Forming Process with neat sketch. What are the factors that affect the process? **[10]**

b) Explain the difference between flow forming and metal spinning with neat sketch. **[8]**

✪ ✪ ✪

Total No. of Questions : 8]

SEAT No. :

PC1886

[Total No. of Pages : 2

[6353]-213
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 indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) What is the meaning of tool life? Discuss various factors affacting the tool life. **[9]**

b) Explain machinability, machinability rating and various machinability criterias. **[9]**

OR

Q2) a) List functions of coolants and lubricants. Discuss types of cutting fluids in detail. **[9]**

b) The useful tool life of a HSS tool machining mild steel at 25m/min is 4 hours. Calculate the tool life when the tool operates at 35m/min. n = 0.125. **[9]**

Q3) a) Explain geometry of tool on tool life with suitable sketches. **[9]**

b) Describe formation of crater wear and abrasive wear with suitable sketches. **[8]**

OR

Q4) a) Discuss effect of cutting parameters on tool life. **[9]**

b) For a metal machining, the following information is available. Tool change time, = 15 min. Tool re-grind time, = 10 min. Machine running cost,= Rs. 7 per hour, Tool depreciation per regrind, = 50 paise, n = 0.25, C = 150. Calculate the optimum cutting speed. **[8]**

P.T.O.

Q5) a) List various shapes of inserts used in metal cutting. Explain any two shapes of inserts with suitable sketches and comment on their strength. **[9]**

b) Discuss various steps to be used in design of shank for a single point turning tool. **[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 40 m/min on a lathe equipped with a 15 KW motor. Safe stress for tool material is 270 MPa and efficiency of machine tool is 80%. **[9]**

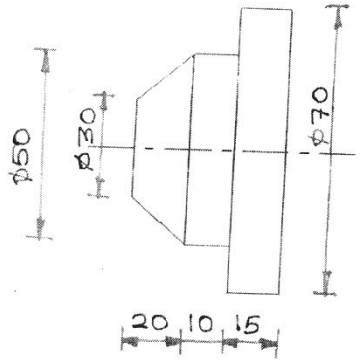
Q7) a) Discuss in detail with suitable sketches the procedure to be followed in designing a flat form tool by graphical method. **[9]**

b) With suitable sketch of reamer, explain guide lines for designing length of body and number of teeth for reamer. **[8]**

OR

Q8) a) Explain with suitable example the procedure to be followed in designing a circular form tool by graphical method. **[8]**

b) Design flat form tool for a given job by graphical method when, Rake angle =23°, Relief angle =26°, Raw material -Aluminum. **[9]**



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Total No. of Questions : 8]

SEAT No. :

PC1887

[Total No. of Pages : 3

[6353]-214

T.E. (Production)

Kinematics and Design of Machines

(2019 Pattern) (Semester-I) (311084 A)

Time : 2 ½Hours] *[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 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 with suitable sketch related to cam and follower system: **[7]**

i) Trace point

ii) Pitch curve

iii) Base circle

b) Draw the profile of cam operating a knife edge follower from the following data: **[10]**

i) Follower to move outwards through a distance of 20 mm during 120º of cam rotation

ii) Follower to dwell for 60° of cam rotation;

iii) Follower to return to its initial position during 90° of cam rotation ; and

iv) Follower to dwell for the remaining 90° of cam rotation.

The minimum radius of the cam is 40 mm and the line of stroke of the follower is offset 15 mm from the axis of the cam and the displacement of the follower is to take place with uniform acceleration and retardation on both the outward and return strokes. Cam rotating at 500 rpm clockwise. Draw the cam profile.

OR

P.T.O.

Q2) a) Explain the terms "coefficient of fluctuation of energy" and "coefficient of fluctuation of speed." **[7]**

b) The turning moment diagram for a multicylinder engine has been drawn to a scale 1 mm = 600 N-m vertically and 1 mm = 3º 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 + 107 mm^2, when the engine is running at a speed of 600 r.p.m. If the total fluctuation of speed is not to exceed ± 1.5% of the mean, find the necessary mass of the flywheel of radius 0.5 m. **[10]**

Q3) a) Explain Fatigue failure and stress concentration. **[8]**

b) A cantilever beam of circular cross section, made of steel with ultimate tensile strength of 540 N/mm^2, is fixed at one end and subjected to a completely reversed force of 10 kN at free ends. The force is perpendicular to beam axis. The distance between free and fixed end of beam is 100 mm. The construction of cantilever is such that there is no stress concentration. The corrected endurance limit is 160.96 N/mm^2. If the diameter of beam is 35 mm, determine life of beam. Assume factor of safety is 1. **[10]**

OR

Q4) a) Explain following: **[6]**
- i) Surface finish factor
- ii) Size factor
- iii) Factor for stress concentration

b) Explain following: **[12]**
- i) Methods of reducing effect of stress concentration
- ii) Modified Goodman diagram for Axial loading

Q5) a) Discuss the causes of variations in dimensions of component. **[7]**

b) The mean tensile strength and the standard deviation of 250 nuts are 310 N/mm^2 and 35 N/mm^2 respectively. Determine: **[10]**
- i) The number of nuts expected to have a strength less than 270 N/mm^2
- ii) The number of nuts expected to have a strength between 270 N/mm^2 and 360 N/mm^2.

The areas below standard normal distribution curve from Z = 0 to Z are as follows.

Z	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Areas	0.3159	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452

OR

Q6) a) Explain importance and limitations of 'normal distribution curves' in statistical analysis. **[7]**

b) Explain the following terms: **[10]**

i) Population

ii) Sample

iii) Random Variable

Also explain the concept of reliability based design

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 400 mm is subjected to constant tensile force of 4000 N. If the factor of safety is 2, design the bar with objective of minimizing the material cost out of following material. What will be the cost of bar. **[12]**

Material	Mass density kg/m^3	Material cost per unit mass, Rs/kg	Yield strength N/mm^2
Plain carbon steel	7800	28	400
Alloy steel	7850	150	900
Aluminium alloy	2800	140	150
Titanium alloy	4500	2200	800

OR

Q8) a) Explain the guidelines to be followed in the design of casting parts. **[8]**

b) What is design for manufacture (DFM)? Explain the general principles to be followed while designing parts for manufacture. **[10]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1888

[Total No. of Pages : 5

[6353]-215

T.E. (Production)

Finite Element Analysis

(2019 Pattern) (Semester - I) (311085(A)-I) (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) ***Use of scientific calculator is allowed.***
3) ***Figures to the right indicate full marks.***

Q1) Fig. 1 shows a bar of cross-sectional area of 250mm^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 20×10^3 N/mm^2, determine: **[16]**

a) The nodal Displacement

b) The Stresses in each part of bar

c) The support reactions.

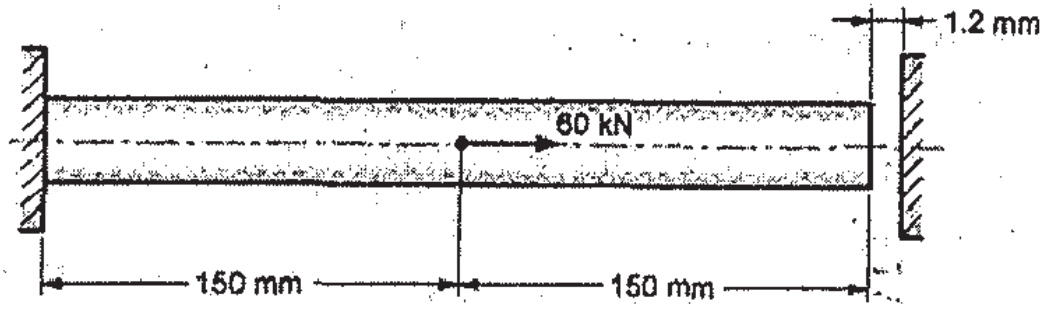

Fig.1

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]**

a) The deflection of each spring

P.T.O.

b) The reaction force at the support

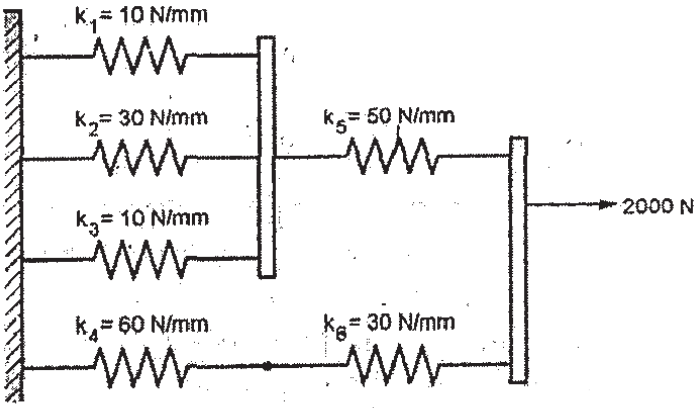

Fig.2

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 60mm^2. If the length of the horizontal and vertical bars are 100mm and 750mm 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

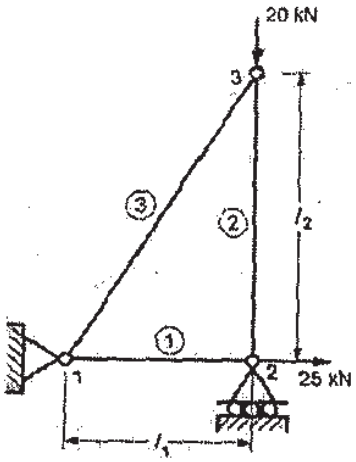

Fig.3

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

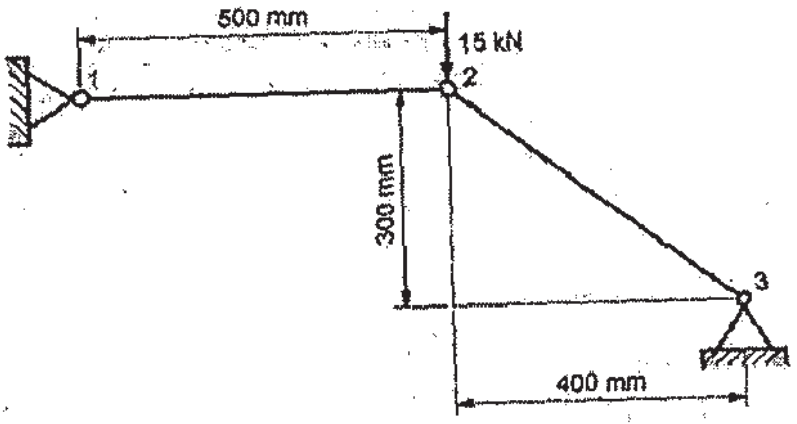

Fig.4

b) Explain the basics steps in modeling of 1-D problem using finite element method. **[5]**

Q5) A triangular plate of size 100 × 75 × 12.5mm 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:

Element stiffness matrix and nodal displacements. **[17]**

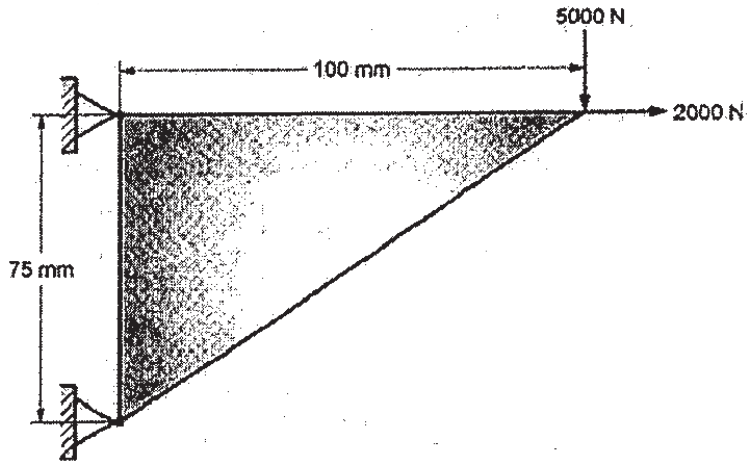

Fig.5

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 plate is 10 mm. Model the plate with CST element and determine Element stiffness matrix and nodal displacements. **[17]**

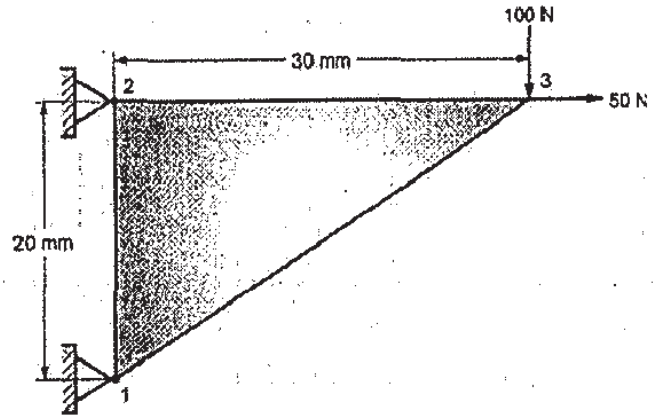

Fig.6

Q7) a) Explain constant strain triangle element, if the coordinates of three nodes for triangular element are 1(1.5, 2), 2 (7, 3.5), 3 (4, 7) respectively. The coordinate of internal point P is (3.85,4.8). Evaluate the shape functions N1, N2, N3 for point P. If temperature at nodes 1,2,3 are 250°C, 150°C,100°C respectively, determine temperature at point P. **[6]**

b) Determine the Cartesian coordinate of the point P(ξ = 0.5, η = 0.6) shown in Fig 7 **[6]**

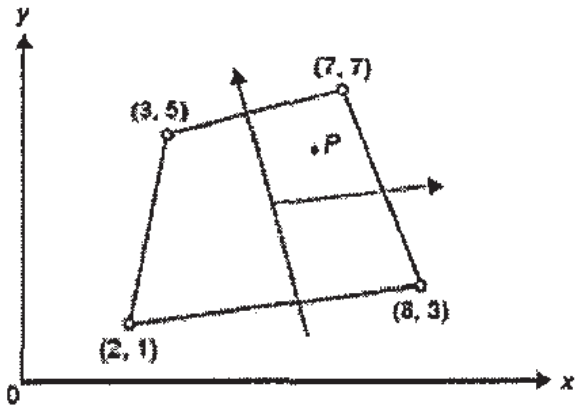

Fig.7

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 within 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 1-D, 2-D, 3-D elements. Give appropriate example with neat labeled diagram. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PC-1889

[Total No. of Pages : 2

[6353] - 216
T.E. (Production)
Elective-I: Advances in Manufacturing Processes
(2019 Pattern) (Semester - I) (311085 (A) - 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) Explain Metal mould casting process and Continuous casting process. **[9]**

b) What is Squeeze casting? Explain it. **[9]**

OR

Q2) a) Describe Vacuum mould casting with sketch. **[9]**

b) What is Ceramic shell casting? **[9]**

Q3) a) Draw neat sketch and explain Heat Affected Zone (HAZ) **[9]**

b) Define cooling rate, solidification rates, weld thermal cycles, residual stresses and their measurements related to welding process. **[8]**

OR

Q4) a) What are different types of weld joints and joint Designs? **[9]**

b) Explain welding defects and inspection process. **[8]**

P.T.O.

Q5) a) What are Magnetic Abrasive Finishing (MAF)? Discuss necessity of it. **[9]**

b) Explain Magnetic Abrasive Finishing (MAF) Process Capabilities and Applications. **[9]**

OR

Q6) a) Explain the Magneto Rheological Abrasive Finishing (MRAF) with sketch. **[9]**

b) Discuss Magneto Rheological Abrasive Finishing (MIRAF) Process principle, Process equipment and Process Parameters? **[9]**

Q7) a) Explain types of broaching machines and parts of the machines. **[9]**

b) Sketch and explain gear hobbing and gear shaping. **[8]**

OR

Q8) a) Write note on working of Thread milling and thread rolling. **[9]**

b) Explain Construction and working of the Gear lapping and gear grinding machines. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-1890

[Total No. of Pages : 2

[6353] - 217
T.E. (Production)
Elective-I: Mechatronic
(2019 Pattern) (Semester - I) (311085 A-III)

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) Explain what is meant by Mechatronics and appreciate its relevance in engineering design. **[9]**

b) Discuss what do you mean by system and define elements of measurement system. **[9]**

OR

Q2) a) Describe capacitive sensor with application. **[9]**

b) A 550° wire-wound potentiometer has 400 turns and a total resistance of 1KΩ. What is the resolution in ohms? In degrees? **[9]**

Q3) a) Explain significance of carry flags in a microprocessor. **[9]**

b) Develop a conceptual design of a sensors based control system for an toaster. Assume suitable data if necessary. **[8]**

OR

P.T.O.

Q4) a) Write the instructions to load two hexadecimal numbers 91D and 80C in the registers A and B respectively. Add the numbers and store the result in memory location 607B. **[9]**

b) What are characteristics of ADC (Analog to Digital Conversion) and state its significance. **[8]**

Q5) a) Construct the ladder logic diagrams for (a) the AND gate and (b) the OR gate. Also develop a truth table for both logics. **[6]**

b) Explain application of PLC system for can Filling Machine. **[12]**

OR

Q6) Write short notes on the following **[18]**

a) Interfacing of microprocessor

b) PID controllers

c) Microcontroller 8051

Q7) a) Write the instructions to load two hexadecimal numbers 70D and 86C in the registers A and B respectively. Add the numbers and store the result in memory location 430B. **[12]**

b) Write a note on signal conversion. **[5]**

OR

Q8) a) Construct the ladder logic diagrams for (a) the OR gate and (b) the NOR gate. Also develop a truth table for both logics. **[12]**

b) Explain application of PLC system for industrial application. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC-1891

[Total No. of Pages : 2

[6353] - 218
T.E. (Production)
Elective-I: Supply Chain Management
(2019 Pattern) (Semester - 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) ***Assume suitable data if necessary.***
4) ***Use of Non-programmable scientific calculators is allowed.***
5) ***Figures to the right indicate full marks.***

Q1) a) Explain the objectives of material handling. **[5]**

b) Explain principles of transport management. **[6]**

c) Explain Warehouse Management System (WMS) **[6]**

OR

Q2) a) Explain functions that the material transport system is designed to perform **[5]**

b) Explain Obsolete, Surplus and Scrap Management. **[6]**

c) Explain Value Analysis in detail**.** **[6]**

Q3) a) Explain network design decisions using decision trees. **[6]**

b) How to select a distribution network design. **[6]**

c) Write a short note on uncertainty in network design. **[6]**

OR

P.T.O.

Q4) a) Write in detail factors influencing distribution network design. **[7]**

b) Explain design options for a distribution network. **[6]**

c) What are factors affecting network design decisions. **[5]**

Q5) a) How supply chain risk pooling works? **[5]**

b) Explain four "R" strategy of revenue management. **[6]**

c) Explain Pricing and Revenue Management**.** **[6]**

OR

Q6) a) Explain Managing Inventory for Short Life Cycle Products. **[5]**

b) What is Risk Pooling in Supply Chain Management? **[6]**

c) Explain Revenue Management for Multiple Customer Segments. **[6]**

Q7) a) Explain Building Strategic Partnerships and Trust in detail. **[6]**

b) Explain the Bullwhip Effect. **[6]**

c) Explain Effective Forecasting in details. **[6]**

OR

Q8) a) Write short note on coordination in supply chain. **[6]**

b) Explain Collaborative Planning, Forecasting and Replenishment (CPFR) **[6]**

c) Explain Agile Supply Chain. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC1892

[Total No. of Pages : 3

[6353]-219

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 indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) To design a drawing die for a component as shown in figure no.1, calculate following values for a sheet of thickness 2 mm and yield strength 380 MPa. **[12]**

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 draw

vi) Press capacity required in each draw

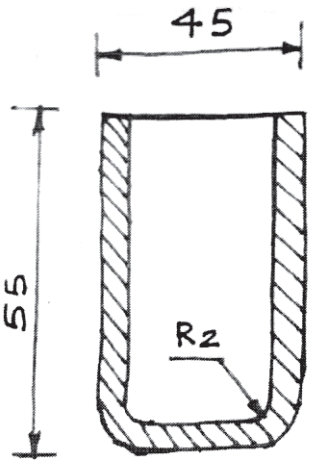

Figure No.1 All dimensions in mm.

P.T.O.

b) Calculate developed length of the part as shown in figure no. 2 **[6]**

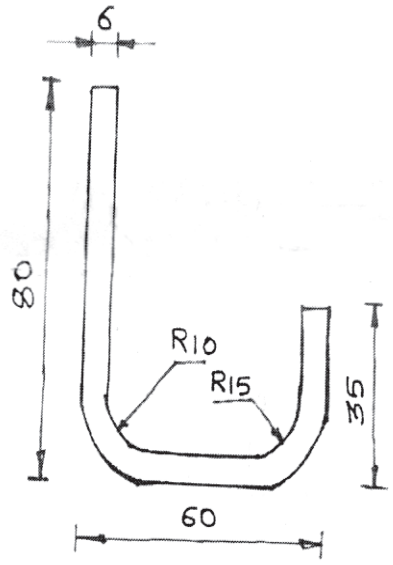

Figure No.2 All dimensions in mm

OR

Q2) a) With suitable example, explain how to use a graphical method to calculate blank size. **[9]**

b) What is the meaning of bend allowance in sheet bending? Explain working of types of bending dies with suitable sketches. **[9]**

Q3) a) Discuss various guidelines to be used for designing ribs, webs and drafts in forging die design with suitable sketches. **[9]**

b) List various operations performed in forging? Explain design of fuller with suitable sketches. **[8]**

OR

Q4) a) Explain design of trimming die in forging die design with suitable sketch. **[9]**

b) Discuss various guidelines to be used in selection of parting line in forging die design. **[8]**

Q5) a) Which metals and alloys are used for submerged plunger type hot chamber die casting machines? Explain working of submerged plunger type hot chamber die casting machine with suitable sketches **[9]**

b) Why are cores used in die casting? Explain various types of cores used in die casting **[9]**

OR

Q6) a) What are the types of dies in die casting? Explain various types of die casting dies in detail. **[9]**

b) Explain working of air- injection type die casting machine with suitable sketch. **[9]**

Q7) a) Describe various stages of transfer moulding with suitable sketches. **[9]**

b) Explain with the help of neat sketches disc gate, fan gate and spoke gate. **[8]**

OR

Q8) a) Describe working principle of blow moulding with suitable sketches. **[9]**

b) Determine number of cavities for a mould by rated capacity method for a given data. Material = Acrylic, Rated clamping capacity = 840 kN, Cavity pressure = 63 MPa. Projected area of moulding including runners & sprue = 2700 mm^2. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC1893

[Total No. of Pages : 2

[6353]-220

T.E. (Production Engineering)

PRODUCTION & OPERATIONS MANAGEMENT

(2019 Pattern) (Semester - II) (311089(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) ***Figures to the right 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) What is Productivity and what is its relationship with production? **[9]**

b) What are the Factors determining Production Planning and Control (PPC). **[9]**

OR

Q2) a) Write a short note on concurrent engineering. **[9]**

b) What are the factors affecting Product Design and Product Development. **[9]**

Q3) a) Explain with Flow Chart Systematic Layout Planning Procedure. **[8]**

b) Explain different types of material handling equipment with its applications in manufacturing industries. **[9]**

OR

Q4) a) List and explain various principles of material handling. **[10]**

b) Explain different types of plant layouts used in manufacturing industries. **[7]**

Q5) a) Define following terms related to inventory and also show graphically. **[11]**

i) Lead Time
ii) Recorder Level
iii) Safety stock
iv) Average inventor level

b) An automobile factory manufacturer manufactures Engine within the factory. The particulars of this engine are given below. **[6]**

Demand rate = 16,000 units/ year
Production rate = 38000 units/ year
set-up cost = Rs. 550 / set-up
carrying cost = Rs. 17 /unit/ year
Find EBQ, Total cost and Cycle time

OR

P.T.O.

Q6) a) What is EOQ? Derive an expression for the Economic Order Quantity when the stock replenishment is instantaneous (give assumptions). **[8]**

b) XYZ Industries needs 18,000 units/year of a bought out component which will be used in its main product. The ordering cost is Rs. 135 per order and the carrying cost per unit per year is 20% of the purchase price per which is Rs. 75. **[9]**

Find:

i) Economic order quantity.

ii) Number of orders per year.

iii) Time between successive orders.

Q7) Write a short note on: **[18]**

a) Identity management

b) Line of Balance

OR

Q8) Write a short note on: **[18]**

a) Asset tracking

b) Sustainable Production and Green Manufacturing

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Total No. of Questions : 8]

SEAT No. :

PC-1894

[Total No. of Pages :2

[6353]-221
T.E. (Production)
PROCESS ENGINEERING AND RESOURCE PLANNING
(2019 Pattern) (311090 (A)) (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.7or 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) What are the causes of work piece variation? **[8]**

b) Explain the concept of 3-2-1 locating principle. **[9]**

OR

Q2) a) What are the factors taken into consideration for eliminating operation. **[8]**

b) Discuss major, critical, qualifying and re-qualifying operations. **[9]**

Q3) a) Discuss the relation between process selection and machine selection. **[9]**

b) Explain different types of problems of selecting a machine for processing. **[8]**

OR

Q4) a) What is general purpose machine tools? State different advantages. **[8]**

b) State and explain different factors in selection of machine. **[9]**

Q5) a) What are the factors determining capacity requirement? **[9]**

b) Compare various factors of production with capacity for the same product for job type, batch type and mass type engineering industries. **[9]**

P.T.O.

OR

Q6) a) What are the factors affecting on process selection? **[9]**

b) Define- Ideal capacity, Present capacity, Idle capacity, Design capacity. **[9]**

Q7) a) Write note on recent trends in CAPP. **[9]**

b) How does CAPP improve the efficiency and effectiveness of the manufacturing process. **[9]**

OR

Q8) a) How is feature recognition achieved in CAPP. **[9]**

b) What are types of CAPP system explain any one? **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1895

[Total No. of Pages :2

[6353]-222

T.E. (Production Engineering)

Elective - II : Product Design and Development

(2019 Pattern) (Semester - II) (311091A)

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 includicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Write various stages of product life cycle. **[9]**

b) Explore stage gate system of product development. **[8]**

OR

Q2) a) Why product palnning is essential. Explore various planning stages. **[9]**

b) Which are different elements in marketing plan? **[8]**

Q3) a) How to gather information of customers. Explain it related to product of an automobile industry. **[9]**

b) Brief on Kano Model. **[8]**

OR

Q4) a) Discuss house of quality in brief. **[9]**

b) How to implement quality function deployment. **[8]**

Q5) a) Discuss DFM guidelines. How these are important in manufacturing industry? **[9]**

b) Suggest mathods for the estimation of manufacturing cost. **[9]**

OR

P.T.O.

Q6) a) Explain DFM guidelines For closed die forging. **[9]**

b) Compare deep drawing process to sheet bending process for DFM. **[9]**

Q7) a) Elaborate various opportunities available for PLM. **[9]**

b) Enumerate different PLM strategies in brief. **[9]**

OR

Q8) a) Discuss case study of PLM related to any two home appliances. **[9]**

b) How to implement PLM in auto industry. Describe various stages. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1896

[Total No. of Pages :2

[6353]-223

T.E. Production

Nano Manufacturing

(2019 Pattern) (Semester - II) (311091A - II) (Elective - II)

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 includicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) What is the reason for using uncoventional or advanced machining? **[10]**

b) Which non-conventional machining process has highest material removal rate? **[6]**

OR

Q2) a) What are the different energy sources used in nonconventional machining processes? **[10]**

b) What are the needs of unconventional manufacturing process? **[6]**

Q3) a) What is the purpose of nano finishing process? **[10]**

b) What is the need for nano finishing process? **[8]**

OR

Q4) a) What are the different types of nano finishing process? **[10]**

b) Why finishing is necessary on metal surface? **[8]**

Q5) a) What are the two fundamental approaches to nanomanufacturing? **[12]**

b) What are the key issues in the synthesis of nanomaterials? **[6]**

OR

P.T.O.

Q6) a) What are the difference between bottom-up fabrication and top-down fabrication? **[6]**

b) What are the approaches used in nano fabrication? **[12]**

Q7) a) What are the different methods of measurement of nano materials? **[12]**

b) What is importance of Nanometrology? **[6]**

OR

Q8) a) Which device can be used for nano measurement? **[12]**

b) What is the role of size in nanomaterials? **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

PC-1897

[Total No. of Pages : 2

[6353]-224

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

Q1) a) What is error propagation? Explain it. **[9]**

b) Evaluate error in the volume V of tank given by $V = (\pi/4)\, d^2\, 1$ at d = 1.5m and 1 = 2.25 m if error in measurement of dia. d is ± 0.015m & 1 is ± 0.017m. **[9]**

OR

Q2) a) What is bisection method and write procedure of it. **[9]**

b) Determine using bisection method, a root of equation $\cos x - 1.3x = 0$ with accuracy 0.01. **[9]**

Q3) a) How many methods of curve fitting? Explain in short. **[9]**

b) It is known that tensile strength of plastic increases as a function of the time when it is heated. The following data is collected. What is the value of tensile strength at time 70minute? **[8]**

Time (minute)	10	20	30	40	50	60
Tensile strength (N/mm^2)	14.3575	16.6517	16.7353	17.6762	18.5128	104.8

OR

P.T.O.

Q4) a) What do you understand from polynomial regression? **[9]**

b) In some determinations of the values v of CO_2 dissolved in a given volume of water at different temp θ, the following pairs were obtained **[8]**

θ	0	5	10	15
v	1.80	1.45	1.18	1.00

Obtain by method of least square, a relation of the form $v = b + a\theta$ which best fits to these observations. Also find the value CO_2 dissolved in volume of water at temp. 25°C.

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) Use Simpson's 3/8 rule to evaluate

$\int_0^{\pi/2} \sqrt{\sin x + \cos x}\, dx = \int_0^{\pi/2} (\sin x + \cos x)^{1/2} dx$. (Consider only one strip i.e. 3 sub strips). **[9]**

OR

Q6) a) Use Simpon's 3/8 rule to evaluate $\int_{0.5}^{0.7} \sqrt{7}\, e^x dx$ (Consider only one strip i.e. 3 sub strips). **[9]**

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

Q7) a) Differentiate between classical optimization and multiple optimization. **[9]**

b) Discuss Genetic Algorithm (GA) and Simulated Annealing with applications. **[8]**

OR

Q8) a) What is Lagrange multipliers and Steepest descent method? Explain in detail. **[9]**

b) Which method of optimization is in practice? **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC-1898

[Total No. of Pages : 5

[6353]-225
T.E. (Production Engineering)
FINANCIAL MANAGEMENT AND COSTING
(2019 Pattern) (Semester - II) (311091(A-IV) (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 indicate full marks.***
3) ***Assume suitable data if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Explain how nature of business, market conditions and technology affect a firm's working capital requirement. **[6]**

b) Calculate the amount of working capital requirement for SRCC Ltd. from the following information: **[6]**

	₹.(Per Unit)
Raw materials	160
Direct labour	60
Overheads	120
Total cost	340
Profit	60
Selling price	400

Raw materials are held in stock on an average for one month. Materials are in process on an average for half-a-month. Finished goods are in stock on an average for one month. Credit allowed by suppliers is one month and credit allowed to debtors is two months. Time lag in payment of wages is 1½ weeks. Time lag in payment of overhead expenses is one month. One fourth of the sales are made on cash basis.

Cash in hand and at the bank is expected to be ₹50,000; and expected level of production amounts to 1,04,000 units for a year of 52 weeks. You may assume that production is carried on evenly throughout the year and a time period of four weeks is equivalent to a month.

c) What is the sales ratio method of working capital estimation? **[5]**

OR

P.T.O.

Q2) a) Mr. Ravi Prasad and Sons invests ₹500, ₹1,000, ₹1,500, Rs. 2,000 and ₹2,500 at the end of each year. Calculate the compound value at the end of the 5th year, compounded annually, when the interest charged is 5% per annum. **[6]**

b) What are the dangers of excessive and inadequate working capital? **[6]**

c) Explain the concept of working capital. Are gross and net concepts of working capital exclusive? Discuss. **[5]**

Q3) a) Describe the different classification of cost in detail. **[6]**

b) From the following particulars of a manufacturing firm prepare a statement showing: **[6]**

i) Cost of Materials Consumed

ii) Factory or Work Cost

iii) Cost of Production

	₹
Stock of materials on 1st January 2003	80,000
Purchases during the period	22,00,000
Stock of finished goods on 1st January 2003	1,00,000
Direct wages	10,00,000
Sales	48,00,000
Factory on cost	30,00,000
Office and Administrative Expenses	2,00,000
Stock of raw materials on 31st December 2003	2,80,000
Stock of finished goods on 31" December 2003	1,20,000

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
		Walfare	₹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) What are the important basic requisites for classification of cost? Explain them briefly. **[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]**

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Total No. of Questions : 8]

SEAT No. :

PC1899

[Total No. of Pages : 2

[6353]-226
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 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 required.***

Q1) a) What do you understand the term reliability? Explain in detail. **[9]**

b) Discuss how infrared thermography inspection is more advantages over other temperature monitoring techniques. **[8]**

OR

Q2) a) What is Ferrography oil analysis? Explain the steps for Ferrography oil analysis. **[9]**

b) What is equipment availability and what are the three basic approaches to define and quantity availability. **[8]**

Q3) a) What is Concurrent Engineering? What is the main goal of concurrent engineering? What are some challenges in implementing concurrent engineering? **[9]**

b) What are standard 14 points for quality transformation given by Dr. W Edward Deming? **[8]**

OR

Q4) a) What are 8 pillars of TPM? Explain each pillar in detail. **[9]**

b) What are the 5 stages of PDCA process? **[8]**

P.T.O.

Q5) a) What is the MRP II concept What are the main advantages of MRP II systems? Differentiate between MRP-I & MRP-II. **[9]**

b) What does capital market mean? How does the company raise funds in capital market? **[9]**

OR

Q6) a) Differentiate between dispatching and scheduling? **[9]**

b) What do you understand by Diminishing Marginal Utility? Explain it with example. **[9]**

Q7) a) What is the difference of money market and capital market? **[9]**

b) What are the Principle factors of estimating cost? Elaborate with example. **[9]**

OR

Q8) a) Write a short note on Time Value of Money. **[9]**

b) What do you mean by Depreciation? List out and explain different Methods of depreciation. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC1900

[Total No. of Pages : 5

[6353]-227

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) ***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 Diagram must be drawn wherever necessary.***
4) ***Use of Logarithmic Table. Slide rule and pocket calculator is allowed.***
5) ***Assume Suitable data if necessary.***

Q1) a) A cam is to give the following motion to a knife-edged follower: **[9]**

i) Outstroke during 60° of cam rotation:

ii) Dwell for the next 30° of cam rotation:

iii) Return stroke during next 60° of cam rotation, and

iv) Dwell for the remaining 210° of cam rotation.

The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft.

b) Draw neat sketch of Turning Moment diagram for a four-stroke cycle internal combustion engine. **[4]**

c) The turning moment diagram for a petrol engine is drawn to the following scales turning moment 1 mm 5 N-m: crank angle 1 mm 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order. are 295, 685, 40, 340, 960, 270 mm^2. The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m **[5]**

OR

P.T.O.

Q2) a) Why a roller follower is preferred to that of a knife edged follower? **[8]**

Explain following terms:

i) Pitch circle

ii) Prime circle

iii) Pressure angle

iv) Trace point

b) The turning moment diagram for a multi-cylinder engine has been drawn to a scale of 1 mm to 500 N-m torque and 1 mm to 6° of crank displacement. The intercepted areas between output torque curve and mean resistance line taken in order from one end. in sq. mm are

–30,+410,-280,+320,–330,+250, –360,+280,-260 sq. mm. when the engine is running at 800 rpm

The engine has a stroke of 300 mm and the fluctuation of speed is not to exceed 2% of the mean speed. Determine a suitable diameter and mass of the flywheel rim for a limiting value off the safe centrifugal stress of 7 MPa. The material density may be assumed a 7200 kg/hr. **[10]**

Q3) a) Explain the Modified Goodman Diagram for fluctuating axial/bending stresses with neat sketches. **[8]**

b) A plate made of plain carbon steel 40C8(Sut = 580 N/mm^2), shown in Fig. (A), is subjected to a completely reversed axial force of 50 kN. The expected reliability is 90%. for which. If the required factor of safety is 2, determine the plate thickness for infinite life.

Use following data:

i) Theoretical stress concentration factor = 2.27

ii) Notch sensitivity = 0.8

iii) The surface finish factor = 0.75

iv) The size fctor = 0.85

v) The load factor = 0.923

vi) The reliability factor = 0.897

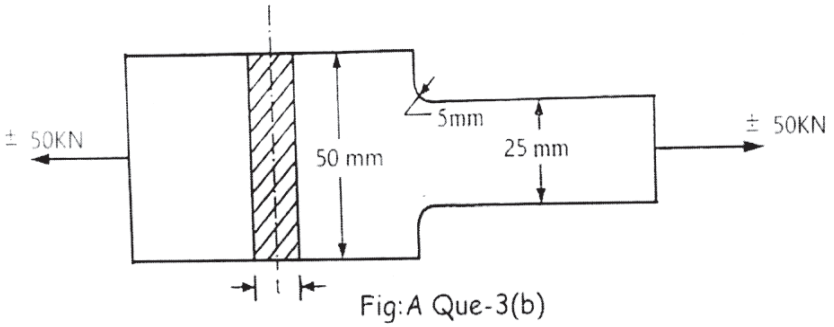

Fig:A Que-3(b)

[9]

OR

Q4) a) Define the following terms: **[8]**

i) Reverse Stress

ii) Notch sensitivity

iii) Endurance Limit

iv) Stiess Concentration

b) A circular cantilever bean made up of cold drawn steel 35C8 (Sut=550N/mm^2 & Syt=320N/mm^2) as shown in figure B, is subjected to a load which varies from -50N to +150N. The factor of safety is 2.0. Determine the diameter of the beam at the fillet section.

Use following data:

i) Theoretical stress concentration factor =1 .42

ii) Notch sensitivity = 0.9

iii) The surface finish factor = 0.89

iv) The size factor = 0.85

v) The reliability factor = 1.00

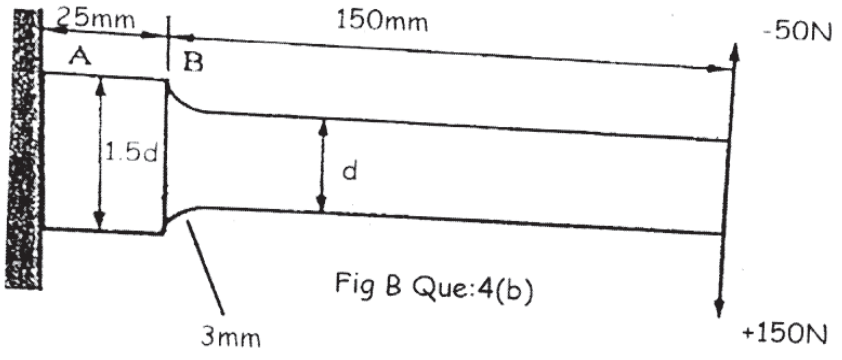

Fig B Que:4(b)

[9]

Q5) a) Differentiate between 'Normal Distribution Curve' & 'Standard Normal Distribution Curve in engineering statistical analysis. **[6]**

b) A batch of 100 helical compression springs are tested for the deflection under the axial load. The results are tabulated as follows;

Deflection of springs in	Number of springs
14-16	03
16-18	10
18-20	50
20-22	31
22-24	06

lf the permissible deflection for the springs is between 18 mm and 23 mm, determine the % of the springs likely to be rejected

Z	0.8	0.9	1.0	1.1	2.2	2.3	2.4	2.5
Area	0.2881	0.3159	0.3413	0.3643	0.4861	0.4893	0.4918	0.4938

[Use linear interpolation for values in between.] **[12]**

OR

Q6) a) Explain the difference between 'Design Tolerance and Natural Tolerance'. How would the designer select the tolerance for the minimum rejection of the components? **[6]**

b) The recommended class of fit for the journal and the bearing of a hydrodynamic bearing is 20 H_7-e_8. The diameters of the journal and bearing are normally distributed. From the considerations of hydrodynamic action and bearing stability, the maximum and minimum clearances are limited to 0.08 and 0.05 mm respectively. Determine the percentage of rejected assemblies.

The tolerances in micron are as follows:

Diameter, mm	H_7		e_8	
	es	ei	es	ei
20	+21	0	–40	–73

[Use linear interpolation for values in between.]

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	2.6	2.7				
Area	0.4918	0.4938	0.4953	0.4965				

[12]

Q7) a) What is design for manufacture (DFM)? Explain the general principles to be followed while designing the parts for manufacture. **[9]**

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

i) Desirable effect

ii) Undesirable effect

iii) Primary design equation

iv) Geometrical parameter

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 5,000 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 p 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. :

PC1901

[Total No. of Pages : 3

[6353]-228

T.E. (Production Sandwich)

MATERIAL FORMING AND MOULD DESIGN

(2019 Pattern) (Semester - II) (311124A)

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 and mention it clearly.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Show that for rolling process (Δh) max $\mu^2 R$ **[8]**

Where, (Δh) max = Maximum draft μ = Coefficient of friction

R = Rolling radius

Consider rolling of strip initial thickness h0

b) Calculate the rolling load to reduce steel 600mm wide and 30mm thick by 20%. Roll diameter 800mm flow stress of steel 150 N/mm^2. Assume $\mu = 0.6$ What would be rolling load if, **[9]**

i) Sliding friction occur

ii) Sticking friction occur

OR

Q2) a) Draw the sketch and What are the Principle and important features and Process Characteristics of Electromagnetic Forming Processes? What are the Advantages? **[9]**

b) A 0.1% carbon steel 50mm wide and 5mm thick was rolled in one pass to 3.5mm at 1060^0 C. When yield stress was 1.05 KN/mm^2 The roll diameter was 340mm Find the Magnitude of Rolling load taking into account Roll Flattering If rolls made up of cost iron (I) Assume Young's modulus = 1.005 MN/mm^2. Passion ration = 0.35, Coefficient of Friction = 0.3 **[8]**

P.T.O.

Q3) a) For a slab casting 500 × 250 × 50 mm which to be made in cast iron. Calculate the choke area. Take density of material as 7.86 gms/cm^2, fluidity of iron at 22inches, mass density of motion metal (d) as 6.09 gms/cm^2 system with 100mm cope height. **[8]**

b) How will you design Riser as per CAINE's method? Explain the type Types of Riser with neat sketch. **[9]**

OR

Q4) a) Describe with neat sketch Directional and Progressive Solidification. **[8]**

b) Calculate size of cylindrical riser (height and die equal) necessary to feed a steel slab casting 25 × 25 × 5 cm with side riser, casting poured horizontally into mould for steel take constant, a = 0.10, b = 0.03 and c = 1.0 **[9]**

Q5) a) Describe Die Design, Die Materials, and Lubrication on aspect of forging. **[9]**

b) Calculate the forging load at the start of hot forging of a steel billet, for following data: -Given Data:- **[9]**

length of billet = 2m Width = 0.9

Thickness = 0.2 Tool Bite = 0.3

σ_0 = 50 Mpa = at start completion of forging

σ_0 = 150 Mpa = at completion of forging

Reduction in forging = 50%

OR

Q6) a) Calculate the load required to forge 300 mm thick and 600 mm diameter cylinder billet to 80% of its original height between the flat dies **[9]**

i) at room temp. with lubrication having

μ = 0.05 and yield stress 530 N/mm^2

ii) at 900ºc, σ_0 = 60 Mpa but there is sticking friction What is the P_{max} for sliding friction.

b) Using open die forging, a solid cylindrical piece of 304 stainless steel having 100 mm dia × 72 mm height is reduced in the height to 60 mm at room temperature Assuming, coefficient, of friction as 0.22 and flow stress for this material at the required true strain 1000 Mpa calculate the forging force at end of stroke. **[9]**

What is the diameter of work piece after forging?

Q7) a) What is the difference between toggle clamping and ram clamping in injection molding machines? **[9]**

b) Explain following part injection mould **[9]**

i) Guide pillar & guide bush

ii) Register ring

OR

Q8) a) Differentiate between Two plate mold Three plate mold with figure. **[9]**

b) What are the various types of Types of Gates used in Injection Molding? Explain with neat sketch. **[9]**

ⓘⓘⓘⓘ

Total No. of Questions : 8]

SEAT No. : ____

PC-1902

[Total No. of Pages : 2

[6353]-229

T.E. (Production Sandwich)

METROLOGY & QUALITY CONTROL

(2019 Pattern) (Semester - II) (311125(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) ***Assume Suitable data if necessary.***

Q1) a) Explain constructional feature of probes with neat sketches. **[9]**

b) Explore laser inter ferometers with its applications. **[8]**

OR

Q2) a) Which are various advanced techniques in metrology. Explain. **[9]**

b) Write procedure to measure an object on CMM. **[8]**

Q3) a) Explain various flatness measurement techniques. **[9]**

b) Explain types of threads. How to do thread measurement techniques. **[8]**

OR

Q4) a) Why surface finish is important? Explore technique to measure surface finish in detail. **[9]**

b) Elaborate various firm measurement techniques. **[8]**

Q5) a) Explain working of pitot tube with neat sketch. **[9]**

b) Explore principle of thermocouple with it's application. **[9]**

OR

P.T.O.

Q6) a) What is the working principle of orifice meter. Explain with neat sketch. **[9]**

b) Why to measure torque. Explain various torques measuring methods. **[9]**

Q7) a) Explain X & R chart for various variable. **[9]**

b) Write importance of SQC in manufacturing industry. Explain various applications. **[9]**

OR

Q8) a) What is double sampling plan. Explain in detail. **[9]**

b) Explain control chart for attributes (P, nP & C chart) **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1903

[Total No. of Pages : 3

[6353]-230

T.E. (Production Engineering) (Sandwich)

STATISTICS AND NUMERICAL OPTIMIZATION METHODAS

(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 indicates full marks.***
3) ***Neat diagram 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) Solve the following system of linear equations using the Gauss elimination method.

$2x + 3y - z = 7$

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

$x - y + 2z = 6$ **[9]**

b) Use the bisection method to find the root function $f(x) = x^3 - 2x - 5$ within the interval [1,3] with a tolerance of 0.01. **[9]**

OR

Q2) a) Solve following equation using gauss elimination method. ***[9]***

$4x + 2y - z = 8$

$2x - 3y + 2z = 0$

$-3x + y + 3z = 3$

b) Use the Newton-Raphson method to find the root of the equation $f(x) = e^x - 2x$ with initial guess of $x_0 = 1$. Perform two iterations. **[9]**

P.T.O.

Q3) a) Given the following set of data points for x and y, use Newton's forward difference method to find the value of y at $x = 3.5$ **[9]**

x	1	2	4	5
y	1	8	64	125

b) Given the following set of data points for x and y, use Lagrange interpolation polynomial to find the value of y at $x = 2.5$. **[9]**

x	1	2	4	5
y	2	3	5	6

OR

Q4) a) Given the following set of data points for x and y, use Lagrange imterpolation polynomial to find the value of y at $x = 2.3$. **[9]**

x	1	2	4	5
y	3	5	11	15

b) Given the following set of data points for x and y , use Newton's forward difference method to find the value of y at $x = 2.2$ **[9]**

x	1	2	3	4
y	1	4	9	16

Q5) a) Use the Trapezoidal rule to approximate the integral of

$(x) = x^2 + 2x$ *from* $x = 0$ *to* $x = 2$. **[8]**

b) Use Simpson's 1/3 rule to approximate the integral of

$(x) = x^3 + 4x^2$ *from* $x = 0$ *to* $x = 2$. **[9]**

OR

Q6) a) Given the following set of data points, use Newton's divided difference method to find the interpolating polynomial and use it to estimate the value of $f(1.5)$ **[8]**

x	0	1	2	3
$f(x)$	1	2	4	5

b) Use Simpsons $1/3^{rd}$ rule to evaluate e^{-x^2} **[9]**

Q7) a) Explain the concept of optimization and its significance in various fields such as engineering, economics, and operations research. **[9]**

b) Describe the role of objective functions in optimization problems. How are they formulated and evaluated? **[8]**

OR

Q8) a) Write in brief implantation of Genetic Algorithm with suitable example **[9]**

b) Brief on: Generalized reduced gradient Method. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-1904

[Total No. of Pages : 2

[6353]-231

T.E. (Production Sandwich)

ADVANCED MATERIALS - I

(2019 Pattern) (Semester - II) (Elective - II) (311126A)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***Answer Q.1or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7or Q.8.***
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) What are the various Moulding Methods used in the production of advanced materials? **[8]**

b) Explain generalized Hooke's law? Explain the reduction of Hooke's law from three dimensions to two dimensions in the context of a lamina? **[9]**

OR

Q2) a) What is the significance of hand layup in the manufacturing of advanced materials? **[8]**

b) How are the compliance and stiffness matrices related to the engineering elastic constants of an orthotropic lamina? **[9]**

Q3) a) What are different systems used in the preparation of Functionally Graded Materials? Explain some notable properties? **[8]**

b) Explain the Shape Memory Alloys (SMAs) with its Classifications, Composition and Applications? **[9]**

OR

Q4) a) Explain the classifications of Functionally Graded Materials with its Applications? **[8]**

b) How does the shape memory effect work in Shape Memory Alloys? Give examples of applications where Shape Memory Alloys are commonly used? **[9]**

P.T.O.

Q5) a) What are the unique properties exhibited by materials at the nano scale? State their advantages and disadvantages? **[9]**

b) What is the importance of biocompatibility in biomaterials and its impact on medical applications? **[9]**

OR

Q6) a) Explain Nano materials with their significance in various fields? State the Advantages, Disadvantages and Applications? **[9]**

b) Highlight important bio metallic alloys, such as Ni-Ti alloy and Co-Cr-Mo alloys with their properties and Applications? **[9]**

Q7) a) What are the strengthening mechanisms employed in Iron base super alloys? State their properties and Applications? **[9]**

b) What are the important metallurgical aspects of Magnesium alloys with their properties and Applications? **[9]**

OR

Q8) a) Explain the composition of Cobalt base super alloys and their role in enhancing properties and State their Applications? **[9]**

b) What are the significant properties of Titanium alloys? State their important metallurgical aspects and Applications? **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC-1905

[Total No. of Pages : 5

[6353]-232

T.E. (Production 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) ***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.***
5) ***Figures to the right indicate full marks.***

Q1) a) Differentiate between **[8]**

i) Expired cost and unexpired cost

ii) Direct and indirect costs

b) Selfhelp Ltd. has gensets and produces its own power. Data for power costs are as follows : **[9]**

Horse Power Hours	Production deptts		Service deptts	
	A	B	X	Y
Needed capacity production	10,000	20,000	12,000	8,000
Used during the month of May	8,000	13,000	7,000	6,000

During the month of May, costs for generating power amounted to Rs. 9,30,000; of this Rs. 2,50,000 was considered to be fixed cost. Service Deptt X renders service to A, B and Y in the ratio 13:6:1, while Y renders service to A and B in the ratio 31:3. Given that the direct labour hours in Deptts A and B are 1,650 hours and 2,175 hours respectively, find the power cost per labour hour in each of these two Deptts.

OR

P.T.O.

Q2) a) What kinds of costs are there? List the steps involved in estimating each type's cost. **[8]**

b) Calculate machine hour rate from the following data : **[9]**

Cost of machine	Rs.	1,16,000
Estimated scrap value	Rs.	16,000
Estimated working life		20,000 hrs.
Estimated maintenance cost during working life of machine	Rs.	2,400
Power used per machine	Rs.	1 per hour
Rent rates per month (10% to be charged to machine)	Rs.	3,000
Normal machine running hours during a month		180
Standing charges other than rent, rates etc. per month	Rs.	400

Q3) a) Differentiate between apportionment and absorption of overhead. **[9]**

b) A factory has three production departments (P_1, P_2 and P_3) and two service departments (S_1 and S_2). Budgeted overheads for the next year have been allocated/apportioned by the cost department among the five departments. The secondary distribution of service department overheads is pending and the following details are given to you : **[9]**

Department	Overheads apportioned/ allocated to activity		Estimated level
P_1	Rs.	48,000	5,000 labour hours
P_2	Rs.	1,12,000	12,000 machine hours
P_3	Rs.	52,000	6,000 labour hours
			Apportionment of service department costs
S_1	Rs.	16,000	P_1(20%), P_2(40%), P_3(20%), S_2(20%)
S_2	Rs.	24,000	P_1(10%), P_2(60%), P_3(20%), S_1(10%)

Calculate the overhead rate of each production department after completing the distribution of service department costs.

OR

Q4) a) Describe the broad guidelines that should be followed when deciding whether an expense item qualifies as overhead. **[9]**

b) The overhead of a manufacturing company has been analysed to the point of primary distribution as given below : **[9]**

		Rs.
Production departments :	Machine	10,00,000
	Assembly	4,00,000
Service departments :	Canteen	2,00,000
	Powerhouse	3,00,000

The canteen is to be apportioned on the basis of employees :

	Employees	%
Machine	240	60
Assembly	140	35
Powerhouse	20	5
	400	100

The powerhouse is to be apportioned on the basis of electricity used :

	Thousand kilowatts	%
Machine	270	75
Assembly	36	10
Canteen	54	15
	360	100

Q5) a) Describe what process costing means. What distinguishes this type of costing from others? **[8]**

b) A company manufacturing two products furnishes the following data for a year : **[9]**

Product	Annual output (units)	Total machine hours	Total number of purchase orders	Total number of set-ups
A	5,000	20,000	160	20
B	60,000	1,20,000	384	44

The annual overheads are as under :

	Rs.
Volume related activity costs :	5,50,000
Set-up related costs	8,20,000
Purchase related costs	6,18,000

You are required to calculate the cost per unit of each product A and B based on :

i) Traditional method of charging overheads

ii) Activity based costing method

OR

Q6) a) Give a brief explanation of the details of job, batch and unit costs. **[8]**

b) The following transactions occurred at the Small Machine Manufacturing Company Ltd: **[9]**

i) Issued Rs. 1,000 in supplies from the materials inventory.

ii) Purchased materials worth Rs. 20,000.

iii) Purchased materials costing Rs. 15,800 on cash basis.

iv) Paid for the materials purchased.

v) Issued materials worth Rs. 17,000 to the production department.

vi) Incurred wages of Rs. 42,000 which were debited to a temporary account called the wages payable account. Of this amount, Rs. 8,000 was withheld for taxes; the balance was paid in cash to the employees.

vii) Analysis of the wage accounts reveals that 60 per cent was direct labour, 30 per cent indirect manufacturing labour and 10 per cent administrative and selling costs.

viii) Paid cash for utilities, power, equipment maintenance and other miscellaneous items for the manufacturing plant. The total amount was Rs. 21,600.

ix) Applied overhead on the basis of 175 per cent of direct labour costs.

x) Depreciation on plant and equipment is to be charged at Rs. 10,500.

xi) The following balances appeared in the accounts of company :

	Opening	Closing
Materials inventory	Rs. 37,050	–
Work-in-process inventory	8,250	_
Finished goods inventory	41,500	Rs.33,200
Cost of goods sold		65,850

You are required to prepare T accounts to show the costs during the period.

Q7) a) Summarize variance analysis. **[9]**

b) SV Ltd, a multi-product company, furnishes you the following data relating to the current year : **[9]**

Particulars	First half of the year	Second half of the year
Sales	Rs. 45,000	Rs. 50,000
Total costs	40,000	43,000

Assuming that there is no change in prices and variable costs and that the fixed expenses are incurred equally in the two half-year periods, calculate for the year: (i) The profit-volume ratio, (ii) Fixed expenses, (iii) Break-even sales, and (iv) Percentage margin of safety.

OR

Q8) a) Describe value engineering and value analysis in brief. **[9]**

b) From the following particulars, calculate Labour Variance: **[9]**

Standard hours = 200

Standard rate for actual production = ₹ 1 per hour

Actual hour = 190

Actual Rate = 1.25 per hour

▽▽▽▽

Total No. of Questions : 8]

SEAT No. :

PC-1906

[Total No. of Pages : 2

[6353]-233
T.E. (Production Sandwich)
ADVANCED JOINING TECHNOLOGY
(2019 Pattern) (Semester - II) (311126(A)-III) (Elective - II)

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) What is cold welding? State its advantages, disadvantages and applications of the process. **[10]**

b) Explain principle and working of Forge welding. State its advantages disadvantages and applications of the process. **[8]**

OR

Q2) a) Explain diffusion bonding process stating its advantages, disadvantages, and applications of the process. **[9]**

b) Explain Explosive welding stating its advantages, disadvantages and applications of the process. **[9]**

Q3) a) Explain Thermit Welding with neat sketch? 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 Laser Beam Welding stating its advantages, disadvantages and applications of the process. **[8]**

b) Write short notes on : **[9]**

i) Welding automation in aerospace

ii) Robotic Welding.

iii) Under Water welding

P.T.O.

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

iii) Tensile bend test of weldments

b) Describe in short, the liquid penetration test of weldments. **[9]**

Q7) a) Write Short notes on : **[8]**

i) Post weld heat treatment of welds

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) Undercut

b) What are different weldability test? Describe any one in short. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-1907

[Total No. of Pages : 2

[6353]-234
T.E. (Production Sandwich)
WORLD CLASS MANUFACTURING
(2019 Pattern) (Semester - II) (311126(A)IV) (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) ***Figure 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 are the various types of coding systems widely used? Explain in brief **[9]**

b) Identify what do you understand by cell design? What are the criteria used for cell design? **[8]**

OR

Q2) a) Explain the concept of part family in detail. **[9]**

b) What is Production Flow Analysis? Explain Benefits and Applications of Group Technology. **[8]**

Q3) a) Distinguish between preventive maintenance and breakdown maintenance. **[9]**

b) What is Quality Function Deployment? Explain in brief. **[8]**

OR

Q4) a) Discuss the PQCDSM framework and its role in evaluating TPM performance. Provide examples of each measure. **[9]**

b) What is Genechi Genbitsu? State and explain its importance with suitable example. **[8]**

P.T.O.

Q5) a) Explain the arrangement of any four of the following components at workplace **[9]**

i) Visual Displays

ii) Control Panels

iii) Hand Controls

iv) Multifunction Hand controls

v) Mirror hand arrangements

b) What are 5S techniques? Explain with suitable example **[9]**

OR

Q6) a) What is Visual Management? What do you mean by visual control and why is it important? **[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) Analyse the role of Lean thinking in warehouse management. Discuss how Lean techniques can optimize warehouse layout, inventory management and order fulfilment processes **[9]**

b) Define IOT. Explain the applications of IOT in manufacturing **[9]**

OR

Q8) a) Explain enablers of Industry 4.0 and barriers of Industry 4.0 **[9]**

b) What is the lean practitioner's approach to solve healthcare process problems? What are the steps involved and how is quality improvement executed? **[9]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1908

[Total No. of Pages : 4

[6353]-235
T.E. (Mechatronics Engineering)
MACHINE DESING
(2019 Pattern) (Semester - I) (317541)

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) ***Assume suitable data wherever necessary.***
4) ***Use of non programmable calculator & drawing instruments is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Derive the formula for torque required to raise the load by a square threaded power screw. **[6]**

b) Adouble - threaded power screw, with ISO metric trapezoidal threads is used to raise a load of 300kN. The nominal diameter is 100mm and the pitch is 12mm. The coefficient of friction at the screw threads is 0.15. Neglecting collar friction, calculate **[12]**

i) torque required to raise the load:

ii) torque required to lower the load: and

iii) efficiency of the screw.

OR

Q2) a) Write a short note on Differential and Compound Screw. **[6]**

b) A machine vice has single-start, square threads with 22 mm nominal diameter and 5 mm pitch. The outer and inner diameters of the friction collar are 55 and 45 mm respectively. The coefficients of friction for thread and collar are 0.15 and 0.17 respectively. The machinist can comfortably exert a force of 125 N on the handle at a mean radius of 150 mm. Assuming uniform wear for the collar, calculate **[12]**

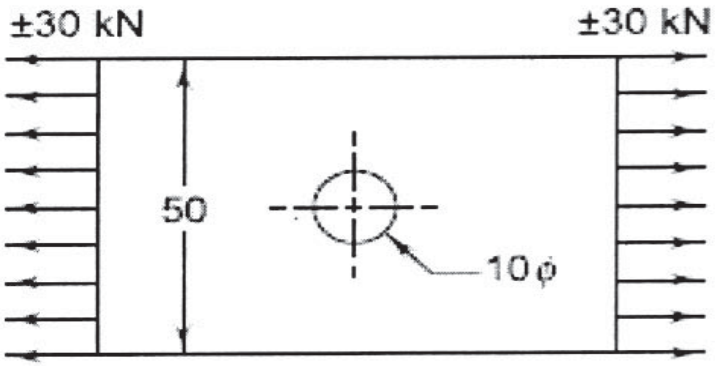
i) the clamping force developed between the jaws; and

ii) the overall efficiency of the clamp

P.T.O.

Q3) a) Discuss the methods for the reduction of stress concentration in machine components. **[6]**

b) A plate made of steel 20C8 (Sut = 440 N/mm^2) in hot rolled and normalized condition with surface finish factor as 0.67 is shown in Fig. It is subjected to a completely reversed axial load of 30 kN. The notch sensitivity factor q can be taken as 0.8 and the reliability factor is 0.897. The size factor is 0.85. The factor of safety is 2. Take theoretical stress concentration factor K_t as 2.51. Determine the plate thickness for infinite life. **[12]**



OR

Q4) a) Explain the Modified Goodman's diagram for bending stresses and torsional shear stresses. **[6]**

b) A machine component is subjected to a fiexural stress which fluctuates between + 300 MN/m^2 and –150 MN/m^2. Determine the value of minimum ultimate strength according to

i) Gerber relation;

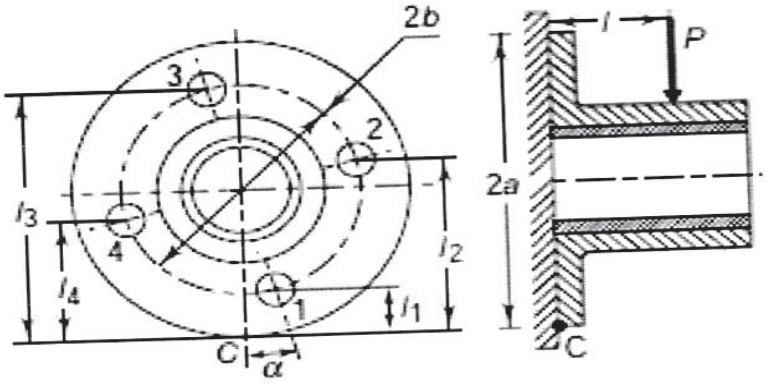
ii) Modified Goodman relation: and

iii) Soderberg relation

Take yield strength = [0.55×Ultimate strength]: Endurance strength = [0.5 × Ultimate strength]; and factor of safety = 2. **[12]**

Q5) a) Write short note on nut locking devices covering the necessity and various types. **[7]**

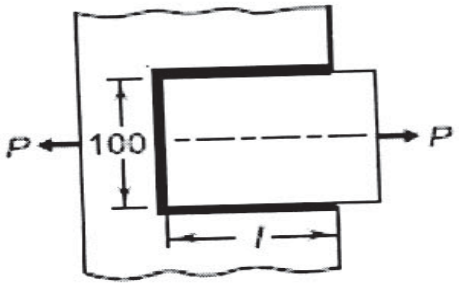
b) A round flange bearing, as shown in Fig., is fastened to the machine frame by means of four cap screws spaced equally on a 300 mm pitch circle diameter. The diameter of the flange is 400 mm. The external force P is 25 kN, which is located at a distance of 150 mm from the machine frame. There are two dowel pins to take shear load. The cap screws are relieved of all shear force. Determine th size of the cap screws, if the maximum permissible tensile stress in the cap screw is limited to 50 N/mm^2. **[10]**



OR

Q6) a) Define Welded Joints with its advantages and disadvantages. **[7]**

b) A steel plate, 100 mm wide and 10 mm thick, is joined with another steel plate by means of single transverse and double parallel fillet welds, as shown in Fig. The strength of the welded joint should be equal to the strength of the plates to be joined. The permissible tensile and shear stresses for the weld material and the plates are 70 and 50 N/mm^2 respectively. Find the length of each parallel fillet weld. Assume the tensile force acting on the plates as static. **[10]**



Q7) a) Write the functions and applications of springs. **[5]**

b) Design a spring for a balance to measure 0 to 1000 N over a scale of length 80 mm. The spring is to be enclosed in a casing of 25 mm diameter. The approximate number of turns is 30. The modulus of rigidity is 85 kN / mm^2. Also calculate the maximum shear stress induced. **[12]**

OR

Q8) a) Write a short note on Surge in spring. **[5]**

b) A safety valve 50 mm in diameter is to blow off at a pressure of 1.5 MPa. It is held on its seat by means of a helical compression spring with an initial compression of 25 mm. The maximum lift of the valve is 10 mm. The spring index can be taken as 6. The spring is made of patented and cold drawn steel wire with ultimate tensile strength of 1500 N/mm^2 and modulus of rigidity of 81370 N/mm^2. The permissible shear stress for the spring wire should be taken as 30% of the ultimate tensile strength. Calculate: **[12]**

i) wire diameter

ii) mean coil diameter

iii) number of active turns

iv) total number of turns

v) solid length

vi) free length

vii) pitch of the coil

* * *

Total No. of Questions : 8]

SEAT No. : ____

PC1909

[Total No. of Pages : 2

[6353]-236

T.E. (Mechatronics Engineering)

MANUFACTURING PROCESSES

(2019 Pattern) (Semester - I) (317542)

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 diagram s& must be drawn wherever necessary.***
3) ***Use of drawing instruments, electronic pocket calculators are allowed.***
4) ***Figures to the right indicates full marks.***
5) ***Assume suitable data if necessary.***

Q1) a) What are the various type of chips? Explain with a neat sketch. **[9]**

b) Define Machining & differentiate between orthogonal & oblique cutting.**[8]**

OR

Q2) a) Describe the tool geometry of a single point cutting tool with a neat sketch.**[9]**

b) Classify the Milling Machine. Compare Shaping and planning Machine.**[8]**

Q3) a) What are the type of brazed joint? Compare Soldering and Brazing processes. **[9]**

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

i) Forge welding

ii) Ultrasonic welding

OR

Q4) a) Draw neat sketch of Oxy Acetylene gas welding and explain important points regarding oxy Acetylene welding. **[9]**

b) Short note on: **[8]**

i) Soldering method

ii) Brazing method

P.T.O.

Q5) a) Explain with neat sketch electrical discharge machining (EDM). **[6]**

b) Explain with neat sketch laser beam machining. **[6]**

c) Write short note on Fundamental of Rapid prototyping. **[6]**

OR

Q6) a) Classify the unconventional machining processes. **[6]**

b) Explain with neat sketch Electron Beam Machining (EBM). **[6]**

c) Explain photolithography and layer processes used in IC fabrication. **[6]**

Q7) a) Explain silicon processing with neat sketch. (circuit). **[6]**

b) Explain PCB assembly with neat sketch. **[6]**

c) State the procedure for PCB fabrication. **[6]**

OR

Q8) a) Explain IC packaging. **[6]**

b) Write short notes on Stereo lithography. **[6]**

c) What do you mean by PCB structure. What are the types and materials required? **[6]**

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Total No. of Questions : 8] **SEAT No. :**

PC1910 **[Total No. of Pages : 2**

[6353]-237
T.E. (Mechatronics Engg.)
CONTROL SYSTEM
(2019 Pattern) (Semester - I) (317543)

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) ***Use of drawing instruments, electronic pocket calculators are allowed.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

Q1) a) Using Routh Hurwitz stability criterion, determine the range of K for stability for $Q(s) = s^4 + 2s^3 + (4+K)s^2 + 9s + 25 = 0$ **[6]**

b) Explain the significance of auxiliary equation. **[6]**

c) Describe the various rules to sketch the root locus. **[6]**

OR

Q2) a) State and explain Routh Hurwitz stability criterion. **[6]**

b) Comment on the stability of a system using Routh's stability criteria whose characteristic equation is : $s^4 + 2s^3 + 4s^2 + 6s + 8 = 0$. How many poles of systems lie in right half of S Plane. **[6]**

c) State the advantages of root locus. **[6]**

Q3) a) What are the limitations for frequency domain approach . **[4]**

b) For the system with closed loop transfer function $G(s) = \frac{100}{s^2 + 10s + 100}$, determine resonant peak, resonant frequency, damping factor, and undamped natural frequency. **[6]**

c) What is a polar plot? Explain with examples. **[8]**

OR

P.T.O.

Q4) a) What are the advantages of frequency domain approach. **[4]**

b) For the system with closed loop transfer function $G(s) = \frac{36}{s^2 + 6s + 36}$, determine resonant peak, resonant frequency, damping factor, and undamped natural frequency. **[6]**

c) Explain steps to sketch Nyquist plot. **[8]**

Q5) a) Define and explain : **[9]**

i) gain margin

ii) phase margin

iii) gain cross over frequency

iv) phase crossover frequency

b) Explain the procedure to obtain gain margin and phase margin from the Bode plot. **[8]**

OR

Q6) a) Discuss the nature of bode plot of : **[9]**

i) pole at origin

ii) simple pole

iii) simple zero

iv) Quadratic pole

b) Explain steps to sketch Bode plot **[8]**

Q7) a) What is derivative control mode. State its characteristics. **[6]**

b) Explain concept of industrial automation. **[6]**

c) What is a PID controller? Explain in detail. **[5]**

OR

Q8) a) What is integral control mode? State its characteristics. **[6]**

b) Explain PD control mode stare its characteristics. **[6]**

c) Explain applications of loT **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC1911

[Total No. of Pages : 2

[6353]-238

T.E. (Mechatronics Engineering)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester-I) (317544)

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.7or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of Non-programmable Calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain the any four properties of DTFS. **[8]**

b) Determine the Fourier Series respresentation of the following sequence and sketch the frequency spectrum, **[10]**

$x(n) = \{\ldots\ldots, 2, 1, 2, 2, 1, 2, 2, 1, 2, \ldots\ldots\}$
$\uparrow$

OR

Q2) a) State and explain any two properties of Discrete Time Fourier Transform? **[8]**

b) Find the DTFT of the sequence, $x(n) = \{1, 1, -1, 0\}$ **[10]**

Q3) a) State and explain the properties of the Discrete Fourier Transform. **[6]**

i) Linearity

ii) Time shifting

b) Find the Discrete Fourier Transform of the following sequence **[8]**

$x(n) = \{1, 0, 1, 0, 1, 0, 1, 0\}$

c) Explain the bit reversal concept in FFT algorithms. **[3]**

P.T.O.

OR

Q4) a) Find the Inverse Discrete Fourier Transform of **[6]**
$X(k) = \{6, 0, 2, 0\}$

b) Find the linear convolution using circular convolution method for the following sequences and compare the result with linear convolution. **[11]**

$$x(n) = \{1,1, 2, 3\}$$
$$h(n) = \{1, 2, 1\}$$

Q5) a) Using bilinear transformation method find $H(z)$, **[8]**

$$H(s) = \frac{1}{(s+7)(s+15)}$$

For T = 1 sec

b) Compare analog and digital filters. **[6]**

c) Explain the designing steps to design digital butterworth filter. **[4]**

OR

Q6) a) Find the order and cut-off frequency of the filter with specifications given as, **[9]**

$$0.6 \leq |H(e^{j\omega})| \leq 1; \text{ for } 0 \leq \omega \leq 0.35\pi$$
$$|H(e^{j\omega})| \leq 0.1; \text{ for } 0.7\pi \leq \omega \leq \pi$$

b) Write a short note on bilinear transformation method. **[6]**

c) Explain in brief the digital filters. **[3]**

Q7) a) Explain the Gibb's phenomenon in detail with neat diagram. **[7]**

b) Design a low pass FIR filter using rectangular window by taking N = 5, magnitude=1 and cut-off frequency $\omega_c = 0.2\pi$ rad/sample. **[10]**

OR

Q8) a) Enlist the different types of windows with their mathematical equations. **[5]**

b) Design a low pass FIR filter with cut-off frequency $\omega_c = 0.8\pi$ rad/sample using hamming window for N = 7, with magnitude = 1. **[12]**

Total No. of Questions : 8]

SEAT No. : ____

PC-1912

[Total No. of Pages : 2

[6353] - 239
T.E. (Mechatronics Engineering)
MICROCONTROLLER
(2019 Pattern) (Semester - I) (317545)

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 indicates full marks***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary***

Q1) a) Explain various timer modes for 8051. **[6]**

b) Write an Embedded C program for 8051 to count 00H to FFH on port P2. **[6]**

c) Explain with the help of diagrams the structure of TCON and TMOD Register. **[6]**

OR

Q2) a) Explain the modes of operation of the timer/counter 8051. **[6]**

b) Write a detailed note on Time delay programming in C. **[6]**

c) Describe the value to be loaded in TH, TL and TMOD on register for delay calculations of 1 msec using timer 1. (Assuming oscillatory frequency 10MHZ) **[6]**

Q3) a) Write a detailed note on the interrupt structure and priorities of the 8051 microcontroller. **[5]**

b) Draw an interfacing diagram of ADC 0809 with 8051. **[5]**

c) Write an Assembly program to switch "ON" OR "OFF" A LED connected on P 1.3 when external interrupt INTO is activated. **[8]**

OR

P.T.O.

Q4) a) Explain different types of SFR's associated with Interrupt. **[5]**

b) Write a note on Programming of External hardware interrupts in C. **[5]**

c) Write an 8051 C program to switch "ON" OR "OFF" A LED connected on P 1.3 . Complement the LED whenever the switch is connected on P 3.2 is pressed. **[8]**

Q5) a) Write short notes on: SCON Register of 8051. **[5]**

b) Write a note on serial communication in 8051 **[5]**

c) Explain interfacing diagram for measurement of apparent power with the help of 8051. **[7]**

OR

Q6) a) Discuss the modes of operation of the serial port of the 8051 microcontroller. **[5]**

b) Describe the SBUF - SFR in 8051 . Explain serial port in full duplex mode. **[5]**

c) Explain interfacing diagram for measurement of Voltage and current with the help of 8051. **[7]**

Q7) a) Draw and explain the interfacing diagram of Stepper Motor with 8051 microcontroller. Write an assembly language program to rotate stepper motors in clockwise direction with full step sequence. **[10]**

b) Draw and explain temperature measurement using 8051. **[7]**

OR

Q8) a) Draw and explain the interfacing diagram of LED with 8051 microcontroller. Write a program to ON and OFF the led with a delay of 1ms. Consider PORT 3 as the output port. **[10]**

b) Draw and explain the interfacing diagram of Single key with 8051 microcontroller. **[7]**

Total No. of Questions : 8]

SEAT No. :

PC 1913

[Total No. of Pages : 2

[6353]-240

T.E. (Mechatronics Engineering)
INDUSTRIAL AUTOMATION
(2019 Pattern) (Semester-II) (317547)

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 drawing instruments, electronic pocket calculators are allowed.***
4) ***Figures to the right indicates full marks.***
5) ***Assume suitable data, if necessary.***

Q1) a) Draw a ladder diagram for following comparison operations : **[8]**

i) less than

ii) greater than

b) Explain the PLC basic comparison functions. **[9]**

OR

Q2) a) Draw a ladder diagram for following math operations : **[8]**

i) ADD

ii) SUB

b) Draw a ladder diagram for following comparison operations : **[9]**

i) Equal

ii) not equal to

iii) greater than or equal to

Q3) a) Explain analog signal processing for analog input signal with example. **[8]**

b) What is PID tuning and state various tuning methods for it. Explain loop control PID function with inputs and outputs. **[9]**

OR

Q4) a) Explain multi - bit data processing with suitable diagram. **[8]**

b) Explain the SKIP function and its application. **[9]**

P.T.O.

Q5) a) Explain working of HMI with suitable example. **[6]**

b) State the need of HMI with its advantages. **[6]**

c) State the need of drives and explain variable frequency drive (VFD) in detail. **[6]**

OR

Q6) a) Compare PLC and SCADA on any six points. **[6]**

b) Draw a block diagram for motion control and state its different elements. **[6]**

c) Explain Selection criterion for drives and also enlist various methods of speed control for PLC. **[6]**

Q7) a) Explain SCADA system with its benefits. **[6]**

b) Explain Internet based SCADA system and also list down its advantages. **[6]**

c) State the applications of SCADA and explain any one application related to our day today life. **[6]**

OR

Q8) a) State different SCADA packages and compare among each other's.**[6]**

b) Differentiate between PLCs and RTUs. **[6]**

c) Write a short note on : Master Terminal Units (MTU). **[6]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1914

[Total No. of Pages : 2

[6353]-241

T.E. (Mechatronics)

ELECTRO-MECHANICAL SYSTEMS

(2019 Pattern) (Semester - II) (317548)

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) ***Assume suitable data wherever necessary.***
4) ***Use of non programmable calculator & drawing instruments is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***

Q1) a) Draw the construction and explain the function of following: **[9]**

i) 4/3 Directional control valves

ii) Unloading valves

iii) Check valve

b) Explain Meter in and Meter out circuits. **[9]**

OR

Q2) a) Explain with neat sketches spring loaded and gas charged accumulators and their advantages and disadvantages. **[9]**

b) Explain single acting Intensifier/booster with neat sketch. **[9]**

Q3) a) Describe the major components of Pneumatic systems. **[9]**

b) Explain how FRL unit works in Pneumatics. **[8]**

OR

Q4) a) Describe the advantages, disadvantages and applications of pneumatic system. **[9]**

b) Explain the construction and working of Pneumatic Air control valves and Quick exhaust valves. **[8]**

P.T.O.

Q5) a) Explain the considerations to be taken into account while designing a pneumatic circuit. **[9]**

b) Draw the Circuit for operating Double Acting Cylinder using 4/2 DCV and explain it. **[9]**

OR

Q6) a) Draw the Pneumatic Circuit for operating Single Acting Cylinder using 3/2 DCV and explain it. **[9]**

b) Draw the Circuit for the Speed Control of a Pneumatic motor and explain it. **[9]**

Q7) a) Explain the ladder logic diagram in PLC with its functions. **[9]**

b) Discuss the use of PLC for industrial process control. **[8]**

OR

Q8) a) Explain the basic structure of programmable Logic Controller (PLC) in automation. **[9]**

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

i) Dominant OFF and Dominant ON circuit

ii) Relays

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Total No. of Questions : 8]

SEAT No. :

PC-1915

[Total No. of Pages : 3

[6353]-242

T.E. (Mechatronics Engineering)

FINITE ELEMENT ANALYSIS

(2019 Pattern) (Semester - II) (317549)

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 indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Derive the equation for stiffness matrix and load vector for CST. **[7]**

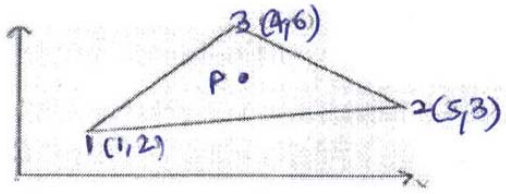
b) What do you mean by CST element? Determine the shape functions for the Constant Strain Triangle (CST) using polynomial functions. **[8]**

c) Discuss Pascal's triangle with convergence conditions. **[3]**

OR

Q2) a) How to verify and validate results in FEA post-processing? **[6]**

b) The nodal coordinate of the triangular element is as shown in the figure. The X coordinate of interior point P is 3.3 and shape function N1=0.3. Determine N2, N3, and y coordinate of point P (use co-factor method)**[6]**



c) Derive the strain displacement matrix and stiffness matrix for LSR (Linear Strain Rectangle) element. **[6]**

P.T.O.

Q3) a) Explain the terms isoparametric, subparametric and superparametric elements. **[6]**

b) Using Lagrangian polynomials, find the shape function for two, three and four noded elements in the natural coordinate system. **[6]**

c) Explain the modeling techniques: sub structuring and sub modeling. **[5]**

OR

Q4) a) Derive the elements of the Jacobian Matrix of transformation in three noded triangular elements (CST). **[6]**

b) Describe the concept of Uniqueness of Mapping. Derive the equation for assembling a stiffness matrix for isoparametric elements. **[6]**

c) Explain geometry associative mesh. **[5]**

Q5) a) Explain essential and natural boundary conditions and solving for temperature distribution. **[6]**

b) Explain steps involved in the processing to solve for 1D heat transfer problem using Finite Element Problem. **[6]**

c) Define heat transfer. Define conduction, natural convection, forced convection and radiation. **[6]**

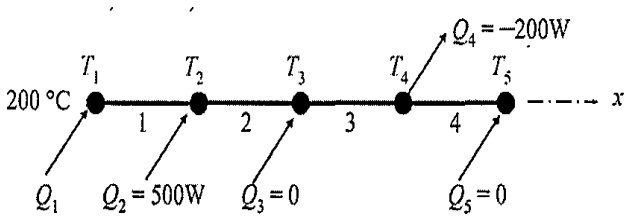
OR

Q6) a) Write the finite element formulation for the composite wall. **[6]**

b) Define Fin. Explain with appropriate governing equations. **[6]**

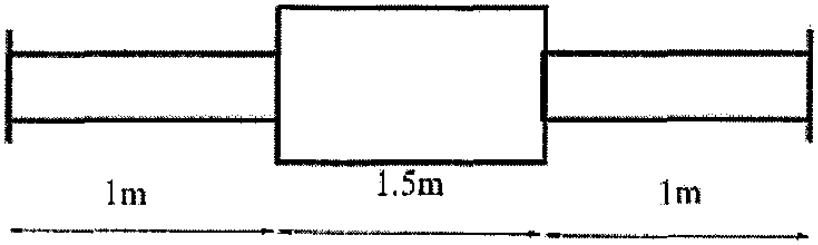
c) Calculate nodal temperature of four elements. **[6]**

Use A = 1 m^2, L = 1m, k = 10W/m/°C



Q7) a) Enlist and explain different types of Dynamic Analysis. **[5]**

b) For the stepped bar shown in fig., determine the first two natural frequencies in terms of rad/s for un-damped free vibration. Let A1=A3=5cm^2, A2=10cm^2, E = 210 GPa and density = 7860kg/m^3. use consistent mass matrices for each element. **[6]**



c) Write the governing equation of motion for dynamic analysis. Explain damped and Undamped free vibration. **[6]**

OR

Q8) a) Write down Consistent and Lumped mass matrices for following elements. **[9]**

i) Bar Element

ii) Plane Stress Element

iii) Triangular Element

b) Explain importance of eigenvalues and eigenvectors. **[4]**

c) Differentiate between Lumped mass system and Consistent mass system. **[4]**

Total No. of Questions : 8]

SEAT No. :

PC-1916

[Total No. of Pages :2

[6353]-243

T.E. (Mechatronics Engineering)

Embedded System Design

(2019 Pattern) (Semester - II) (317550)

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 calculator is allowed.***

Q1) a) Explain in detail with block schematic of compare mode of CCP module. **[6]**

b) Explain PWM generation with example. **[6]**

c) Create a 2KHz PWM frequency with 10% duty cycle on CCPI pin. Assume XTAL = 10MHz **[6]**

OR

Q2) a) Explain Capture mode of PIC18FXX in detail. **[6]**

b) Draw an interfacing diagram and write an algorithm for DC Motor speed contrlo using PIC18XXX. **[6]**

c) Create a 1KHz PWM frequency with 25% duty cycle on CCP1 pin. Assume XTAL =10 MHz, N=16. **[6]**

Q3) a) Draw and Explain Interrupt Structure of PIC 18FXXX **[9]**

b) Write a program using Timer o and Timer 1 interrupts to generate square wave on PINS RB1 and RB7, while data is been transferred from PORT C to PORT D **[9]**

OR

Q4) a) What is peripheral Interrupt, ISR Explain in detail wih example. **[9]**

b) Explain External Interrupt INT0and its programing in PIC18FXX. **[9]**

P.T.O.

Q5) a) Draw and explain the interfacing of LCD port D and port E OF PIC18XXL microcontroller without BUSY FLAG. **[9]**

b) Design a PIC 18 based date acquisition system for Temperature Measurement using LM 35. Write a program to display temperature on LCD. **[8]**

OR

Q6) a) Design a frequency counter for counting number of pulses and display same on LCD. **[9]**

b) Draw a neat interfacing diagram to display "SPPU" on 4th position in the line one and "UNIVERSITY" at 5th position on second line, write an embedded C program. **[8]**

Q7) a) Compare RS 232 and RS 485 in detail. **[8]**

b) Explain the use of BRG register for calculation of Baud rate with UART block Diagram. **[9]**

OR

Q8) a) Draw and explain MSSP structure of PIC18FXX **[9]**

b) Explain the SPI mode of MSSP structure used for serial communication. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC-1917

[Total No. of Pages : 2

[6353]-244

T.E. (Mechatronics Engineering)

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

(2019 Pattern) (Semester - II) (317551)

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) Explain random Forest Algorithm. **[9]**

b) Explain Support vector Regression. **[8]**

OR

Q2) a) Calculate the gini index of below data and construct a decision tree. **[9]**

Weekend	Weather	Parents	Money	Decision
W1	Sunny	Yes	Rich	Cinema
W2	Sunny	No	Rich	Tennis
W3	Windy	Yes	Rich	Cinema
W4	Rainy	Yes	Poor	Cinema
W5	Rainy	No	Rich	Stay In
W6	Rainy	Yes	Poor	Cinema
W7	Windy	No	Poor	Cinema
W8	Windy	No	Rich	Shopping
W9	Windy	Yes	Rich	Cinema
W10	Sunny	No	Rich	Tennis

b) Explain application of Classification & regression in Mechanical Engineering. **[8]**

P.T.O.

Q3) a) What are four typical problems to be solved using machine learning approach? **[9]**

b) Explain different performance evaluators used for interpretation/ assessment of classification model. Explain 2 × 2 confusion matrix and explain its terminology. **[9]**

OR

Q4) a) Compare Training data vs. test data vs. validation data. **[6]**

b) What is hyper parameter tuning? **[6]**

c) Explain with neat sketch K-fold cross-validation mode. **[6]**

Q5) a) What is reinforcement learning? State one practical example. **[5]**

b) Explain types of reinforcement learning: (Positive & Negative reinforcement) **[6]**

c) Explain Markov Decision Process. **[6]**

OR

Q6) a) Explain value-based, policy-based, and model-based reinforcement learning. **[6]**

b) Explain Q-Learning. **[6]**

c) Explain Artificial Neural Network (ANN). **[5]**

Q7) a) What is human-machine interaction? **[6]**

b) Make a list of maintenance and explain in brief. Discuss the scope of AIML. **[6]**

c) Explain scope of ML for Materials Science. **[6]**

OR

Q8) a) What are the opportunities and challenges HMI? **[6]**

b) Explain fault diagnosis (of any suitable machine element) using ML. **[6]**

c) Explain Image based part classification. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PC1918

[Total No. of Pages : 2

[6353]-245
T.E. (Robotics and Automation Engineering)
EMBEDDED SYSTEM IN ROBOTICS
(2019 Pattern) (Semester - I) (311501 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) ***Figures to the right indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

Q1) a) Compare synchronous and Asynchronous communication. **[9]**

b) Explain Bluetooth in detail. Enlist is application. **[9]**

OR

Q2) a) Write short note on communication protocol. **[9]**

i) SPI

ii) SCI

b) Explain USB in detail. Enlist its application. **[9]**

Q3) a) Write short note on: **[9]**

i) Data Types

ii) Operators in embedded C

b) Explain Serial communication and types of serial communication. **[8]**

OR

Q4) a) Write short note on UART. **[9]**

b) What is embedded networking? Explain in detail. **[8]**

Q5) a) Explain need of RTOS in detail. **[8]**

b) Explain Foreground and background system. **[9]**

OR

P.T.O.

Q6) a) Write short note on: **[8]**

i) Semaphores

ii) ISR

b) Define Kernel. Explain architecture of kernel. **[9]**

Q7) a) Explain Types of Device drivers and its need. **[8]**

b) Write any 5 commands from Linux with description. **[10]**

OR

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

i) Linux fundamentals

ii) VI editor

b) Explain Pieces of Linux in detail. **[8]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1919

[Total No. of Pages : 2

[6353]-246

T.E. (Robotics & Automation)

HYDRAULICS AND PNEUMATICS

(2019 Pattern) (Semester - I) (311502(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 Diagram must be drawn wherever necessary.***
3) ***Assume Suitable data if necessary.***
4) ***Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.***
5) ***Figures to the right indicates full marks.***

Q1) a) With Neat Sketch, Explain Operation of Poppet check valve and state its Advantages & Disadvantages. **[8]**

b) Draw neat sketch and explain the following with their applications in circuit. **[9]**

i) Three Way, Two Position Direction Control Valve

ii) Four Way, Three Position Direction Control Valve (Closed Centre)

OR

Q2) a) Classifiy different types of Pressure control valves used in the hydraulic circuits. Draw ISO symbol for each. **[8]**

b) With Neat Sketch, Explain Operation of pressure and temperature of compensated FCV. **[9]**

Q3) a) Explain counter balance valve circuit with neat sketch. **[9]**

b) Draw a regenerative circuit by using 4/3 DCV and explain its application. **[9]**

OR

Q4) a) Differentiate between meter in circuit and meter out circuit. **[9]**

b) With neat sketch explain the spring loaded accumulator. **[9]**

P.T.O.

Q5) a) Write the advantages, disadvantages and applications of pneumatic system. **[9]**

b) With neat sketch explain the working of FRL unit. **[9]**

OR

Q6) a) Explain with neat sketch working of AND valve and with the help of circuit diagram explain any one typical application. **[9]**

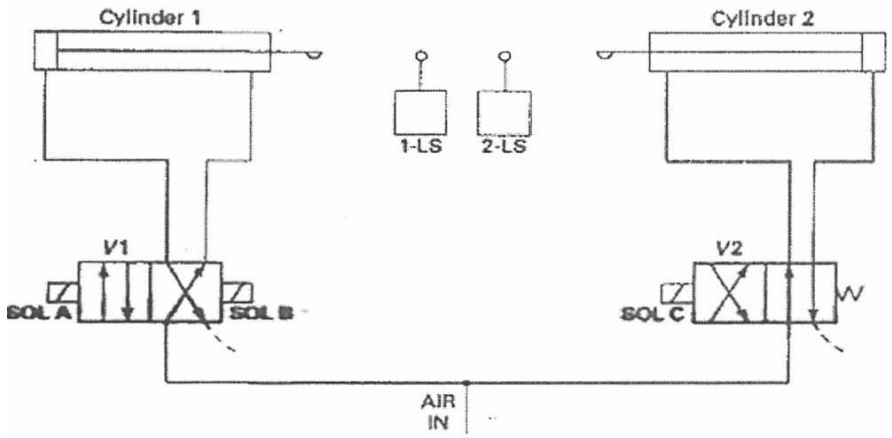
b) Draw circuit for **[9]**

i) Controlling speed of pneumatic double acting cylinder.

ii) Speed control of pneumatic motor.

Q7) a) With neat sketch explain 5/2-way single solenoid valve, spring return. **[8]**

b) Explain the complete operation of the system shown in fig. **[9]**



OR

Q8) a) Explain an Electro-hydraulic servo system with neat sketch. **[8]**

b) What is a programmable logic controller? State the main function of each of the following elements of a PLC: **[9]**

i) CPU

ii) Programmer/monitor

iii) I/O module

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Total No. of Questions : 8]

SEAT No. : ____

PC1920

[Total No. of Pages : 3

[6353]-247
T.E. (Robotics and Automation)
ROBOT KINEMATICS AND DYNAMICS
(2019 Pattern) (Semester - I) (311503 A)

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 Calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Genetic algorithm is to be used to minimize the function $z = xy^2 + 8xy$ such that $1 \leq x \leq 4$ and $0 \leq y \leq 6$ Preform the following. **[10]**

i) Generate initial population of 5 solutions in binary coded form with string length as 4.

ii) Obtain the decoded values.

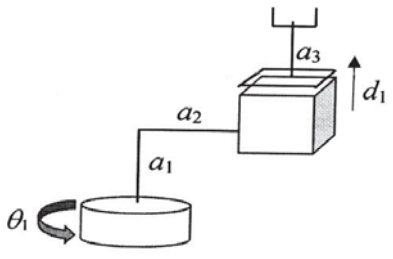
iii) Convert decoded values into actual values of variables.

iv) Obtain the values of objective function z.

b) Explain the steps of pattern search method to solve inverse kinematics problems. **[8]**

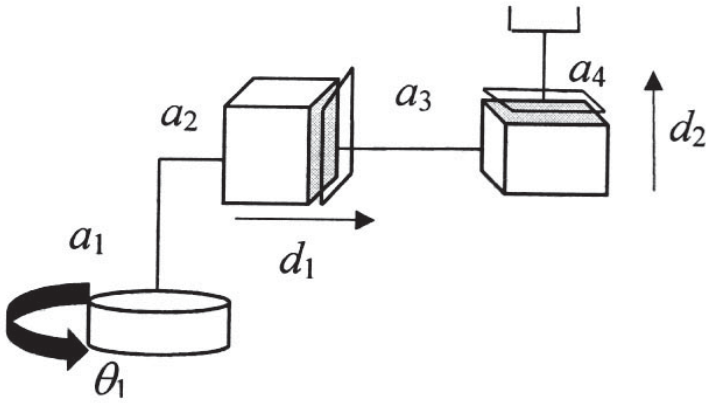
OR

Q2) a) For the robot shown in Fig., Use inverse kinematics to determine the values of joint parameters θ_1 and d_1 to move the robot end effector to position (8, 6, 25). The link lengths are: a_1 = 12cm, a_2 = 10cm, a_3 = 8cm. **[8]**



P.T.O.

b) For the robot shown in Figure, use inverse kinematics to obtain the joint parameters θ_1 d_1, and d_2 to bring the robot end effector to the position (37.9,45.2,46).Consider a_1=30cm, a_2=15cm, a_3=40cm, a_4 = 10cm. **[10]**



Q3) a) A vacuum gripper is used to hold a part having mass 50kg. Determine the number of suction cups required if the applied pressure is 0.9 bar, Coefficient of friction between part and cup surface is 0.40 and the diameter of each vacuum cup is 60 mm. **[8]**

b) An air compressor running at 100 rpm is used to operate a pneumatic gripper having cylinder of piston diameter 40 mm and required storke length of 50 mm. Determine the motor power (in HP) required to develop a gipper force of 350N. **[6]**

c) What are the advantages and limitations of electro-magnetic grippers?**[4]**

OR

Q4) a) Explain the design aspects of mechanical grippers. **[6]**

b) What are various criteria for selection of grippers in robotics applications? **[6]**

c) A 4cm diameter electromagnetic gripper consists of a 150 turn coil of average turns length 5 cm, mounted on a high permeability core (μr = 1800) of magnetic path length 10cm (including 1.5cm through the object). If, operated from a 24 V DC supply a current of 1.5 Amp is drawn, calculate the maximum retention force. **[6]**

Q5) a) What are input and output parameters of forward dynamics? What is the use of forward dynamics in robot design and selection? **[8]**

b) For a single rotary manipulator link, the gripper force is = [15N, - 10N, 0], mass of the link = 10kg, Angular velocity of link (ω) = 5rad/s, Angular acceleration of link = -15 rad/s^2, Length of link = 1.5m with CG located at 0.6m from joint. Determine the resultant joint reaction force in base co-ordinate system for angular position of 30^o. **[9]**

OR

Q6) a) Explain Lagrangian formulation for manipulator dynamics. **[7]**

b) A robot arm with revolute joint is stationary at $\theta = 18^o$. It is required to move it to $\theta = 56^o$ in 5 seconds. Find the coefficients of cubic polynomial that accomplishes this motion and brings the manipulator to rest at goal point. Hence determine the angular position, angular velocity, and angular acceleration at t = 1.6 seconds. **[10]**

Q7) a) Why is balancing of rotating parts necessary for high speed engines? Discuss how a single revolving mass is balanced by two masses revolving in different planes. **[7]**

b) Define the following terms: **[10]**

i) Swaying Couple

ii) Hammer blow

iii) Tractive force

iv) Primary balancing

v) Secondary balancing

Q8) a) What is balancing? What are types of balancing? **[8]**

b) Four masses m_1, m_2, m_3 and m_4 are 60kg, 150kg, 90kg and 100kg respectively. The corresponding radii of rotation are 0.30m, 0.42m, 0.35m and 0.40m respectively and the angles between successive masses are 32^o, 40^o and 95^o. Find the position and magnitude of the balance mass required, if its radius of rotation is 0.15m. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC1921

[Total No. of Pages : 2

[6353]-248

T.E. (Robotics & Automation Engineering)

SENSORS TECHNOLOGY

(2019 Pattern) (Semester-I) (311504 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 diagrams must be drawn wherever necessary.***
3) ***Use of electronic pocket Calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) Distinguish between RTD and Thermistor. **[8]**

b) What is a "Bimetallic Strip"? Explain its operation with suitable example. Also state the advantages, disadvantages and application of the same. **[9]**

OR

Q2) a) Explain in detail the operation of Thermocouple with suitable circuit diagram. **[8]**

b) Explain different "Governing Laws used in Thermocouple" also explain in detail Freiheit, Celcius and Kelvin scale of temperature with suitable examples. **[9]**

Q3) a) Explain in details about "Capacitive Type Accelerometer" also state the advantages and application of the same. **[8]**

b) Compare Pin type and Continuous type level Sensor. **[9]**

OR

Q4) a) What is Position Sensor? Explain in details about LVDT. **[8]**

b) Explain in details with suitable example for Capacitive, Inductive and Resistive type of Sensor. **[9]**

P.T.O.

Q5) a) Distinguish between Metal Foil type and Semiconductor type Strain Gauge **[9]**

b) What is Gauge Factor? Derive an expression for Gauge Factor in terms of poisons ratio. **[9]**

OR

Q6) a) Compare Bounded type and Unbounded type Strain Gauge. **[9]**

b) Explain the working of Load Cell with suitable circuit diagram also state the advantages and application of the same. **[9]**

Q7) a) Explain "Nanotechnology". How Nanotechnology plays an vital role in sensor technology. **[9]**

b) Write a short note on Thermal Detectors and explain its any two types. **[9]**

OR

Q8) a) Explain in detail construction and working of "Bio Sensor" with suitable example. Also state the advantages and application of the same. **[9]**

b) Explain in details Nanotechnology-Enabled Sensors. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1922

[Total No. of Pages : 2

[6353]-249
T.E. (Robotics and Automation)
STATISTICS AND NUMERICAL METHODS
(2019 Pattern) (Semester - I) (311505A-I) (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) ***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) Solve the following system of linear equations using the Gauss elimination method **[9]**

$2x - y + z = 5$

$3x + 2y - z = 4$

$x + 3y + z = 3$

b) Find a root of an equation $f(x) = \sin(x) - x$ using bisection method. Within accuracy to 0.001. Start with interval $[0, \pi]$ **[9]**

OR

Q2) a) Solve following equation using gauss elimination method **[9]**

$3x + 2y - z = 4$

$2x - 3y + z = 5$

$x + y + 2z = 7$

b) Use the Newton-Raphson method to find a root of the equation $f(x) = x^2 - 5$ with an initial guess of $x_0 = 3$. Perform three iterations **[9]**

Q3) a) Given the following set of data points for x and y, use Newton's forward difference method to find the value of y at $x = 4$. **[9]**

x	1	2	3	5
y	3	9	21	75

b) Given the following set of data points for x and y, use Lagrange interpolation polynomial to find the value of y at $x = 2.5$. **[9]**

x	1	2	4	5
y	2	3	5	6

P.T.O.

OR

Q4) a) Given the following set of data points for x and y, use Lagrange interpolation polynomial to find the value of y at $x = 2.3$. **[9]**

x	1	2	4	5
y	3	5	11	15

b) Given the following set of data points for x and y, use Newton's forward difference method to find the value of y at $x = 2.5$. **[9]**

x	1	2	3	4
y	4	11	24	45

Q5) a) Use the Trapezoidal rule to approximate the integral of $(x) = x^2 + 2x$ from $x = 0$ to $x = 2$. **[8]**

b) Use Simpson's 1/3 rule to approximate the integral of $(x) = e^x$ from $x = 0$ to x = 1. **[9]**

OR

Q6) a) Use the fourth-order Runge-Kutta method to approximate the solution of the differential equation $dy/dx = x + y$ with the initial condition $y(0) = 1$ at $x = 0$. **[8]**

b) Use Simpsons l/3rd rule to evaluate e^{-x2}. **[9]**

Q7) a) Describe the challenges associated with solving large-scale optimization problems. **[9]**

b) Discuss the role of uncertainty in optimization problems. **[8]**

OR

Q8) a) Write in brief implantation of Genetic Algorithm with suitable example.**[9]**

b) Brief on: Generalized reduced gradient Method. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC-1923

[Total No. of Pages : 3

[6353]-250

T.E. (Robotics & Automation)

FINITE ELEMENT ANALYSIS (Elective - I)

(2019 Pattern) (Semester - I) (311505(A)-II)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Figure to the right indicates full marks.***
2) ***Neat Diagram must be drawn wherever necessary.***
3) ***Assume Suitable data if necessary.***
4) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 & Q.7 or Q.8.***
5) ***Use of Calculator is allowed.***

Q1) a) What is meant by Banded and Skyline Matrix methods and how these are used for reduction in memory required to simulation in FEA? **[6]**

b) Derive Shape Function for ID linear Element in Natural Coordinates. **[4]**

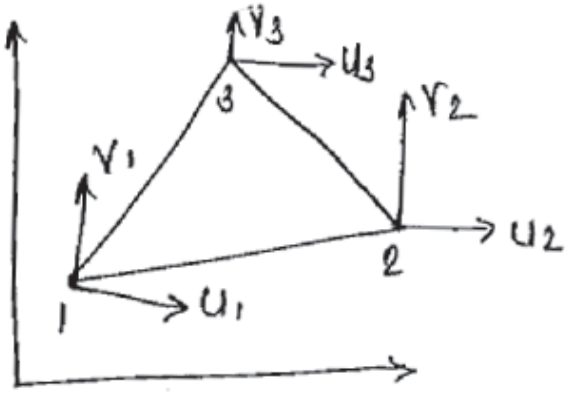
c) The triangular element has nodal coordinates (10, 10) (40, 20) and (30, 50) for nodes 1,2 and 3 respectively for a point 'p' inside triangle. Determine the x and y coordinates if shape functions N_1 and N_2 are 0.15 and 0.25 respectively. **[8]**

OR

Q2) a) Explain and derive the expression for shape functions of CST elements. **[4]**

b) Write short note on CST element and LST element. **[4]**

c) For the triangular element shown in fig, the nodal values of displacement in x and y directions respectively are $u_1 = 2.0$, $u_2 = 3.0$, $u_3 = 5.0$ and $v_1 = 1.0$, $v_2 = 2.0$, $v_3 = 3.0$. Find out for plane stress conditions (i) Displacement of point P, (ii) Strain-displacement relationship (iii) Element stress (iv) strains **[10]**



P.T.O.

Q3) a) Write short notes on : **[9]**

i) Types of 2D Elements

ii) Jacobian matrix

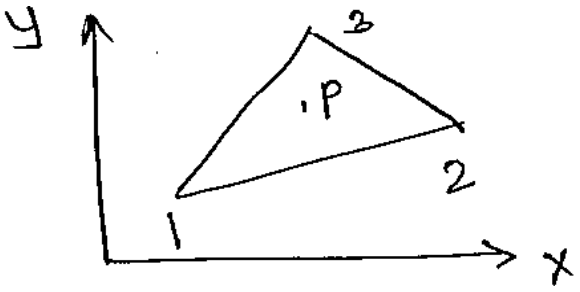
iii) Gaussian quadrature integration technique.

b) The coordinates and function values at the three nodes of a triangular linear element are given below. Calculate the function value at (20,6). **[8]**

Node 1 Coordinates (13,1) Function value 190

Node 2 Coordinates (25,6). Function value 160

Node 3 Coordinates (13,13) Function value 185.



OR

Q4) a) What are the Condition for Axisymmetric Problem? **[4]**

b) Explain the difference between isoparametric, subparametric and superparametric elements. **[5]**

c) Triangular elements are used for stress analysis of a plate subjected to plane load. The components of displacement along x and y axes at the nodes i,j and k of an element are found to the (–0.001,0.01), (–0.002,0.01) and (–0.002, 0.02) cm respectively. If the (x, y) coordinates of the nodes i, j and k are (20, 20), (40, 20) and (40, 40) in cm respectively, find **[8]**

i) the distribution of the two displacement components inside the element and

ii) components of displacement of the point (x_p, y_p) = (30, 25) cm.

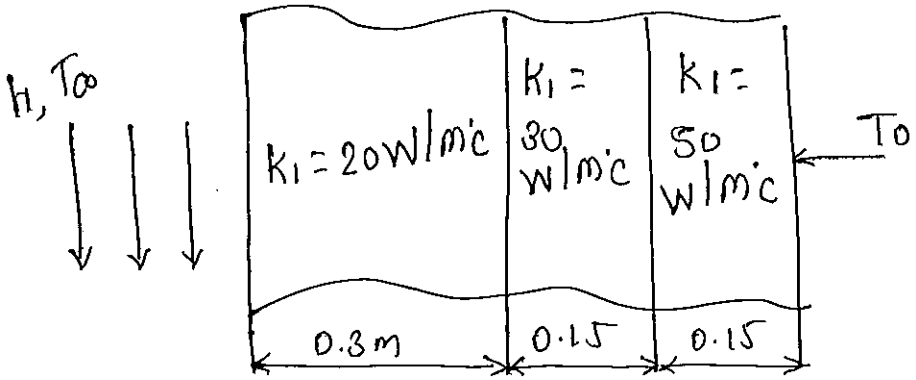
Q5) a) Write a note on various steps involved in the processing steps to solve for 1D heat Transfer problem using Finite Element Problem? **[7]**

b) A metallic fin with thermal conductivity 360 W/m°C, 0.1 cm thick and 10 cm long extends from a plane wall whose temperature is 235°C. Determine the temperature distribution and amount of heat transferred from the fin to the air at 20°C with heat transfer coefficient of 9 W/m2°C. Take the width of the fin to be 1m. **[10]**

OR

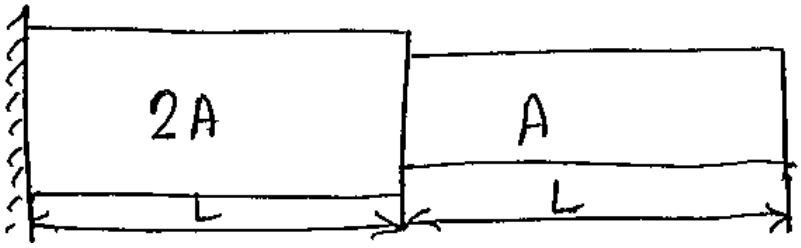
Q6) a) Derive elements stiffness matrix formulation for one dimensional steady state Heat Conduction problems. **[7]**

b) A composite wall consists of three materials as shown in fig. the outer temperature is T_0 = 20°C. Convection heat transfer takes place on the inner surface of the wall with T_∞ = 800°C and h = 25W/m² °C. Determine the temperature distribution in the wall. **[10]**



Q7) a) Explain Eigen Values for undamped free vibration system? **[8]**

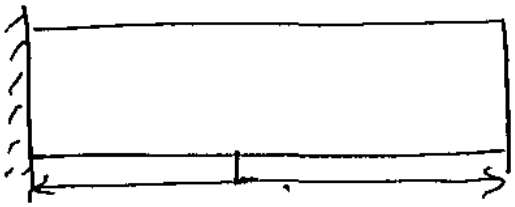
b) Find the natural frequencies of longitudinal vibrations of the same steppe shaft of areas A= 12000 mm² and 2A= 2500 mm² and of equal length (L=1m), when it is constrained at one end, as shown below: **[10]**



OR

Q8) a) Derive the consistent mass matrix for bar element and truss element. **[8]**

b) Find the natural frequency of longitudinal vibration using consistent and lumped mass matrix method with one element of bar as shown in figure. Take E = 2 × 1011 N/m², p = 7800kg/m³, L = 1m **[10]**



Total No. of Questions : 8]

SEAT No. :

PC-1924

[Total No. of Pages :2

[6353]-251

T.E. (Robotics and Automation)

Industrial Robotics and Material Handling System (Elective I)

(2019 Pattern) (Semester - I) (311505 A-III)

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 includicate full marks.***
4) ***Assume Suitable data if necessary.***
5) ***Use of electronic pocket calculator is allowed.***

Q1) a) Explain with sketches robot configurations used in Industries. **[9]**

b) Explain load handling capacity of an Industrial Robot with industrial applications. **[9]**

OR

Q2) a) Define speed of response. Draw and explain robot centered cell used in manufacturing industry. **[9]**

b) Write a short note on CNC machine tool loading. **[9]**

Q3) a) Explain cyclidrical cam type grippers. **[8]**

b) What are the characteristics of end- of - arm tooling? **[5]**

c) List the advantages and disadvantages of magnetic grippers. **[4]**

OR

Q4) a) Explain the following with a sketch: **[9]**

i) Magnetic grippers

ii) Vacuum grippers

iii) Mechanical grippers

b) Write a short note on economics of robotization. **[8]**

P.T.O.

Q5) a) List and explain pick and place Robot used in manufacturing industry. **[8]**

b) Write a short note on Spot Welding Robots used in automobile manufacturing industry. **[9]**

OR

Q6) a) Write a short note on Assembly and mega-assembly Robots. **[8]**

b) Explain in brief the vision system used in Robots. **[9]**

Q7) Write a short note on: **[18]**

a) Lee's Algorithm for obstacle avoidance.

b) Military Robots.

OR

Q8) Write a short note on : **[18]**

a) Medical applications of Robots

b) Underwater applications Robots

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Total No. of Questions : 8]

SEAT No. :

PC-1925

[Total No. of Pages :3

[6353]-252

T.E. (Robotics and Automation)

INTELLIGENT MANUFACTURING SYSTEM

(2019 Pattern) (Semester - I) (311505A) - IV (Elective - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of Calculator is allowed.***
4) ***Assume Suitable data jf necessary***

Q1) a) What are evolutionary optimization methods? How these methods are different from traditional optimization methods? **[12]**

b) Explain applications of fuzzy logic in manufacturing automation. **[5]**

OR

Q2) a) In binary coded genetic algorithm, what will be the value of function $z = x^2_1 - 10x_1.x_2$ if coded values of x_1 and x_2 are '0110' and '0111' respectively and $-3 \le x_1.x_2 \le 3$. **[8]**

b) Perform one iteration of following unconstrained non-linear optimization model to minimize surface roughness (Z) using Simulated Annealing (SA) considering two variables as (rake angle x_1, and flank angle x_2). Min Z = (x_1 x_2-10) Subjected to -10° ≤ x_1 ≤ 12°, 0° ≤ x_2 ≤ 15° **[9]**

Q3) a) Apply rank order clustering technique to arrange the parts (J) and machines (M) into groups from the following part machine incidence matrix. **[9]**

	Parts								
Machines	A	B	C	D	E	F	G	H	I
1	1			1				1	
2					1				1
3			1		1				1
4		1				1			
5	1							1	
6			1						1
7		1				1	1		

P.T.O.

b) What is Opitz coding system? What are its advantages and limitations? **[9]**

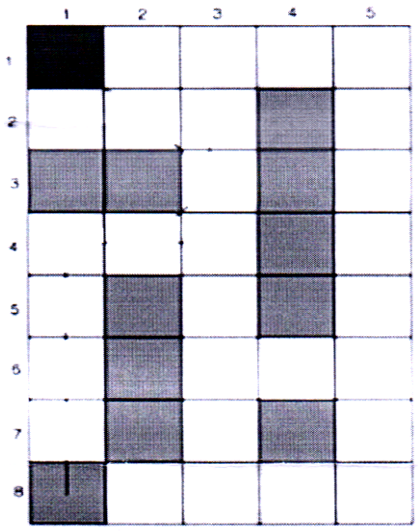
OR

Q4) a) Apply row and colum masking algorithm for grouping of the parts (P) and machines (M) from the following part machine incidence matrix.**[9]**

Machines \ Parts	A-112	A-115	A-120	A-123	A-131	A-212	A-230	A-432	A-451	A-510
SAW01	1		1	1	1			1	1	
LATHE01				1						
LATHE02	1		1		1			1	1	
DRL01		1								1
MILL02		1								
MILL05						1	1			1
GRIND05	1									
GRIND06										1

b) Explain the application of K-means clustering algorithm to solve group technology problems. **[9]**

Q5) a) Use Lee's algorithm for path planning to avoid the obstacles indicated by blocked cells. The starting point is cell [8, 1] while the terminating cell is [1, 1]. **[9]**



b) Explain applications of genetic algorithm for robot path planning.**[8]**

OR

Q6) a) With any suitable application, compare A* algorithm with Dijkstra's algorithm. **[10]**

b) Write short note on: Path planning robot control in dynamic environment.**[7]**

Q7) a) Explain route optimization for AS/RS systems. **[9]**

b) Write note on : Application of artificial intelligence in flexible manufacturing system. **[9]**

OR

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

i) Autonomous mobile robots

ii) Real time scheduling in FMS

iii) Automatic tool path generation

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Total No. of Questions : 8]

SEAT No. :

PC1926

[Total No. of Pages : 3

[6353]-253

T.E. (Robotics & Automation Engg.)

ROBOT PROGRAMMING

(2019 Pattern) (Semester-II) (311508 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) ***Use of calculator is allowed.***
4) ***Assume Suitable data if necessary.***

Q1) a) Explain the following instructions with relevant examples in VAL II: **[10]**

i) PROMPT

ii) APPRO

iii) IOPUT

iv) WSET

v) ABORT

b) Write a short note on commands for listing, storing, retrieving program and location data in VAL II. **[8]**

OR

Q2) a) Write a pick and place VAL II language program for below given data: **[9]**

Assume speed percentage: 75

Pick coordinates: (355, 244, 390, -175, 9, -139)

Place coordinates: (355, 244, 390, -175, 9, -139)

End effector: Gripper

b) Write a short note production rate calculations using robot. **[9]**

P.T.O.

Q3) a) Explain the following instructions in detail: **[10]**

i) SetDO do l5, 1;

ii) MoveAbsJ p50, vl000, z50, tool2;

iii) MoveL Offs(p2, 0, 0, 10), vl000, z50, tool1;

iv) VAR num length;

v) CONST num gravity := 9.81;

b) What are the differences between manual mode and automatic mode in ABB industrial robot? **[8]**

OR

Q4) a) Explain the programme structure of RAPID language. And explain the data types in RAPID language. **[9]**

b) Write a RAPID language code and flowchart to calculate the volume of cylinder. **[9]**

Q5) a) Write a short note on sensor commands in AML language. **[9]**

b) Explain the following instructions in AML language: **[8]**

i) MOVE(<JX, JY, JZ>,<9.5, 1.4, 5.1>);

ii) DEFIO(21, 0, 1, 1, 1);

iii) READ(0,DATA1)

iv) DISPLAY('Welcome',EOL);

OR

Q6) a) Write a short note on motion commands in AML language. **[9]**

b) Explain the following instructions with relevant examples in AML language: **[8]**

i) ERASE

ii) SETTLE

ii) ACCEL

iv) QGOAL

Q7) a) How is cycle time analysis conducted for robots, and what factors influence it? **[9]**

b) What are the key features of Robot Studio online software, and how are they utilized in different stages of robot programming? **[8]**

OR

Q8) a) How is collision detection implemented in robotics, and what methods are commonly used to prevent collisions? **[9]**

b) What challenges arise in scenarios involving multiple robots and machine interference, and how are they typically addressed? **[8]**

Total No. of Questions : 8]

SEAT No. :

PC1927

[Total No. of Pages : 4

[6353]-254

T.E. (Robotics and Automation Engineering)

ARTIFICIAL INTELLIGENCE FOR ROBOTICS

(2019 Pattern) (Semester - II) (311509 - 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) ***Use of Calculator is allowed.***
4) ***Assume Suitable data if necessary.***

Q1) a) Ant colony optimization is used to solve a travelling salesmen problem with 5 stations. The distance matrix is given below. Considering the start and finish station as A, what is the % probability that an ant will choose the path A to C? Assume initial pheromone deposition level for all paths as 1. **[9]**

	A	B	C	D	E
A	0	21	10	17	19
B	21	0	18	10	14
C	10	18	0	22	15
D	17	10	22	0	11
E	19	14	15	11	0

b) Explain the steps of real coded genetic algorithm. **[8]**

OR

Q2) a) Determine the initial temperature if simulated annealing algorithm is used to minimize the function $z = 3.x_1.x_2+x_1^2.x_2$ such that $-3 \le x_1 \le 5$ and $2 \le x_2 \le 10$. **[10]**

b) Explain with suitable application the 'Branch and Bound algorithm'. **[7]**

P.T.O.

Q3) a) Using run length encoding determine the compression ratio for the following image. **[10]**

0	0	0	0	1	1
1	1	1	1	1	1
0	0	0	0	0	0
0	0	0	0	0	0
1	1	1	1	1	0
0	0	0	0	0	0

b) Explain region growing method for image segmentation. **[7]**

OR

Q4) a) For the image shown below, determine the moment of inertia about x axis. **[10]**

1	0	1	0	0
1	0	1	1	1
0	0	1	0	1
1	1	1	0	0
0	1	1	0	1

b) Write note on: Imaging based robot guidance. **[7]**

Q5) a) What is bug 1 algorithm? Explain the analysis of Bug 1 algorithm with any suitable application example. **[4]**

b) Fuzzy logic is to be used for automatic navigation of an Autonomous Mobile Robot (AMR). **[14]**

The Input levels and their membership functions are :

i) Distance (D) between current position of AMR and targeted position at three levels : Low (0, 0, 40), Medium (20, 60, 100), High (80, 120, 120).

ii) The angle of deviation (θ) from the targeted position at three level Negative (–60, –60, –20), Moderate (–40, 0, 40), Positive (20, 60, 60) The output are :

Angular velocity of right wheel (ω_R) and angular velocity of left wheel (ω_R) both operating at five levels : Negative Big (–30, –30, –20), Negative Small (–25, –15, –5), Moderate (–10,0,10), Positive Small (5,15,25), Positive Big (20,30,30).

Determine the angular velocity of right wheel (ω_R) and angular velocity of left whell (ω_R) for distance (D) = 36 units and angle of deviation (θ)= 25°.

OR

Q6) a) Write a note on visibility graph method for robot path planning. **[6]**

b) A spot welding operation is to be performed on a sheet at four locations A, B, C, D having coordinates as mentioned below : **[12]**

Location of spot welding	Co-ordinates
A	(5.00, 5.10, 8.00)
B	(2.06, 2.73, 5.60)
C	(5.45, 7.80, 11.90)
D	(1.56, 0.76, 5.15)

A robot with two rotational joints having following inverse kinematics model is employed to perform this task.

$x = 10 \cos\theta_1 . \cos \theta_2$

$y = 10 \cos \theta_1 . \sin \theta_2$

$z = -10 \sin \theta_2 + 15$

Determine the total angular displacement of both joints to perform the operation in a sequence A-C-B-D.

Q7) a) Use A* algorithm to determine the shortest path for an automated guided vehicle while moving from work station at (4, 6) to workstation at (1, 1) shown below. The obstacles are in the form of tool storage racks at locations (3, 2), (4, 2) and (2, 2). **[9]**

(1, 1)	(2, 1)	(3, 1)	(4, 1)
(1, 2)	(2, 2)	(3, 2)	(4, 2)
(1, 3)	(2, 3)	(3, 3)	(4, 3)
(1, 4)	(2, 4)	(3, 4)	(4, 4)
(1, 5)	(2, 5)	(3, 5)	(4, 5)
(1, 6)	(2, 6)	(3, 6)	(4, 6)

b) Write note on : Felxible manufacturing system. **[9]**

OR

Q8) a) Explain with suitable example techniques for automatic tool path generation. **[9]**

b) Explain route optimization for AS/RS systems. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1928

[Total No. of Pages : 2

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T.E. (Robotics & Automation)

FLEXIBLE MANUFACTURING SYSTEMS

(2019 Pattern) (Semester - II) (311510(A))

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Figure to the right indicates full marks.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume Suitable data if necessary.***
4) ***Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.***
5) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***

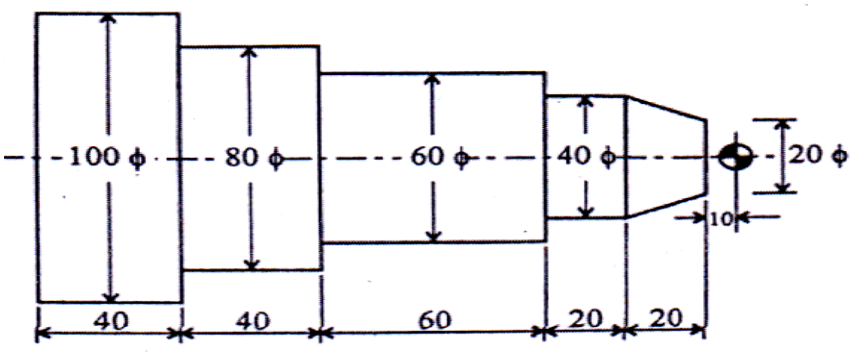
Q1) a) What are the basic components of the NC system and explain the function of each component? **[8]**

b) Write a note on present and qualified tools. **[9]**

OR

Q2) a) Briefly explain turning and machining center. **[8]**

b) Prepare part programming of following component. **[9]**



All dimensions in mm.

P.T.O.

Q3) a) Explain different functions of CIM. **[9]**

b) What is a material requirement planning? Explain the various inputs to the MRP system? **[9]**

OR

Q4) a) Explain about computer aided process planning (CAPP). **[9]**

b) Briefly explain Extended Enterprises? **[9]**

Q5) a) Explain types of AGV and their principal of working. **[9]**

b) Explain the basic components of a robotic system. **[9]**

OR

Q6) a) Elaborate with examples principles of Material Handling. **[9]**

b) Explain the following terms : **[9]**

i) Unit load AS/RS

ii) Mini load AS/RS

iii) Carousel AS/RS

Q7) a) What are the different types of tool strategies? Explain Each. **[8]**

b) Write note on Mass Exchange, Tool Sharing and Tool Migration.Give suitable example to each. **[9]**

OR

Q8) a) Explain the term Tool Monitoring and fault Detection. **[8]**

b) Draw and explain block diagram offered detection in vibration. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC-1929

[Total No. of Pages : 2

[6353]-256

T.E. (Robotics & Automation)

MICRO-ELECTRO MECHANICAL SYSTEMS

(2019 Pattern) (Semester - II) (311511A-I) (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.***
4) ***Assume Suitable data if necessary.***

Q1) a) What is the principle of electrostatic sensor? What do electrostatic sensors measure? **[9]**

b) Explain working principle of thermal resistors. **[8]**

OR

Q2) a) Explain significance of thermocouple in MEMS also classify thermocouples. **[9]**

b) Explore various applications of micro grippers. Elaborate any two applications in detail. **[8]**

Q3) a) Explain how MEMS based sensors and actuators are contributing to the development of smart cities. **[9]**

b) Brief on various piezoresistive sensor materials. **[8]**

OR

Q4) a) Brief working principle of acoustic sensor. What are the advantages and limitation of acoustic sensor? **[9]**

b) Describe challenges associated with stress analysis of mechanical elements in MEMS. **[8]**

P.T.O.

Q5) a) What are polymers? Why it is needed in semiconductor industry. **[9]**

b) Explain the concept of optical MEMS. How it is important in semiconductor industry. **[9]**

OR

Q6) a) Compare Liquid crystal polymer and parylene with each other. Also write advantages and limitations. **[9]**

b) Write a short note on SU-8 with its product characteristics. **[9]**

Q7) a) Why acceleration sensors are essential in cellphone? Elaborate it. **[6]**

b) Elaborate case study related to metal detector. **[6]**

c) Brief on Acceleration sensor. **[6]**

OR

Q8) a) Explain concept of Zigbee. **[6]**

b) Write a short note on : Wireless cameras and voice transmission. **[6]**

c) Write a case study related to Blood pressure sensor. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PC-1930

[Total No. of Pages : 2

[6353]-257
T.E. (Robotics and Automation Engineering)
HUMANOID ROBOTS
(2019 Pattern) (Semester - II) (311511A-II) (Elective - II)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates :

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) a) Explain concept of angular momentum and the inertia tensor in humanoid robotics. **[8]**

b) How can the dynamic equations of motion be derived for a humanoid robot in 2D analysis? Explain the steps involved in the derivation process.

A humanoid robot has two feet with contact points at (0.0) and (0.3. 0) in a 2D plane. The robot's center of mass is located at (0.1. 0.2). Calculate the net torque around the center of mass and determine if the robot is in balance. **[10]**

OR

Q2) a) Explain ZMP-Based Walking Pattern Generation. **[8]**

b) What is the significance of 3D analysis in humanoid robotics, and how does it contribute to understanding robot behaviour? **[10]**

A humanoid robot has a mass of 12 kg. The inertia tensor of the robot's body is given as follows: lxx = 1.5 kgm^2, lyy = 3 kgm^2, lzz = 1 kg*m^2 Calculate the total moment of inertia for the robot's body.

Q3) a) How does the field of humanoid robotics contribute to the study and understanding of neuroscience? **[8]**

b) How can foveal vision be implemented in humanoid robots? What is cognitive human robotics, and how does it integrate cognitive abilities into robot systems? **[9]**

OR

P.T.O.

Q4) a) Explain the significance of foveal vision in humanoid robots. **[8]**

b) Discuss the role of humanoid robots to emulate neuro-mechanisms. **[9]**

Q5) a) What is the significance of cooperation between multiple humanoids in robotics? **[8]**

b) Explain multi-arm object manipulation control. **[9]**

OR

Q6) a) Explain leader-follower cooperative object manipulation in robotics. **[8]**

b) What are the challenges in controlling multiple robot arms for object manipulation? Explain the significance of cooperation between multiple humanoids in robotics. **[9]**

Q7) Write short note on : **[18]**

a) Collaborative Robotics

b) Humanoids in entertainment industry

c) Al techniques

OR

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

a) A.l. Robotics applications

b) Cobots

c) Social Robotics

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Total No. of Questions : 8] **SEAT No. :**

PC-1931 **[Total No. of Pages :2**

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T.E. (Robotics and Automation)

MODELING AND SIMULATION

(2019 Pattern) (Semester - II) (311511A-III) (Elective - II)

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 indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Explain Practical applications and uses of random number generation. **[6]**

b) What is the nature of simulation models? **[6]**

c) Which are the inputs of simulation model? **[5]**

OR

Q2) a) Which are the four phases of input modeling for simulation? **[6]**

b) What is input modeling in simulation? **[6]**

c) Describe generation of pseudo random numbers. **[5]**

Q3) a) Explain generating continuous random variates like Exponential. **[6]**

b) Which are types of simulations with regard to output analysis? **[6]**

c) Explain generating continuous random variates like Uniform. **[5]**

OR

Q4) a) What is random variate generation? **[6]**

b) Which are the factors to be considered in selecting generator? **[6]**

c) Explain generating continuous random variates like Normal. **[5]**

P.T.O.

Q5) a) Discuss the need for and the quantity of equipment and personnel in manufacturing system design. **[6]**

b) Describe Evalution of operational procedures in simulation in manufacturing system design. **[6]**

c) What is a Manufacturing System? Which are the basic components of manufacturing system? **[6]**

OR

Q6) a) Write short note on reentrant manufacturing system. **[6]**

b) How to Reduce Downtime in manufacturing? **[6]**

c) Which are sources of randomness in manufacturing system? **[6]**

Q7) a) Which features needed in programming most discrete-event simulation models? **[6]**

b) What are the advantages of using a simulation package rather than a general -purpose programming language? **[6]**

c) Describe classification of simulation software. **[6]**

OR

Q8) a) Which are the features to be considered while selecting simulation software? **[6]**

b) What is SLAM? Which are applications of it? **[6]**

c) Describe ARENA simulation software package. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC4868

[Total No. of Pages : 2

[6353]-259

T.E. (Robotics and Automation)

SWARM INTELLIGENCE IN ROBOTICS

(2019 Pattern) (Semester - II) (311511(A)- IV) (Elective - II)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1or 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 if necessary***

Q1) a) How the Ant Colony Optimization algorithm is used to solve combinatorial optimization problem? Explain with suitable application. **[8]**

b) Explain with a suitable example working mechanism of Ant Colony Optimization algorithm. **[9]**

OR

Q2) a) Ant colony optimization is used to solve a travelling salesmen problem with 5 stations. The distance matrix is given below. Considering starting station as A, what is the % probability that an ant will choose the path 1 to 3? Assume initial pheromone deposition level as 1. **[10]**

	1	2	3	4	5
1	0	10	13	17	11
2	10	0	16	13	14
3	13	16	0	11	14
4	17	13	11	0	20
5	11	14	14	20	0

b) Explain with suitable application a Recursive Ant Colony Optimization.**[7]**

Q3) a) Explain hybrid artificial bee colony-simulated annealing algorithm. **[8]**

b) Explain Artificial Bee colony algorithm. What are its algorithm specific parameters? How they are determined? **[9]**

OR

P.T.O.

Q4) a) What is the role of scout bees in Artificial Bee colony algorithm? How the numbers of scout bees are decided? **[9]**

b) Explain hybridized Artificial Bee Colony-genetic algorithm. **[8]**

Q5) a) The objective function values of 10 different solutions are as given below:

Solution No.	1	2	3	4	5	6	7	8	9	10
Objective function value	25	22	31	33	29	38	22	27	30	21

For a minimization of objective function value, shuffled frog algorithm is used. If numbers of memeplexes are three, determine the solutions in each memeplex. **[10]**

b) Draw the flowchart and explain the Fish School algorithm. **[8]**

OR

Q6) a) Explain the teacher phase and learner's phase in Teaching learning based optimization algorithm. **[8]**

b) Draw the flowchart and explain the Cat Swarm Optimization. **[10]**

Q7) a) Explain the use of swarm intelligence in obstacle avoidance for mobile robots in dynamic environment. **[9]**

b) Explain the use of swarm intelligence in robot clustering. **[9]**

OR

Q8) a) Describe application of swarm intelligence in route optimization for AS/RS systems. **[9]**

b) Write note on: Robot path planning. **[9]**

Total No. of Questions : 8] **SEAT No. :**

PC1932 **[Total No. of Pages : 3**

[6353]-260
T.E. (Artificial Intelligence and Machine Learning)
DESIGN & ANALYSIS OF ALGORITHMS
(2019 Pattern) (Semester - I) (318541)

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.***

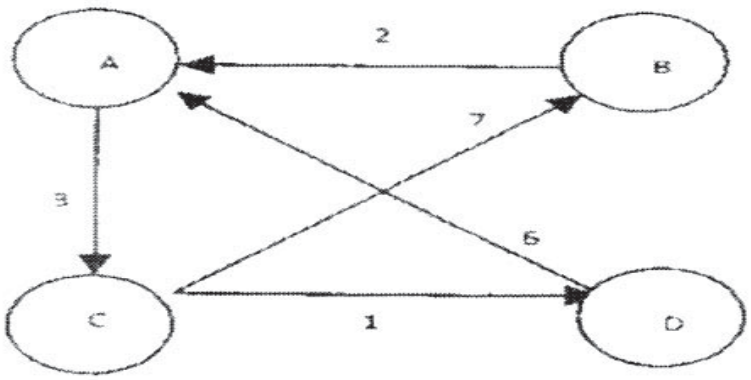
Q1) a) Let N = 4 and {a1, a2, a3, a4} = {DAA, ITPM, OS, SP}. Let (1:3) = {3,3,1,1} and Q(0:3) = {2, 3, 1,1,1} Compute and construct OBST for above values using Dynamic Programming. **[8]**

b) State and explain the principle of dynamic programming. Name the elements of dynamic programming. **[6]**

c) Compare Dynamic Programming with Greedy Approach. **[4]**

OR

Q2) a) Solve using Floyd's algorithm for all pair's shortest paths. **[8]**



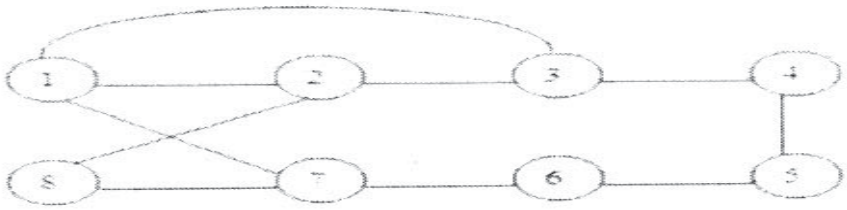
P.T.O.

b) Solve the following instance of the 0/1 knapsack problem by Dynamic programming, Capacity W = 8. **[10]**

Item	1	2	3	4
Weight	12	10	20	15
Profit	2	1	3	2

Q3) a) Differentiate between backtracking and branch and bound. Draw state space tree for given sum of subset problem: Set of elements = {3, 5, 6, 7} and d = 15. **[7]**

b) Find out Hamiltonian cycle for following graph. **[6]**



c) Compare Backtracking and Recursion? **[4]**

OR

Q4) a) Find all possible solution for 5-queens' problem using backtracking method **[7]**

b) Write an algorithm for 0/1 Knapsack problem using backtracking menthod. **[6]**

c) Write a recursive algorithm of backtracking method. **[4]**

Q5) a) Explain following term: **[10]**
Branch and Bound
LC search.
FIFO branch & bound.
Bounding function
Difference in LIFOBB and LCBB.

b) What is travelling salesman problem? Find the solution of following travelling salesman problem using branch and bound method. **[8]**

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

OR

Q6) a) 0/1 Knapsack instance n = 4 with capacity 10kg. Such that find maximum profit using Least Cost branch and bound (LCBB) method. Use fixed Size formation for state space tree. **[10]**

Item	1	2	3	4
Profit	40	42	20	12
Weight	4	7	5	3

b) Describe in brief the general strategy used in branch and bound method. Write general algorithm for Branch and Bound Method. **[8]**

Q7) a) Explain complexity classes P and NP and differentiate between NP complete and NP Hard. **[10]**

b) Differentiate between different models of parallel computations. **[7]**

OR

Q8) a) Specify one example of NP-HARD problem. Also mention that why it is NP hard. **[10]**

b) Write an algorithm for pointer doubling problem. What is time complexity of this algorithm? **[7]**

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Total No. of Questions : 8]

SEAT No. :

PC1933

[Total No. of Pages : 2

[6353]-261

T.E. (Artificial Intelligence and Machine Learning)

IOT WITH ARTIFICIAL INTELLIGENCE

(2019 Pattern) (Semester - I) (318542)

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.7or 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 IEEE 802.15.4 Standard and its advantages and disadvantages. **[8]**

b) Write short note on 6LoWPAN. **[6]**

c) Write any four difference between IPV6 and IPV4. **[4]**

OR

Q2) a) Explain Architecture of MQTT protocol and describe in brief how it is different from COAP protocol. **[8]**

b) How does SCADA software system works. **[6]**

c) State and describe various characteristics of LoRaWAN technology? **[4]**

Q3) a) Explain Solution framework for IoT applications. **[7]**

b) Explain Data Integration platforms. **[6]**

c) Describe Google Cloud Platform IoT frameworks. **[4]**

OR

Q4) a) List and Explain three main Authentication and Authorization security Protocol. **[7]**

b) Write short note on Unstructured data storage on cloud. **[6]**

c) Explain in brief implementation of Device Integration. **[4]**

P.T.O.

Q5) a) Explain different types of data analytics. **[8]**

b) Explain encrypting in Data in Motion. **[6]**

c) Write a note on Unstructured Data. **[4]**

OR

Q6) a) Explain in detail Challenges in Data Analytics. **[8]**

b) What are the best practices for securing Data at Rest. **[6]**

c) List advantages and disadvantages of structured data. **[4]**

Q7) a) Explain in detail big Data & IoT Data analytics. **[7]**

b) Write Short note on smart Cities. **[6]**

c) How does smart commercial building works? **[4]**

OR

Q8) a) Describe advantages and disadvantages of use of IoT in Industrial automation. **[7]**

b) Discuss the benefits of IoT enabled smart grid technology. **[6]**

c) What are real world design constraints in IoT. **[4]**

Total No. of Questions : 8]

SEAT No. : [ ]

PC1934

[Total No. of Pages : 2

[6353]-262
T.E. (AI & ML)
WEB TECHNOLOGY
(2019 Pattern) (Semester - I) (318543)

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) Explain the Web Framework Types in details? **[8]**

b) Describe lifecycle of Angular JS. **[9]**

OR

Q2) a) Explain the MVC architecture in details. **[8]**

b) What is ReactJS. Explain components of ReactJS. **[9]**

Q3) a) What is Node.js? How does it works. List Application of NodeJS. **[8]**

b) Explain NodeJS CRUD operation using MongoDB. **[9]**

OR

Q4) a) What are different NodeJS events. Explain it with example. **[8]**

b) Difference between NodeJS and ExpressJS? **[9]**

Q5) a) What is mobile first design. Why it's important & How to implement it. **[9]**

b) What is Jquery Mobile. State it's features & advantages of it. **[9]**

OR

P.T.O.

Q6) a) What is Mobile web. Difference between Mobile web and Mobile App. **[9]**

b) Explain different types of widget in details for Jquery Mobile. **[9]**

Q7) a) What is AWS cloud in web application deployment. **[9]**

b) State AWS VPS. Explain Component of VPC. **[9]**

OR

Q8) a) Explain AWS Elastic compute in details. **[9]**

b) How to Deploy Website or Web Application on AWS? **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC1935

[Total No. of Pages : 2

[6353]-263

T.E. (Artificial Intelligence and Machine Learning)
Management and Entrepreneurship for IT Industry
(2019 Pattern) (Semester-I) (318544)

Time : 2 ½Hours] *[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 indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain the characteristics of entrepreneurs and their role in society in detail. **[6]**

b) Describe the classification and types of entrepreneurs in detail. **[6]**

c) Explain market feasibility study and technical feasibility study in India. **[6]**

OR

Q2) a) Explain the entrepreneurship in India and barriers to entrepreneurship. **[6]**

b) Define and explain financial feasibility study and social feasibility study in India. **[6]**

c) Explain the role of entrepreneurs in economic development. **[6]**

Q3) a) Define the process for project selection, project report, need and significance of project report. **[6]**

b) Explain the meaning and importance of ERP and Functional areas of Management. **[6]**

c) Explain the Supply Chain Management with a case study. **[5]**

OR

P.T.O.

Q4) a) Explain the guidelines by planning commission for project report in detail. **[6]**

b) Explain the Finance and Accounting related to Human Resources. **[6]**

c) Explain the Types of reports and methods of report generation. **[5]**

Q5) a) Define the characteristics and advantages of micro and small enterprises. **[6]**

b) Explain the Government of India industrial policy 2007 on micro and small enterprises. **[6]**

c) Explain the Institutional support to SSIDC and TECSOK. **[6]**

OR

Q6) a) Define the steps in establishing micro and small enterprises in detail. **[6]**

b) Define the micro and small enterprises and Institutional support for MSME-DI. **[6]**

c) Explain the Institutional support to MSME-DI and NSIC. **[6]**

Q7) a) Write short note on Concept and Theories and Kinds of Intellectual Property Rights. **[6]**

b) Write short note on International Regime Relating to IPR TRIPS. **[6]**

c) Write short notes on Treaties (WIPO, WTO, GATTS). **[5]**

OR

Q8) a) Explain the Advantages and Disadvantages of IPR in detail. **[6]**

b) Write short note on Criticisms of Intellectual Property Rights. **[6]**

c) Explain the Politics of Intellectual Property Rights and Third World Criticisms. **[5]**

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T.E. (Artificial Intelligence and Machine Learning)

ROBOTICS

(2019 Pattern) (Semester - I) (318545 (A)) (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) ***Figure to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Explain homogenous coordinate system in detail. **[6]**

b) Explain properties of transformation matrices in detail. **[6]**

c) How to form forward solution in robotic kinematic. **[6]**

OR

Q2) a) Explain inverse or back solution with any suitable example. **[6]**

b) Explain motion generation in detail. **[6]**

c) Explain techniques for obtaining inverse solution. **[6]**

Q3) a) Explain design aspects for gripper. **[6]**

b) Explain Mechanical Gripper in detail. **[6]**

c) Explain types of sensors in detail. **[5]**

OR

Q4) a) Write a short note on uses of sensors in robotics. **[6]**

b) Explain force analysis for basic mechanical gripper system. **[6]**

c) Explain types of gripper in detail. **[5]**

P.T.O.

Q5) a) Write short note on robot programming Languages **[9]**

i) AI

ii) AML

iii) Val

b) Explain following robot computational elements in detail **[9]**

i) Application Control

ii) Communication

iii) Coordination

OR

Q6) a) Write short note on robot programming Languages **[9]**

i) RAIL

ii) RPL

iii) Val

b) Write a short note on following robot computational elements. **[9]**

i) Robot Path Planning

ii) Functionalities

iii) Calculation

Q7) a) Explain machine loading and unloading in detail. **[6]**

b) Write a short note on Robotic technology. **[6]**

c) Write a short note on Education and Training. **[5]**

OR

Q8) a) Explain the terms **[6]**

i) Social Issues

ii) Labor issues

iii) Capital formation

b) Write a short note on International Impacts. **[5]**

c) Explain welding and coating operations **[6]**

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Total No. of Questions : 8] **SEAT No. :**

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T.E. (Artificial Intelligence and Machine Learning)

(Elective - 1)

(2019 Pattern) (Semester - I) (318545 B)

Pattern Recognition

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 includicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Explain Nearest neighbor algorithm with example. **[8]**

b) Explain Bayes Decision rule. Explain how it can be used for two class classification. **[6]**

c) Explain Gaussian mixture models. **[4]**

OR

Q2) a) Prove that the bayes classifier is equivalent to the minimum distance classifier, assuming that the feature vector is Gaussian. **[8]**

b) What is the difference between maximum likelihood and Bayes method. **[6]**

c) What is maximum entropy estimation. **[4]**

Q3) a) Explain any Linear discriminant based algorithm. **[7]**

b) Explain least means square algorithm in detail. **[6]**

c) Explain decision hyperplane. **[4]**

OR

P.T.O.

Q4) a) Explain the perceptron learning algorithm in detail. **[7]**

b) Explain stochastic approximation of LMS algorithm. **[6]**

c) Explain sum of error estimate. **[4]**

Q5) a) Describe the architecture and learning algorithm of back propagation network. **[8]**

b) Explain K- means clustering algorithm. **[6]**

c) Draw the model of single artificial neuron. **[4]**

OR

Q6) a) Explain two layer perceptron with algorithm. **[8]**

b) Define the criterion functions used in clustering. **[6]**

c) Explain the proximity measures. **[4]**

Q7) a) Explain principal component analysis for dimentionality reduction. **[7]**

b) Explain expectation maximization with the help of algorithm. **[6]**

c) Explain Bayesian parameter estimation. **[4]**

OR

Q8) a) Write a note on first order Hidden markov model. How the Hidden markov model different from markov model. **[7]**

b) Define Classifier. Explain different types of classifiers. **[6]**

c) Explain discriminant functions. **[4]**

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T.E. (Artificial Intelligence and Machine Learning)

INFORMATION SECURITY (Elective - I)

(2019 Pattern) (Semester - I) (318545C)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q. No. 1 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 Chinese reminder theorem with an example. **[9]**

b) Calculate the secret key if Prime Number, p = 7, Primitive root, g=3, using deffiehellman algorithm. Consider Xa =2, Xb =5. **[9]**

OR

Q2) a) Elaborate Elliptic Curve Cryptography. **[9]**

b) Explain Public Key Cryptography with the help of RSA algorithm. **[9]**

Q3) a) What is Digital singnature? How it works? Elaborate. **[8]**

b) Explain SHA algorithm. Compare it with SHA - 3. **[9]**

OR

Q4) a) How the security is provided to email messages using Pretty Good Privacy (PGP) Protocol? Elaborate. **[8]**

b) Elaborate Two Simple Hash Functions used in cryptography. List any three applications of Cryptographic Hash functions. **[9]**

Q5) a) What is a honeypot? How it protects against cyber-attacks? **[9]**

b) Explain the need and characteristics of Firewall. **[9]**

OR

P.T.O.

Q6) a) What is Security attack? Differentiate between active and passive attacks. **[9]**

b) Explain application security in detail. **[9]**

Q7) a) Write a short note on : **[9]**

i) Child Pornography

ii) Email bombing

b) What is Cyber - stalking? Elaborate Types of Stalkers. **[8]**

OR

Q8) a) Explain any two laws against the cyber - crimes in detail. **[9]**

b) What is password cracking? Develop strategies to enhance password security and prevent cracking. **[8]**

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Total No. of Questions : 8]

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[6353]-267
T.E. (AI & ML)
BUSINESS INTELLIGENCE
(2019 Pattern) (Elective - I) (Semester - I) (318545 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.7or 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 in detail any BI Tool with suitable example. **[8]**

b) Explain Business report and components of Business report in detail. **[9]**

OR

Q2) a) Describe different types of Charts and Graphs related to Business Report. **[8]**

b) Explain the balanced scorecard in detail with suitable example. **[9]**

Q3) a) Explain the concept of Multi-criteria Decision Making With Pairwise Comparisons. **[6]**

b) Explain Decision Modeling with Spreadsheets & Mathematical Programming Optimization. **[6]**

c) Write short note on prescriptive analytic for Decision Support. **[6]**

OR

Q4) a) Explain Descriptive and Predictive analytic in detail. **[6]**

b) Write a note on Decision Support System Modeling. **[6]**

c) Explain Decision Analysis with Decision Tables and Decision Trees in detail. **[6]**

P.T.O.

Q5) a) Illustrate the role of visual and business analytics (BA) in BI with an example. **[8]**

b) Illustrate the use of BI in CRM with an example. **[9]**

OR

Q6) a) Illustrate the use of Business Intelligence in Telecommunications with an example. **[8]**

b) Illustrate the use of Business Intelligence in Banking in detail with an example. **[9]**

Q7) a) Explain Location-Based Analytics for Organizations. **[6]**

b) Explain the critical success factors for Implementing a BI strategy. **[6]**

c) Explain Analytics Applications for Consumers in detail. **[6]**

OR

Q8) a) Discuss the Impact of Analytics in Organizations with an example. **[6]**

b) Explain Advanced Visualization in detail with an example. **[6]**

c) Discuss how to Cloud technology will be used in BI for Data Analysis. **[6]**

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Total No. of Questions : 8]

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T.E. (Artificial Intelligence and Machine Learning)
MACHINE INTELLIGENCE FOR DATA SCIENCE
(2019 Pattern) (Semester-II) (318552)

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) What is residuals & regression inference related to Regression Models. **[6]**

b) Explain in detail an overview of statistical linear models. **[6]**

c) Explain Maximum likelihood estimation in logistic regression. **[6]**

OR

Q2) a) Explain how the Interpretation of odds and odds ratios is done using Regression Models. **[6]**

b) Write a note on Poisson regression. **[6]**

c) Write a note on logistic regression. **[6]**

Q3) a) What is random forest & growing of random forest? **[6]**

b) Explain ensemble in detail and its techniques. **[6]**

c) What is Support Vector Machine classification algorithm, explain in detail. **[5]**

OR

Q4) a) How optimal separating is achieved in hyper planes? **[6]**

b) What is Bagging and Bootstrap ensemble methods? **[6]**

c) Write a note on random feature selection in random forest. **[5]**

P.T.O.

Q5) a) Explain Bagging & boosting and also tell its impact on bias and variance. **[6]**

b) What are the different steps involved in creating a Decision Tree? **[6]**

c) Write a note on C5.0 boosting. **[6]**

OR

Q6) a) What is a Decision Tree? Entropy, explain in detail. **[6]**

b) Explain in detail Gradient Boosting Machines. **[6]**

c) Write a note on CART. **[6]**

Q7) a) Write a note on methods, Density - Based Spatial Clustering. **[6]**

b) Write a note on Agglomerative Hierarchical clustering technique. **[6]**

c) How does choosing number of clusters in Hierarchical clustering is done? **[5]**

OR

Q8) a) What is clustering and unsupervised learning. **[6]**

b) Which are the different clustering methods? Explain Partitioning methods in detail. **[6]**

c) Explain the roles of dendrograms in detail. **[5]**

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Total No. of Questions : 8]

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PC-1941

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T.E. (Artificial Intelligence and Machine Learning)

ARTIFICIAL NEURAL NETWORKS

(2019 Pattern) (Semester - II) (318554)

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. 7or 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 the role of activation functions in MLPs. Explain commonly used activation functions in detail. **[6]**

b) Explain Stochastic Gradient Descent with example. **[6]**

c) Describe some real-world applications of feedforward neural networks.**[6]**

OR

Q2) a) Explain the architecture of a multilayer perceptron (MLP).How it differs from a single-layer perceptron? **[6]**

b) Explain the error back propagation algorithm, its Learning Factors and Performance issues. **[8]**

c) Explain Descriminant Functions and Sigmoid Neurons. **[4]**

Q3) a) Explain how simulated annealing can be used to optimize the weights in a stochastic neural network. **[7]**

b) Describe the architecture of a recurrent neural network (RNN). What are some advantages and limitations of RNNs in sequence modeling tasks**[10]**

P.T.O.

OR

Q4) a) What is an auto-associative feedforward network, and how is it different from a standard feedforward network? **[7]**

b) What are Hopfield networks and Pattern storage network, and give some applications of these models? **[10]**

Q5) a) Explain the components of competitive learning and how they are used to classify input patterns. Provide an example. **[8]**

b) Discuss the principles of Semantic Networks and their role in representing knowledge. Provide an example. **[6]**

c) Explain the applications of SOM. **[4]**

OR

Q6) a) Explain Adaptive Resonance Theory (ART) and its role in pattern recognition. Provide an example and applications. **[10]**

b) Describe the architecture of Self-Organizing Maps (SOM) and explain how they are used for feature mapping. Provide an example. **[8]**

Q7) a) Describe the architecture of Deep Learning Networks, including input layer, hidden layers, and output layer. Provide an example. **[7]**

b) Explain the main differences between Traditional Machine Learning and Learning in Deep Neural Networks, including feature engineering, scalability, and interpretability. **[10]**

OR

Q8) a) Discuss the architecture of Deep Recurrent Neural Networks (RNN) and their applications in speech recognition. Provide an example. **[8]**

b) Explain the challenges faced in training Deep Learning Networks, including overfitting, vanishing gradients, and exploding gradients. **[9]**

Total No. of Questions : 8]

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PC-1942

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T.E. (Artificial Intelligence and Machine Learning)

INDUSTRIAL INTERNET OF THINGS

(2019 Pattern) (Semester - II) (318555A) (Elective - 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) Explain Networking of IIoT in detail. **[6]**

b) How Integration of Knowledge is done in CMS? **[6]**

c) Write a note on Interoperability in Smart Automation. **[6]**

OR

Q2) a) Write a note on Communication in IIoT. **[6]**

b) Explain in detail CPS- based manufacturing and Industries. **[6]**

c) What is Enhancing Resiliency in Production Facilities? **[6]**

Q3) a) What is Big Data, and how is it used in IIoT? **[6]**

b) How is CPS used in machine tools? **[6]**

c) What are the advantages of using AI and Data Analytics in Manufacturing? **[5]**

OR

Q4) a) How can Machine Learning be applied in condition monitoring? **[6]**

b) What are the challenges in implementing AI and Data Analytics in Manufacturing? **[6]**

c) What is Cyber Physical System Intelligence? **[5]**

P.T.O.

Q5) a) Write a note on Advance Manufacturing. **[6]**

b) What are the challenges of evaluating the workforce in IIoT? **[6]**

c) How do workers and CPS interact with each other? **[6]**

OR

Q6) a) How can IIoT improve Human-Machine Interaction in the manufacturing sector? **[6]**

b) How does Innovation Ecosystem support Human-Machine Interaction? **[6]**

c) What strategies can be used support user intervention in CPS? **[6]**

Q7) a) How does Smart Metering work, and what are its benefits? **[6]**

b) What are the different applications of IIoT? Explain any one in detail. **[6]**

c) Write a note on e-Health Body Area Networks. **[5]**

OR

Q8) a) What are the real-life examples of IIoT in the Manufacturing sector, and how have they benefited the industry? **[6]**

b) What is City Automation, and what are its advantages? **[6]**

c) Explain Home Automation in detail. **[5]**

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[6353]-272
T.E. (AIML)
BRAIN COMPUTER INTERFACE
(2019 Pattern) (Semester - II) (318555-(B))(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.***
4) ***Assume Suitable data if necessary.***

Q1) a) Explain the Time domain analysis in BCI? Give example. **[6]**

b) Write short note on Independent Component Analysis.(ICA) **[6]**

c) What is Phase synchronization and coherence? **[6]**

OR

Q2) a) Write short note on frequency domain analysis. **[6]**

b) What is Artefacts reduction? **[6]**

c) Explain spatial filtering-principal component analysis (PCA) with example. **[6]**

Q3) a) Explain Binary classification in detail. **[6]**

b) Explain Ensemble classification in detail. **[6]**

c) Explain Support Vector Machine (SVM). **[5]**

OR

Q4) a) Explain Graph theoretical functional connectivity analysis. **[6]**

b) Determine Linear Regression and its applications. **[5]**

c) Explain RBF and Perceptron **[6]**

P.T.O.

Q5) a) What is Peak-to-valley amplitudes in the onset and offset FVEPs? **[6]**

b) Discuss in brief Determination of gazed target. **[6]**

c) Explain Availability of transient VEPs. **[6]**

OR

Q6) a) Explain Machine learning approach in in BCI. **[6]**

b) What is the Usability of Transient VEPs in BCIs-VEPs? **[6]**

c) What are transient VEPs? Explain with an example. **[6]**

Q7) a) What are decoding and tracking arm (hand) position? **[6]**

b) Explain cortical control of muscles via functional electrical simulation? **[6]**

c) What is difference between Cursor and robotic control? **[5]**

OR

Q8) a) What is Visual cognitive BCI? **[6]**

b) What is Emotion detection? Give applications. **[5]**

c) Write short note on Ethics of Brain Computer Interfacing. **[6]**

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T.E. (Artificial Intelligence & Machine Learning)
AI for Cyber Security
(2019 Pattern) (Semester - II) (318555C) (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.***

Q1) a) Explain network anomaly detection techniques and their importance in modern cybersecurity frameworks. **[6]**

b) What is botnet topology? How does AI aid in its detection and analysis? **[6]**

c) Discuss the steps involved in classifying network attacks using AI. **[6]**

OR

Q2) a) Compare various machine learning algorithms for detecting botnets. Highlight their strengths and limitations. **[6]**

b) Describe the challenges of implementing AI-based network anomaly detection in large-scale systems. **[6]**

c) Explain the challenges associated with implementing network anomaly detection systems. **[6]**

Q3) a) Describe keystroke recognition for user authentication. How is it implemented in practice. **[6]**

b) Explain the role of bagging and boosting techniques in improving fraud detection algorithms. **[6]**

c) What is fraud detection using machine learning? **[5]**

OR

Q4) a) Explain the concept of biometric authentication with facial recognition. How does it improve security over traditional methods? **[6]**

b) Discuss how AI-based authentication techniques address the limitations of traditional security methods. **[6]**

c) What is account reputation scoring? Explain its role in securing sensitive information. **[5]**

P.T.O.

Q5) a) What are GANs? Explain their structure and key components in the context of cybersecurity. **[6]**

b) How do adversarial examples created by GANs compromise facial recognition systems? **[6]**

c) What are the main tools and libraries used for developing adversarial examples? **[6]**

OR

Q6) a) Discuss the role of GANs in generating adversarial examples. How are these examples used to attack machine learning models? **[6]**

b) Explain the significance of GANs in enhancing the robustness of defensive AI systems against Attacks. **[6]**

c) How can adversarial examples have generated by GANs compromise Intrusion Detection Systems (IDS)? Provide examples. **[6]**

Q7) a) What is feature engineering? Discuss best practices for handling raw data in machine learning. **[6]**

b) What is the bias-variance trade-off? Provide examples of strategies to balance this trade-off in machine learning models. **[6]**

c) Describe the process of splitting sample data into training and test sets. **[5]**

OR

Q8) a) Explain how the ROC curve is utilized to evaluate a model's performance. **[6]**

b) Discuss the importance of splitting sample data into training and testing sets. How does it affect model evaluation? **[6]**

c) Discuss the importance of cross-validation in managing over fitting. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC-1944

[Total No. of Pages : 2

[6353]-274
T.E. (Artificial Intelligence & Machine Learning)
VIDEO ANALYTICS
(2019 Pattern) (Semester - II) (318555D) (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) ***Assuem suitable data if necessary.***

Q1) a) Explain the concept of back propagation in neural networks and its advantages and disadvantages. **[8]**

b) Describe deep learning networks such as Convolutional Neural Networks (CNNs) in video analytics. **[6]**

c) Compare the application of Bayesian classifier and HMM based classifier in video analytics. **[4]**

OR

Q2) a) Compare the performance of deep learning networks and traditional machine learning methods for video analytics. **[8]**

b) Discuss how a fuzzy classifier can be applied to improve video analytics accuracy. **[6]**

c) Describe the fundamental concept behind HMM-based classifiers. **[4]**

Q3) a) Explain the process of abandoned object detection in video analytics. **[7]**

b) Discuss the key features and applications of crowd analysis in video analytics. **[6]**

c) Define human action recognition in the context of video analytics. **[4]**

OR

Q4) a) Describe the implementation and impact of perimeter security in video analytics. **[7]**

b) How does video analytics contribute to human behavioral analysis? **[6]**

c) Explain the importance of predicting crowd congestion using video analytics. **[4]**

P.T.O.

Q5) a) How does video analytics contribute to customer behavior analysis in retail settings? **[8]**

b) Discuss the significance of people counting in retail analytics using video technology. **[6]**

c) Define driver assistance and its role in video analytics. **[4]**

OR

Q6) a) Explain the methodology and applications of traffic rule violation detection using video analytics. **[8]**

b) Explain the process of traffic congestion identification for route planning in video analytics. **[6]**

c) What is lane change warning and how does it utilize video analytics? **[4]**

Q7) a) Explain the significance of video analysis in action recognition for surveillance applications. **[7]**

b) How does video analytics contribute to context and scene understanding ir surveillance systems? **[6]**

c) Explain a case study demonstrating the effectiveness of video analysis in ADAS. **[4]**

OR

Q8) a) Discuss the implementation of video-based rendering in the context of video analytics. **[7]**

b) Describe the role of video analytics in Advanced Driver Assistance Systems (ADAS). **[6]**

c) List the benefits of video-based rendering. **[4]**

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Total No. of Questions : 8]

SEAT No. :

PC1945

[Total No. of Pages : 2

[6353]-275
T.E. (Computer Science and Design)
SOFTWARE ENGINEERING AND PROJECT MANAGEMENT
(2021 Pattern) (Semester - I) (318241)

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 and clean diagram.***
4) ***Assume suitable data if necessary.***

Q1) a) In the context of software design explain the following in brief : **[6]**

i) Abstraction

ii) Modularity

b) Write a short note on : Component Level Design. **[6]**

c) Explain with neat diagram the user interface design evaluation cycle. **[5]**

OR

Q2) a) What are Architectural Design Decisions? Comment on Application Architectures. **[6]**

b) What are the golden rules of User Interface Design? Explain. **[6]**

c) What is meant by Cohesion and Coupling criteria's that address Functional Independence of Modules? **[5]**

Q3) a) What are the four P's of effective software project management? Explain each P in detail. **[9]**

b) Explain Function Point Metrics. How to compute Function Points using Wighting Factors for Simple, Average and Complex type of Projects? **[9]**

OR

P.T.O.

Q4) a) What is Empirical Estimation Model? Comment on the Structure of Estimation Models. How COCOMO Model is useful for Software Estimation? **[9]**

b) Write a short note on : **[9]**

i) Scheduling with Time Line charts

ii) DART.

Q5) a) What is Risk? Explain Risk Identification. What is RMMM Plan? **[6]**

b) Draw and explain Business Process Reengineering Model. **[6]**

c) What is SCM? What is the role of SCM Repository. **[5]**

OR

Q6) a) What is Risk Projection? How to compute Risk Exposure? **[6]**

b) Explain the Change Control Process with suitable diagram. **[6]**

c) Write a short note on : Reverse Engineering. **[5]**

Q7) a) What is Unit Testing? How it is carried out? **[5]**

b) Draw and explain defect life cycle. **[6]**

c) Write a short note on : Principles of Testing. **[7]**

OR

Q8) a) Explain difference between verification & validation. **[5]**

b) Write short not on **[6]**

i) GUT Testing

ii) Test Management and Automation

c) What is Integration testing? Explain any 2 types of Integration Testing. **[7]**

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Total No. of Questions : 8]

SEAT No. : ____

PC1946

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[6353]-276

T.E. (Computer Science and Design)

THEORY OF COMPUTATION

(2021 Pattern) (Semester - I) (318242)

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) Simplify the following grammar. **[9]**

$S \rightarrow 0A0|1B1|BB, A \rightarrow C, B \rightarrow S|A, C \rightarrow S|\in$

b) What is the ambiguous grammar? Show that the grammar below is ambiguous, & find the equivalent unambiguous grammar **[9]**

$s \rightarrow ss| a | b$

OR

Q2) a) Convert the following CFG into Chomksy Normal Form (CNF): **[9]**

$S \rightarrow PQP$

$P \rightarrow 0P | \epsilon$

$Q \rightarrow 1Q| \epsilon$

b) Write a grammar G for generating the language **[9]**

i) L={w belongs to {a, b}* | w is an odd length palindrome with |w|>0}

ii) Set of odd length strings in {0, 1}* with middle symbol '1'

P.T.O.

Q3) a) Construct a context free grammar which accepts N(A), where **[9]**

A = ({q0, q1}, {0, 1}, {Z0, X}, δ, q0, Z0, φ } where is given by

δ (q0, 1, Z0) = {(q0, XZ0)}

δ (q0, ε, Z0) = {(q0, ε)}

δ (q0, 1, X) = {(q0, XX)}

δ (q0, 0, X) = {(q1, X)}

δ (q1, 1, X) = {(q1, ε)}

δ (q1, 0, Z0) = {(q0, Z0)}

b) Eplain acceptance of PDA by. **[3]**

i) By final state

ii) By empty stack

c) Construct the PDA accepting the language L = {wwR|w is in (a + b)*} **[6]**

OR

Q4) a) Construct the PDA accepting the language L={a^{2n} b^{n} > = 1} Trace your PDA for the input with n = 3. **[9]**

b) Compare Deterministic and Non deterministic PDA. Is it true that non deterministic PDA is more powerful than that of deterministic PDA? Justify your answer. **[9]**

Q5) a) Write short note on **[8]**

i) TM Limitation

ii) Multi-tape Turing Machine

b) What are the different ways for extension of TM? Explain. Design TM for language L = {a^nb^n | n ≥ 1} **[9]**

OR

Q6) a) Design a Turing Machine for the following language by considering transition table and diagram. **[9]**

i) TM that erases all non-blank symbols on the tape where the sequence of non-blank symbols does not contain any blank symbol B in between.

ii) TM that find 2's complement of a binary machine.

b) What is a Turing Machine? Give the formal definition of TM.Design a TM that replaces every occurrence of 110 by 101. **[8]**

Q7) 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]**

OR

Q8) a) Difference between P and NP problems. **[6]**

b) Prove that the Post Correspondence problem is Undecidable. **[6]**

c) Explain tractable and Intractable problem. **[5]**

Total No. of Questions : 8] **SEAT No. :**

PC1947 **[Total No. of Pages : 2**

[6353]-277
T.E. (Computer Science and Design Engineering)
DATABASE SYSTEM DESIGN
(2021 Pattern) (Semester - I) (318243)

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 Referential integrity? Explain types of integrity with the help of example? **[8]**

b) Explain 2NF with suitable example. Enlist the difference between 2NF and 3NF. **[9]**

OR

Q2) a) Elaborate the significance of codd's rule. Explain 12 rules proposed by codd's. **[8]**

b) What is the impact of insert, update and delete anomaly on overall design of database? How is normalization used to remove these anomalies? **[9]**

Q3) a) Draw and explain database transaction state diagram in detail. **[9]**

b) Explain the concept of conflict serializability with suitable example. Since every conflict serializable schedule is view serializable, why do we emphasize conflict serializability rather than view serializability? **[9]**

OR

Q4) a) Explain two phase lock protocol for concurrency control. Also explain its two versions. **[9]**

b) State and explain the ACID properties. During its execution a transaction passes through several states, until it finally commits or aborts. List all possible sequences of states through which a transaction may pass. Explain the situations when each state transition occurs. **[9]**

P.T.O.

Q5) a) Explain how NOSQL databases are different than relational databases? Explain the difference between SQL and NOSQL. **[8]**

b) Explain following types of data with example. **[9]**

i) Structured

ii) Semi-structured

iii) Unstructured

OR

Q6) a) Explain Map-Reduce with an example in MongoDB. **[8]**

b) List the different NOSQL data models. Explain document store NOSQL data model with example. **[9]**

Q7) a) What is object relational database? What are its advantages and disadvantages? **[9]**

b) Write short note on **[9]**

i) Geometric data

ii) Geographic data

OR

Q8) a) Compare JSON and XML with example. Explain with proper example when to use XML database. **[9]**

b) Difference between relational databases and object relational databases with example. What is the need of object oriented database? **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC1948

[Total No. of Pages : 3

[6353]-278

T.E. (Computer Science & Design)

DESIGN AND ANALYSIS OF ALGORITHM

(2021 Pattern) (Semester-I) (318244)

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 indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) What is job scheduling algorithm? How job scheduling algorithm can be solved using Greedy algorithmic approach? Explain your answer with respect to Principle, control abstraction, time analysis of control abstraction, of greedy approach for the following instance of knapsack problem. **[8]**

Each job is associated with a deadline and profit.

Job	J_1	J_2	J_3	J_4
Deadline	2	1	2	1
Profit	100	10	15	27

b) Consider the following instance of the knapsack problem. Find the optimal solution by using dynamic programming approach. Capacity of the knapsack = 3. **[10]**

Item	Weight	Profit
1	5	15
2	4	20
3	3	21

OR

P.T.O.

Q2) a) What is an OBST? Write advantages and disadvantages of imbalanced binary search tree? **[8]**

b) Explain Greedy strategy: Principle, control abstraction, time analysis of control abstraction with suitable example. **[10]**

Q3) a) Explain with suitable example Backtracking: Principle, control abstraction, time analysis of control abstraction. **[8]**

b) Compare between greedy method and dynamic programming with respect to. **[10]**

i) Feasibility

ii) Optimality

iii) Recursion

iv) Memorization

v) Time complexity

OR

Q4) a) What is Branch and Bound method? Write control abstraction for Leastcost search? **[8]**

b) Consider the sum-of-subset problem, n=4, Sum =13, and w_1=3, w_2= 4, w_3 = 5 and w_4 = 6. Find a solution to the problem using backtracking. Show the state-space tree leading to the solution. **[10]**

Q5) a) Write short notes on the following. **[9]**

i) Aggregate Analysis

ii) Accounting Method

iii) Potential Function method

iv) Tractable and Non-tractable Problems

b) Write notes on the following. **[8]**

i) Approximation algorithm

ii) Randomized algorithm

OR

Q6) a) What is amortized analysis? Explain aggregate and potential function methods used for amortized analysis with respect to stack operations. **[8]**

b) What is potential function method, of amortized analysis? To illustrate potential method, find amortized cost of PUSH. POP and MULTIPOP stack operations. **[9]**

Q7) a) i) Explain an algorithm for Distributed Minimum Spanning Tree.

ii) Write and explain Rabin-Karp algorithm for string matching **[8]**

b) Write and explain pseudo code for multi-threaded merge sort algorithm. How parallel merging gives a significant parallelism advantage over merge Sort? **[9]**

OR

Q8) a) Write short notes on the following: **[9]**

i) Multithreaded matrix multiplication.

ii) Multithreaded merge sort.

iii) Distributed breadth first search.

iv) The Rabin-Karp algorithm.

b) With respect to Multithreaded Algorithms explain Analyzing multi threaded algorithms, Parallel loops, Race conditions. **[8]**

Total No. of Questions : 8]

SEAT No. :

PC-1949

[Total No. of Pages : 2

[6353]-279

T.E. (Computer Science and Design Engineering)

INTERNET OF THINGS

(2021 Pattern) (Semester - I) (318245(A)) (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) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figure to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Illustrate steps of IoT design methodology for weather forecasting systems. **[6]**

b) Explain the use of RFID with the help of suitable IoT Application. **[6]**

c) Classify different connectivity technologies required for IoT system development and explain any one of them in brief. **[6]**

OR

Q2) a) Compare REST-based communication and Web Socket Communication API. **[6]**

b) Classify the four pillars of IOT. **[6]**

c) Explain in detail working of push-pull Communication model with diagram for suitable application. **[6]**

Q3) a) Explain the need of standardization of IoT Protocols. **[6]**

b) Show the merits and demerits between RFID and SCADA protocol. **[6]**

c) Show the use of LoRa protocol in the development of any suitable IoT application. **[5]**

OR

P.T.O.

Q4) a) Illustrate different issues with standardization of loT Protocols. **[6]**

b) Examine that why ZigBee is popular than Wi-Fi and Bluetooth in IoT. **[6]**

c) What is BACnet? Explain the different layers function. **[6]**

Q5) a) Use the knowledge of Cloud computing to demonstrate need of **[6]**

i) Auto Scaling

ii) Xively Cloud for IoT

b) What is KNX? Explain KNX-TP features and its telegram. **[6]**

c) Explain python web application framework- Django. **[5]**

OR

Q6) a) Explain WAMP and its key concepts with diagram. **[6]**

b) Briefly explain Amazon Web Services. **[6]**

c) Write the Auto Bahn installation and setup steps. **[5]**

Q7) a) Show the use of classic pillars of information assurance while securing the IoT application. **[6]**

b) List the possible challenges in designing secure IoT applications. **[6]**

c) List and explain vulnerabilities of IoT. **[5]**

OR

Q8) a) Examine how threat model is useful in securing IoT applications. **[6]**

b) Use security concepts to identify different threats in Smart Parking System. **[6]**

c) Explain Security model for IoT. **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC1950

[Total No. of Pages : 2

[6353]-283

T.E. (Computer Science and Design)
ARTIFICIAL INTELLIGENCE
(2019 Pattern) (Semester-II) (318251)

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) Explain How use of alpha and beta cut - offs will improve performance of minimax algorithm? **[8]**

b) Explain CSP with an example graph coloring problem. **[9]**

OR

Q2) a) Explain Monte Carlo Tree Search with all steps and Demonstrate with one Example. **[8]**

b) How AI technique is used to solve tic - tac - toe problem. **[9]**

Q3) a) Explain syntax and semantics of First Order Logic in detail. **[9]**

b) Explain Wumpus world environment giving its PEAS description. **[9]**

OR

Q4) a) Detail the algorithm for deciding entailment in propositional logic. **[9]**

b) Explain how to express properties of entire collections of objects, instead of enumerating the objects by name using Quantifiers. **[9]**

Q5) a) Use forward - chaining algorithm to solve below problem :

The law says that it is a crime for an American to sell weapons to hostile nations. The country Nono, an enemy of America, has some missiles, and all of its missiles were sold to it by ColonelWest, who is American. Prove that West is a criminal. **[8]**

b) Explain different inference rules in FOL with suitable example. **[9]**

OR

P.T.O.

Q6) a) Explain Unification algorithm using suitable example. **[8]**

b) What is Ontological Engineering, explain in detail with its categories object and Model. **[9]**

OR

Q7) a) Discuss AI and its ethical concerns. Explain limitations of AI. **[9]**

b) Explain AI components and AI architecture. **[9]**

OR

Q8) a) Explain. **[9]**

i) Importance of planning

ii) Algorithm for classical planning

b) Analyse various planning approaches in detail. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC1951

[Total No. of Pages : 2

[6353]-284

T.E. (Computer Science & Design)

WEB TECHNOLOGY AND APPLICATION DESIGN

(2021 Pattern) (Semester - II) (318252)

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) ***Make suitable assumptions if necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Write a Java Servlet Program which will display "Welcome Servlet Message''. **[5]**

b) What is Difference between server side & client side scripting language? **[5]**

c) Write HTML form to read user name & password. This data is sent to the servlet. If the correct user name and password is given then welcome him/her by his/her name otherwise display the message for invalid user. **[8]**

OR

Q2) a) Enlist the steps for connectivity between servlet and database. **[5]**

b) What are the strengths of XML technology? Also enlist the limitations of XML. **[5]**

C) Write a AJAX script to obtain the student information stored in XML document the information should displayed on clicking the button. It should be displayed on tabular form. **[8]**

Q3) a) Write a advantages of JSP over servlet. Also explain the lifecycle of JSP. **[5]**

b) Explain the scripting elements in JSP. **[5]**

c) What is MVC? Draw and Explain MVC architecture for developing web applications. **[7]**

OR

P.T.O.

Q4) a) Write a short note on SOAP. **[5]**

b) Draw and Explain neat diagram which depicts MVC to Struts architectures. **[5]**

c) Write a client server JSP Program to find the simple interest and display the result in the client. **[7]**

Q5) a) Classify the data types of PHP and describe various data types. **[5]**

b) Explain how session and cookies are used for session management in PHP. **[8]**

c) What is associative arrays in PHP? Explain it with help of simple PHP code. **[5]**

OR

Q6) a) Identify and Explain step involved in connecting to MySQL with PHP. **[8]**

b) How does ASP.NET works? Also enlist the features of ASP.NET. **[5]**

c) Explain the lifecycle of ASP.NET application. **[5]**

Q7) a) Explain the scalar types and their operation in RUBY. **[6]**

b) Write a program in Rails for displaying the current date & time. **[6]**

c) Write a RUBY program to add two numbers. **[5]**

OR

Q8) a) Write a RUBY program that sorts the array and searches the desired elements from array. **[8]**

b) Explain how to write a student's class in RUBY program. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC-1952

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[6353] - 285
T.E. (Computer Science and Desing)
Ul/UX Design
(2021 Pattern) (Semester - II) (318253)

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 suitaable data if necessary.***

Q1) a) Explain pillars of design. **[8]**

b) What are golden rules of usability interface. **[5]**

c) How do human factors affect the design process? **[5]**

OR

Q2) a) What is acceptance testing. Explain with example. **[8]**

b) Explain the role of assessment in design process. **[5]**

c) Explain how to do interface design evaluation. **[5]**

Q3) a) What are the characteristics of direct manipulation? Give example. What are the problems with direct manipulation. **[6]**

b) Describe naming and abbreviations. **[6]**

c) Describe form fill-in and dialog boxes. **[5]**

OR

P.T.O.

Q4) a) Explain command-organization functionality. **[6]**

b) What is the use of interaction devices? Explain any five interaction devices. **[6]**

c) Discuss functions of menus, content of menus. **[5]**

Q5) a) Explain screen based controls **[6]**

b) What is a windowing system? What are elements of windowing systems? **[6]**

c) Draw UI of Hotel management system by using selection control. **[6]**

OR

Q6) a) What is implementation support? What are the challenges in design and implementation. **[6]**

b) Draw UI of College management system by using Read-only controls. **[6]**

c) Draw UI of Library management system by using operable control. **[6]**

Q7) a) Explain A/B Testing with example **[6]**

b) Explain Heuristic Evaluation and Cognitive walkthroughs **[6]**

c) Explain web page design, window design with example. **[5]**

OR

Q8) a) Explain Quality of service with the help of example. **[6]**

b) Write short note on balancing function and fashion. **[6]**

c) Elaborate variability in response time with real time example. **[5]**

Total No. of Questions : 8]

SEAT No. :

PC-1953

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T.E. (Computer Science and Design Engineering)

Elective - II : MULTIMEDIA TECHNIQUES

(2021 Pattern) (Semester - II) (318254 - 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) ***Mobile phones and programmable calculators are stricly prohibited***
3) ***Assume Suitable data whenever required.***

Q1) a) Explain how a CRT display works and its role in analog video technology? **[9]**

b) Explain the advantages of HDTV in terms of image clarity and detail? **[9]**

OR

Q2) a) What is UHDTV, and how does it differ from HDTV? **[9]**

b) Explain the role of HDMI in digital video transmission? **[9]**

Q3) a) Explain the differences between graphics, images, and videos in multimedia content? **[9]**

b) Why is compression necessary for multimedia data? **[9]**

OR

Q4) a) Explain Differential Binary Coding (DBC) and Arithmetic Coding(AC) ? **[9]**

b) Explain the main components and processes involved in JPEG compression? **[9]**

Q5) a) Discuss the key requirements for implementing Augmented Reality (AR) applications? **[9]**

b) Describe the various input devices used in virtual and augmented reality systems, such as controllers, motion trackers, and motion capture technologies? **[8]**

P.T.O.

OR

Q6) a) Explain the concept of VRML (Virtual Reality Modelling Language) and its role in modelling object and virtual environments? **[9]**

b) Outline some best practices for designing and developing VR, AR, and MR applications? **[8]**

Q7) a) Describe the Multi-Agent Based architecture for Multimedia IoT (M-IoT)? **[9]**

b) Describe the components and functionalities of an M-IoT system used for road management? **[8]**

OR

Q8) a) Discuss the types of sensors and devices used in health monitoring IoT system? **[9]**

b) Discuss the Big Data Layered architecture used in Multimedia IoT applications? **[8]**

Total No. of Questions : 8]

SEAT No. : [ ]

PC-1954

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[6353]-287

T.E. (Computer Science and Design)

Augmented and Virtual Reality

(2021 Pattern) (Semester - II) (318254 B) (Elective - II)

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 difference between Aural & Haptic Representation in virtual reality. **[6]**

b) Explain the concept of Visual representation in Virtual Reality. **[6]**

c) Explain in brief Visual Rendering Methods. **[6]**

OR

Q2) a) Explain in brief Haptic Rendering Methods. **[6]**

b) List & Explain Computer Graphics System Requirement. **[6]**

c) How Visual Rendering system is different from Aural rendering system. **[6]**

Q3) a) List & Explain the rules of Virtual World. **[6]**

b) What do you mean by Collaborative Interaction explain in details? **[6]**

c) What are the side effects of using VR? **[6]**

OR

Q4) a) Which are the properties of Manipulation & Explain in brief Manipulation Operetions? **[6]**

b) How we can interact with Virtual World explain with example. **[6]**

c) Explain Interative design of any VR game. **[6]**

P.T.O.

Q5) a) Discuss in detail the use of Augmented Reality in entertainment field. **[5]**

b) Differentiate between virtual reality and augmented reality. **[6]**

c) Discuss in detail the use of Augmented Reality in military. **[6]**

OR

Q6) a) Explain the different applications of mixed reality. **[5]**

b) Write a short note on: **[6]**

i) Augmented Reality Hardware.

ii) Ingredients of an AR experience.

c) What are input and output in Mixed Reality?

Q7) a) What is the use of google maps AR navigation explain in details. **[6]**

b) Explain in brief Software Components in Augmented reality. **[6]**

c) Explain marker based tracking in details. **[5]**

OR

Q8) a) Write a short note on "Software Tools for Content Creation" **[6]**

b) What is the difference between Marker based and marker less tracking? **[6]**

c) Write note on Location based Augmented Reality? **[5]**

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Total No. of Questions : 8]

SEAT No. :

PC-1955

[Total No. of Pages : 2

[6353]-288

T.E. (Computer Science and Design)

CLOUD COMPUTING

(2021 Pattern) (Semester - II) (318254C) (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 indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) a) What is virtualization? Explain Virtualization in the Grid and Virtualization in the Cloud. **[9]**

b) Explain - **[8]**

i) CPU Virtualization

ii) Network and Storage Virtualization

OR

Q2) a) What is the need of Virtualization? Differentiate between Full Virtualization and Para Virtualization. **[9]**

b) Explain - **[8]**

i) Virtual Clustering

ii) Virtual Infrastructure

Q3) a) Explain in detail-Open Stack Architecture and its Components. **[9]**

b) Explain - **[8]**

i) Amazon Storage System

ii) Amazon Database Services (Dynamo DB)

P.T.O.

OR

Q4) a) Explain - **[8]**

i) Microsoft Azure core concepts and

ii) SQL Azure

b) Explain - **[9]**

i) Amazon Simple DB

ii) Elastic Cloud Computing (EC2)

Q5) a) What is Risk Management in Cloud Computing? What are the different types of risks in cloud computing? **[9]**

b) How to provide security to data in the cloud? What is Content-Level Security? **[9]**

OR

Q6) a) What are the Security Authentication Challenges in the Cloud? **[9]**

b) Explain in detail - Secure Cloud Software Testing. What are the secure cloud software requirements? **[9]**

Q7) a) What are future trends in cloud computing? Explain with examples. **[9]**

b) Explain in detail - **[9]**

i) Comet Cloud

ii) Mobile Cloud

OR

Q8) a) What is **[9]**

i) IPTV

ii) Energy Aware Cloud Computing?

b) Explain in detail - Containers, Dockers and Kubernetes. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC-1956

[Total No. of Pages : 2

[6353]-289
T.E. (Computer Science and Design Engg.)
BUSINESS INTELLIGENCE AND DATA ANALYTICS
(2021 Pattern) (Semester - II) (318254D) (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.***

Q1) a) ExplainList and Crosstabs reports in detail. **[6]**

b) Explain the filtering of reports in detail. **[6]**

c) Explain in detail drill up and drill down operations. **[5]**

OR

Q2) a) Write short note on output forms : PDF,XML,CSV **[6]**

b) Write short note on Conditional formatting of reports. **[6]**

c) How to build dimensional data models **[5]**

Q3) a) Explain data reduction in detail with example. **[7]**

b) Difference between Univariate, Bivariate, Multivariate analysis. **[5]**

c) Write a short note on data discretization. **[5]**

OR

Q4) a) Explain Data exploration in detail with example. **[7]**

b) Explain Data transformation in detail with example. **[5]**

c) Write short note on Data Validation. **[5]**

Q5) a) Explain Association rule and its types. **[5]**

b) Write a short note on Classification. **[5]**

c) Write the steps of Apriori Algorithm to find frequent item set in details with example. **[8]**

OR

P.T.O.

Q6) a) Explain Bayes theorem in detail. **[5]**

b) Difference between Classification and Clustering. **[5]**

c) Explain Logistic regression in detail with example. **[8]**

Q7) a) Explain Role of BI in Finance and marketing. **[6]**

b) Explain BI application in Logistics and Production. **[6]**

c) Explain applications of BI in telecommunication and banking. **[6]**

OR

Q8) a) Explain BI application in CRM. **[6]**

b) Explain Roles ofAnalytical tools in BI. **[6]**

c) Explain role of BI in ERP. **[6]**

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Total No. of Questions : 8]

SEAT No. :

PC-5122

[Total No. of Pages : 2

[6353]-290
T.E. (Honours 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) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Make suitable assumptions whenever necessary.***

Q1) a) What are the different types of data? Explain Categorical and Numerical data with examples. **[9]**

b) What is data visualization? Explain Line,Scatter, and Box plots with examples. **[9]**

OR

Q2) a) Consider the following dataset: 10,12,15,18,20. Calculate the Mean,Median, and Mode. **[9]**

b) Write a short note on: **[9]**

i) Mean,Median, and Mode

ii) Standard Deviation

Q3) a) What is the Hypothesis Concept? Explain the null hypothesis and alternative hypothesis with an example. **[9]**

b) Describe the distribution of a sample mean. What are the key assumptions for this distribution? **[8]**

OR

Q4) a) What are Cross-Validation Techniques? Explain K-fold, LOOCV, and Stratified K-fold. **[9]**

b) What is normalization? Explain Feature Sealing and Min-Max scaling with examples. **[8]**

P.T.O.

Q5) a) What is the Bias-Variance Tradeoff in machine learning? Explain its significance in model performance. **[9]**

b) Define and explain the following dimensionality reduction techniques. **[9]**

i) Principal Component Analysis (PCA)

ii) Linear Discriminant Analysis (LDA)

iii) Features Selection

iv) Factor Analysis

OR

Q6) a) Define and explain the following regularization techniques used in regression : **[9]**

i) Ridge Regression

ii) Lasso Regression

iii) Elastic Net

iv) Regularization Parameter (Lambda)

b) What is Feature Selection? Explain Chi 2 square method for feature selection. **[9]**

Q7) a) What is Linear Regression? Explain the concept of Correlation Coefficient and Rank Correlation. **[9]**

b) What is Logistic Regression? Describe its use in binary classification problems and explain how the logistic function (sigmoid) is applied. **[8]**

OR

Q8) a) What is the Monte Carlo Method? Explain its use in statistical simulations and provide an example of its application in a real-world problem. **[9]**

b) Define Bayes' Theorem and describe its significance in updating the probability of an event based on new evidence. Provide a real-life example where Bayes' Theorem is used. **[8]**

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Total No. of Questions : 8] **SEAT No. :**

PC-1957 **[Total No. of Pages :2**

[6353]-291

T.E. (Cyber Security Honors Course)

INFORMATION AND CYBER SECURITY

(2019 Pattern) (310401) (Semester - I)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of Scientific Calculator is permitted.***

Q1) a) Explain in detail Diffie-Hellman. Discuss the vulnerability of the Diffie-Heilman key exchange algorithm. **[8]**

b) Explain the key steps involved in solving a system of modular congruences using the Chinese Remainder Theorem. How does the choice of pairwise coprime moduli contribute to its effectiveness? **[9]**

OR

Q2) a) Describe the role of the public key and private key in the RSA algorithm. How do they work together to enable secure communication? **[8]**

b) Explore the advantages of Elliptic Curve Cryptography over traditional public-key cryptosystems, such as RSA. How does ECC provide equivalent security with shorter key lengths? **[9]**

Q3) a) What is cybercrime and what are different types of cybercrimes explain in detail with examples? **[9]**

b) Explain Social engineering with example? Explain social effects of Cyber Stalking? **[9]**

OR

Q4) a) Outline the procedural steps involved in identifying and assessing risks as part of the information security risk management process? **[9]**

b) Categorize the various types of laws, and provide a clear distinction between the concepts of law and ethics? **[9]**

P.T.O.

Q5) a) Illustrate the components of SSL with a clear diagram, and elucidate the distinctions between an SSL connection and an SSL session? **[8]**

b) What functionalities does IPSec offer, and what are the contrasting characteristics between Transport mode and Tunnel mode within IPSec? **[9]**

OR

Q6) a) What is the role of X.509 in cryptography? How does X.509 contribute to the field of cryptography and what role does it play in ensuring secure communication? **[8]**

b) What is email security and why it is necessary? Explain any one algorithm used for email security **[9]**

Q7) a) Explain phishing attack, including an illustrative example and outline the various types of phishing strategies? **[9]**

b) Define computer worms and viruses, explain the mechanisms through which computer viruses spread, and outline effective strategies for safeguarding against these cybersecurity threats? **[9]**

OR

Q8) a) Provide a brief overview of Intrusion Detection Systems (IDS), covering their types, along with a discussion on the limitations and challenges associated with these systems? **[9]**

b) What is Malware? Enlist different types of malware. What precaution needs to protect from malware. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1958

[Total No. of Pages : 2

[6353] - 292
T.E. (Computer Engg.) (Honors)
DATA SCIENCE AND VISUALIZATION
(2019 Pattern) (Semester - I) (310501)

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) State and explain how Naïve bays Theorem is used to solve classification problems. **[6]**

b) What is the difference between regression and classification? Explain with example. **[6]**

c) Write a note on (Any 3) **[6]**

i) Partitioning Clustering

ii) Density-Based Clustering

iii) Distribution Model-Based Clustering

iv) Hierarchical Clustering

OR

Q2) a) What is clustering? explain K-means clustering algorithm. **[6]**

b) Explain how simple linear regression is used for house prize prediction. (Assume the suitable dataset). **[6]**

c) Briefly explain evaluation of association rules. **[6]**

P.T.O.

Q3) a) Write a note on the following **[9]**

i) Gini Index

ii) Information gain

iii) Entropy

b) What is a neuron? Explain the architecture of artificial neurons. **[8]**

OR

Q4) a) What is a decision tree? What are the advantages and disadvantages of a decision tree? **[9]**

b) What is a feedforward neural network? Explain with suitable example.**[8]**

Q5) a) What are the challenges related to data visualization? **[6]**

b) Explain dashboard design principles **[6]**

c) What are the advance data visualization techniques? Explain any 2. **[6]**

OR

Q6) a) Write a note on 'Display media for dashboard'. **[9]**

b) Explain where and how bar-graphs, Scatterplots and histograms can be used to visualize the data. **[9]**

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? Enlist and explain.**[6]**

b) Explain multidimensional data model with one example. **[6]**

c) What do you mean by Principal Component Analysis? Explain with example. **[5]**

Total No. of Questions : 8] **SEAT No. :**

PC-1959 **[Total No. of Pages :2**

[6353]-293

T.E. (Honors)

COMPUTER ENGINEERING

Embedded System and Internet of Things

(2019 Pattern) (310601) (Semester - I)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of non-programmable Scientific Calculator is allowed.***

Q1) 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) What is the need of interfacing of sensors with development boards? How is it done? **[5]**

OR

Q2) 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) 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) What are the testing and deployment requirements of embedded systems applications? **[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) Explain SDLC-Requirements of embedded systems application. **[6]**

P.T.O.

Q5) a) With the help of neat diagram, explain technical building blocks of IoT. **[6]**

b) Write a brief note on communication models of IoT and Communication APIs. **[6]**

c) Explain IoT functional blocks in detail. **[6]**

OR

Q6) a) Define Internet of Things (IoT). Enlist and explain its characteristics. **[6]**

b) Draw and distinguish between physical design and logical design of IoT. **[6]**

c) Enlist and explain issues and challenges of IoT. **[6]**

Q7) a) Explain the usability of MQTT protocol for IoT applications. Comment on the QoS supported in MQTT. **[6]**

b) Write a short note on AMQP protocol for IoT. **[6]**

c) Write a short note on "Zigbee" protocol. **[6]**

OR

Q8) a) What is CoAP? How it is suitable for IoT applications? Discuss in detail. **[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]**

Total No. of Questions : 6]

SEAT No. : ____

PC-1960

[Total No. of Pages : 2

[6353] - 294
T.E. (Computer Engg.) (Honors)
VIRTUAL REALITY
(2019 Pattern) (Semester - I) (310701)

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***

Q1) a) Explain in detail different geometric models? **[9]**

b) What is Orthographic projection and Perspective projection **[8]**

OR

Q2) a) What are axis angle representations of rotation? **[9]**

b) Explain different type of eye movements. **[8]**

Q3) a) Explain Rasterization in detail? **[6]**

b) Explain the structure of Human Eye? **[6]**

c) How to improve latency? **[6]**

OR

Q4) a) What is Visual Perception, Explain perception of Depth, Motion and Color? **[6]**

b) Explain the different ways to correct optical distortions? **[6]**

c) How to improve frame rates in Visual Perception? **[6]**

P.T.O.

Q5) a) Explain motion in Real and virtual world. **[5]**

b) Define velocities and acceleration? **[4]**

c) Explain Vestibular System in detail? **[8]**

OR

Q6) a) Explain Tracking position and orientation? **[7]**

b) Explain the difference between tracking 2D and 3D orientation? **[10]**

Q7) a) Explain Locomotion and Manipulation for interaction mechanism of VR. **[6]**

b) Explain the Auditory perception in detail? **[6]**

c) What is Auditory rendering? **[6]**

OR

Q8) a) Explain the physiology of human hearing. **[6]**

b) Explain the interaction with Motor programs and remapping of audio? **[12]**

Total No. of Questions : 8]

SEAT No. :

PC-1961

[Total No. of Pages : 2

[6353]-295

T.E. (Mechanical Engineering) (HONORS)

302041 MJ: FOUNDATIONS OF SYSTEMS AND SYSTEM 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.7or 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) Provide a comprehensive overview of systems science, including its philosophical underpinnings and major theories. Discuss how systems science contributes to understanding complex systems. **[9]**

b) Define open systems and discuss their characteristics. Explain the importance of open systems in the context of systems science and engineering. **[9]**

OR

Q2) a) Describe the system life cycle process, including its phases and activities. Discuss how systems engineering concepts such as System of Interest, Enabling System, and System Interfaces are integrated into the system life cycle. **[9]**

b) Define systems science and provide examples demonstrating its interaction with the general systems approach, system thinking, and engineered systems. **[9]**

Q3) a) Explain the concept of systems architecture and discuss the importance of architecture frameworks. Provide examples of commonly used architecture frameworks and their application in system design. **[9]**

b) Provide a concise explanation of the trade-offs involved in system architecture. **[8]**

P.T.O.

OR

Q4) a) Explain the process of architecture development, including traceability and validation. Discuss why architecture validation is necessary and how it ensures the quality and effectiveness of system designs. **[8]**

b) Describe two different architectural types from the list provided in part. **[9]**

Q5) a) Trace the evolution of Model-Based Systems Engineering (MBSE) and discuss its underlying principles. Explain how MBSE differs from traditional systems engineering approaches. **[9]**

b) Briefly discuss Modelling, Simulation, and Trade-off analysis. **[9]**

OR

Q6) a) Detail the development of Model-Based Systems Engineering (MBSE). **[9]**

b) Provide guidelines for interpreting simple SysML models. Discuss how SysML models capture system requirements, functions, and behaviors. **[9]**

Q7) a) Explain the role of simulation modeling throughout the Systems Engineering (SE) lifecycle. Discuss how simulation modeling aids in design, analysis, and validation of complex systems. **[8]**

b) Provide concise comments on quantitative modeling. **[9]**

OR

Q8) a) Introduce discrete event simulation and system dynamics as modeling paradigms in systems engineering. Explain the prnciples and applications of each paradigm, highlighting their strengths and limitations. **[8]**

b) Explain the role of modeling in decision-making processes. **[9]**

Total No. of Questions : 8]

SEAT No. :

PC-1962

[Total No. of Pages : 2

[6353] - 296
T.E. (Mechanical) (Honors)
ENERGY MANAGEMENT
(2019 Pattern) (Semester - I) (302021MJ)

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 drawn wherever necessary***
3) ***Figures to the right-indicate full marks***
4) ***Assume suitable data, if necessary***

Q1) a) Discuss different schemes of BEE under Energy Conservation Act-2001. **[10]**

b) Explain the concept of Net Zero Energy Building(NZEB) **[8]**

OR

Q2) a) Explain the main features of Electricity act-2003 **[10]**

b) How do an Industry, Nation and Globe would benefit from energy efficiency programs? **[8]**

Q3) a) Define the energy audit. Explain Preliminary energy audit and its importance. **[10]**

b) Define energy management and explain its objectives **[7]**

OR

P.T.O.

Q4) a) List the different instruments used for energy audit and explain following instruments **[10]**

i) Flue gas analyzer

ii) Ultrasonic flow meter.

b) Discuss energy audit report format. **[7]**

Q5) a) What is the NPV of a project (Life 2 years) which require an investment of Rs.80000 and yield Rs. 60000 in the first year and Rs.60000 in the next year, if the interest rate 10%. Comment on this investment whether it is worth or not. **[10]**

b) Explain ROI and its advantages and disadvantages. **[8]**

OR

Q6) a) Annual savings after replacement of boiler for three years is Rs. 6,00,000, Rs. 6,50,000, Rs. 6,50,000. Total project cost is Rs 14.5 lakh. Considering cost of capital as 10%, what is the net present value of the proposal?**[10]**

b) Explain Simple payback period with its advantages and disadvantages **[8]**

Q7) a) Explain Global warming and its impact on enviromnent. **[10]**

b) Explain Clean Development Mechanism (CDM) **[7]**

OR

Q8) a) Discuss International agreements about Environment and climate change **[10]**

b) Discuss on energy and environment. **[7]**

Total No. of Questions : 8]

SEAT No. :

PC1963

[Total No. of Pages : 2

[6353]-297

T.E. (Mechanical/Automobile)
HONORS IN ELECTRIC VEHICLES
e-Vehicle Technology
(2019 Pattern) (Semester-I) (302031 MJ)

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 sketches wherever necessary.***

Q1) a) Write a short note on li-ion battery with its working principle? **[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

Q4) a) Explain Nickel-Metal Hydride Batteries with advantages, disadvantages and applications. **[8]**

b) Explain Li-ion supercapaciter with advantages, disadvantages and applications. **[8]**

P.T.O.

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]**

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Total No. of Questions : 8]

SEAT No. : [ ]

PC1964

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[6353]-298

T.E. (Mechanical)

HONORS IN 3D PRINTING

Additive Manufacturing Technology

(2019 Pattern) (Semester - I) (302011MJ)

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) Explain the mechanism of light-based photo-curing and its application in additive manufacturing. **[10]**

b) Differentiate between Stereolithography (SLA) and Digital Light Processing (DLP) technologies. **[7]**

OR

Q2) a) Describe the process and benefits of Direct Laser Writing (DLW) compared to Continuous Liquid Interface Production (CLIP). **[10]**

b) Evaluate the applications of light-based photo-curing technologies in prototyping, manufacturing, and healthcare. **[7]**

Q3) a) Evaluate the benefits and limitations of laser-based melting technologies compared to traditional manufacturing methods. **[10]**

b) Explain the process and mechanism of laser-based melting technologies and their application in additive manufacturing. **[8]**

OR

Q4) a) Analyse the key process parameters in selective laser melting (SLM) and electron-beam melting (EBM) and evaluate their impact on part quality and material properties. **[10]**

b) Explain Direct Metal Laser Sintering with neat diagram? **[8]**

P.T.O.

Q5) a) Explain the process and mechanism of inkjet-based deposition? **[10]**

b) Differentiate between energy deposition techniques such as Plasma Deposition and Electron Beam-based. **[7]**

OR

Q6) a) Analyse the key process parameters in binder jetting and multi-jet fusion (MJF) and evaluate their impact on part quality. **[10]**

b) Evaluate the benefits and limitations of inkjet-based deposition and fusion technologies compared to traditional manufacturing methods. **[7]**

Q7) a) Describe the process of bio-printing and its applications in tissue engineering and organ regeneration. **[10]**

b) Analyse the benefits and challenges of implementing additive manufacturing in the defence and electronics industries. **[8]**

OR

Q8) a) Explain how additive manufacturing is transforming prominent industries such as aerospace, automotive, and healthcare. **[10]**

b) Differentiate between 4D and 5 D printing technologies. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC1965

[Total No. of Pages : 2

[6353]-299

T.E. (Honors in Robotics)

PRINCIPLES OF ROBOTICS -I

(2019 Pattern) (Semester-I) (304181 HR)

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) ***Assume suitable data if necessary.***
3) ***Draw neat sketches wherever necessary.***

Q1) a) Explain working, principle and advantages of vaccum grippers. **[9]**

b) State the Characteristics of grippers. **[9]**

OR

Q2) a) Explain working and principle of Magnetic gripper. **[9]**

b) Classify grippers based on various criterias. **[9]**

Q3) a) Classify sensors based on working principle. **[8]**

b) Explain working principle and construction of capacitive sensors. **[9]**

OR

Q4) a) Sketch and explain LVDT. **[9]**

b) Explain working principle & construction of optical proximity sensors. **[8]**

Q5) a) Enlist steps in forward kinematic Analysis. **[9]**

b) Explain with neat sketch D-H. parameter. **[9]**

OR

P.T.O.

Q6) a) State properties of generalised composite matrix. **[9]**

b) A 2 DOF planer RR manipulator has L1 = 120 mm and L2 =75mm. Determine joint angles using Geometric approach, so that face end is located at (100, 70). **[9]**

Q7) a) Explain Functional safety applications in Robotics. **[8]**

b) Explain various levels of Image processings. **[9]**

OR

Q8) a) Explain various applications of Robotics in Industry. **[8]**

b) Write short note on following: (Any Two) **[9]**

i) Pick & Place Robots

ii) Home automation

iii) Hospital & patient cases

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Total No. of Questions : 8]

SEAT No. :

PC1966

[Total No. of Pages : 2

[6353]-300

T.E. (Electronics and Telecommunication)
HONORS IN BLOCK CHAIN TECHNOLOGY
Introduction to Block Chain
(2019 Pattern) (Semester-I) (304181 HBCT)

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 indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain the consensus Mechanism in blockchain technology. **[6]**

b) Give the advantages and disadvantages in blockchain technology. **[6]**

c) What is public blockchain? Explain in detail. **[5]**

OR

Q2) a) What is Permissioned blockchain? Explain. **[6]**

b) Give the benefits of blockchain technology & explain "How the tighter security is provided in blockchain". **[6]**

c) Explain Peer-to-Peer Networks (P2P) as a core component in blockchain. **[5]**

Q3) a) What are the major components in Hyper ledger Fabric? List and explain. **[6]**

b) What are layers in the Hyperledger based technology? Explain. **[6]**

c) Explain anyone prominent application of blockchain in detail. **[5]**

OR

Q4) a) How Hyper ledger Fabric works? Explain in detail. **[6]**

b) Explain distributed ledger in blockchain technology in detail. **[6]**

c) Explain the bitcoin technology and how it works? **[5]**

P.T.O.

Q5) a) What is Geth? Explain in detail. **[6]**

b) Explain the working of Ripple in blockchain technology. **[6]**

c) What is blockchain API? How to integrate blockchain API's in a website? **[6]**

OR

Q6) a) What is Stellar? How does Stellar work? **[6]**

b) Explain R3 Corda in blockchain technology. **[6]**

c) What is the Sandbox in blockchain? Explain. **[6]**

Q7) a) How the blockchain is used in Renewable energy? Explain. **[6]**

b) Explain the importance of blockchain in Real Estate. **[6]**

c) What are the problems with the current Remittance channels? How the blockchain Remittance solve the issues of current Remittance channels? **[6]**

OR

Q8) a) Explain the use of blockchain in election and voting system. **[6]**

b) List and explain the challenges of blockchain in supply chain management. **[6]**

c) What is the "Loyalty Rewards programs"? List the benefits of "Loyalty Rewards programs". **[6]**

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Total No. of Questions : 8]

SEAT No. : [ ]

PC1967

[Total No. of Pages : 2

[6353]-301

T.E. (Civil Engineering)

HONORS IN METRO CONSTRUCTION

Surveying in Metro Construction

(2019 Pattern) (Semester - I) (301301)

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) What is the importance of good alignment in metro railway lines. **[9]**

b) Write a short note on construction of new lines of metro railways. **[9]**

OR

Q2) a) Write a short note on Final Location Survey. **[9]**

b) Explain the traffic survey for metro construction. **[9]**

Q3) a) What are the various forces acting on the track? Explain. **[8]**

b) Explain the requirements of a good track. **[9]**

OR

Q4) a) How the maintenance of permanent way is done, explain. **[8]**

b) How the track performs as an elastic structure? Explain. **[9]**

Q5) a) Write a short note on facilities required at a Metro Railway Stations. **[9]**

b) Explain the purpose of a metro railway station. **[9]**

OR

P.T.O.

Q6) a) Write a short note on metro railway stations and yards. **[9]**

b) What are the different classification of metro railway stations. **[9]**

Q7) a) Write a short note on the size and shape of tunnel. **[8]**

b) Explain tunnel lining in details. **[9]**

OR

Q8) a) Write a short note on lighting of Tunnels. **[8]**

b) Write a short note on shaft of tunnel. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PC1968

[Total No. of Pages : 2

[6353]-302

T.E. (Civil)

HONORS IN 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 figures must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Use of non programmable scientific calculator is allowed.***

Q1) a) Write a note on following: **[12]**

i) Housing and Urban Development Corporation Limited (HUDCO)

ii) National Housing Bank

b) What are the advantages of Housing Finance Institutions (HFIs)? Write down the name of any four HFIs in India. **[5]**

OR

Q2) a) Write a note on "National Housing Policy". **[6]**

b) Write a note on "Rural Housing Finance". **[6]**

c) Write a note on "Co-operative Housing". **[5]**

Q3) a) Enlist the different infrastructural facilities required in urban areas and explain the significance of recreational facilities. **[6]**

b) Write a note on "Financial aspect of sewage and sewerage treatment system". **[6]**

c) Enlist the different distribution services in urban area and also write down it's impact on urban lifestyle if those services are not provided as per the government rules. **[5]**

OR

Q4) a) Enlist the data required for provision and planning of urban infrastructure. Also explain the significance of infrastructure facilities. **[6]**

b) Write a note on requirement of area as per URDPFI guidelines for **[6]**

i) educational facilities and

ii) healthcare facilities.

c) Enlist different socio cultural facilities in urban areas and explain any one in detail. **[5]**

P.T.O.

Q5) a) Write down the classification of networks and services system in urban area. Also write down the significance of each system. **[6]**

b) Explain in brief the different components of storm water drains. **[6]**

c) Enlist various types of collection systems of sewage and sewerage treatment plant and explain any one in detail. **[6]**

OR

Q6) a) Write a note on "seven step approach for developing a Municipal Solid Waste Management Plan". **[6]**

b) Explain in brief the different components of water supply system. **[6]**

c) Explain in detail, the data required for design of storm water drain. **[6]**

Q7) Write a note on following: **[18]**

a) Norms for higher education facilities

b) Norms for healthcare facilities

c) Norms for fire fighting

OR

Q8) a) Enlist any four sewage treatment technologies and recommended design period for sewage treatment system components. **[6]**

b) Write a note on "National Water Policy 2012". **[6]**

c) Enlist two categories of open space and its norms as per URDPFI guidelines. **[6]**

■■■■

Total No. of Questions : 8]

SEAT No. : ____

PC1969

[Total No. of Pages : 2

[6353]-303

T.E. (Printing)

HONORS IN ADVANCED PACKAGING TECHNOLOGY

Internet of Things

(2019 Pattern) (Semester - I) (308211)

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.***

Q1) a) Define sensors and Explain the working of any two types of sensors used in IoT application. **[9]**

b) Explain the LED interfacing using Arduino Board. **[9]**

OR

Q2) a) Define Actuator and Explain the working of any two types of actuator used in IoT application. **[9]**

b) Explain the servo-motor interfacing using Arduino Board. **[9]**

Q3) a) Explain the Wi-Fi Communication system and explain the FHSS and DSSS technique used in WiFi. **[8]**

b) Explain the pinouts of ESP8266. **[9]**

OR

Q4) a) Explain what is web-server and mention the steps to be taken for posting the sensor data to the web-server. **[8]**

b) Explain the following instructions: **[9]**

i) pinMode(LED_BUILTIN, OUTPUT);
ii) noTone(0)
iii) Serial.println(”hello world”)
iv) digitalWrite(trigPin, LOW)
v) Serial.println(distance)
vi) delay(50)
vii) serial begin (9600)
viii) int led3Pin = 5
ix) digitalWrite(led3Pin, HIGH)

P.T.O.

Q5) Describe the services and explain SaaS and PaaS in detail. **[18]**

OR

Q6) Describe the issues and challenges in IoT. **[18]**

Q7) Describe in detail about the industrial IoT and its applications. **[17]**

OR

Q8) Explain implementation of IoT in Printing industry. **[17]**

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Total No. of Questions : 8]

SEAT No. :

PC4850

[Total No. of Pages : 2

[6353]-304

T.E. (Artificial Intelligence and Machine Learning)
HONORS IN ARTIFICIAL INTELLIGENCE
(2019 Pattern) (Semester - II) (310303)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer four questions Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data if necessary.***

Q1) a) Explain Bayesian inference using a suitable example. **[9]**

b) Explain Unification algorithm with suitable example. **[8]**

OR

Q2) a) Represent the following sentences into formulas in predicate logic. **[9]**

i) Apples are food.

ii) Chicken are food.

iii) John likes all kinds of food.

iv) Sue eats everything Bill eats.

v) Anything anyone eats and isn't killed by is food.

vi) Bill eats peanuts and is still alive.

b) Explain in detail Hidden Markov model with Example. **[8]**

Q3) a) Explain how Support vector Machines are used for classification with suitable example. Also explain a real life problem that can be solved using SVM. **[9]**

b) What is decision tree? Explain how decision tree algorithm can be used in learning? **[8]**

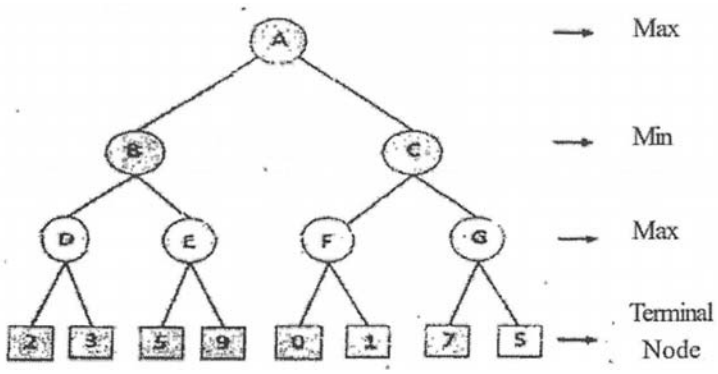
OR

Q4) a) What is reinforcement learning? Explain how reinforcement learning can be applied for autonomous driving. **[9]**

b) With the help of an architecture diagram explain multilayer feed forward artificial neural network. **[8]**

P.T.O.

Q5) a) Solve the given game tree using min max algorithm **[9]**



b) Explain Games and Differentiate between Stochastic Games and Partial games with Example. **[9]**

OR

Q6) a) Explain Alpha-Beta Pruning with an example. What is the need of Alpha-Beta Pruning? **[9]**

b) Write a note on: **[9]**

i) Mini-Max search for the tic-tac-toe game

ii) State-of-the-art Game Programs

Q7) a) Explain computer vision as an expert system application with example of CV framework. **[9]**

b) Explain with example - Text Processing in Natural Language Processing.**[9]**

OR

Q8) a) Explain backward chaining algorithm for first order knowledge base.**[9]**

b) What is NLP? Explain all five phases of NLP. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC1970

[Total No. of Pages : 2

[6353]-305

T.E. (Honors in Cyber Security)

ENTERPRISE ARCHITECTURE AND COMPONENTS

(2019 Pattern) (Semester - II) (310403)

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.7or Q.8.***
2) ***Figures to the right indicates full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data, if necessary.***

Q1) a) List the primary elements depicted in a component relationship diagram. **[6]**

b) Explain the significance of the component model in software architecture. **[5]**

c) Identify the key elements found in a component interaction diagram. **[6]**

OR

Q2) a) Describe how component relationship diagrams help in understanding system architecture. Provide an example to support your explanation. **[9]**

b) Design a component interaction diagram for a real-time messaging application and explain your design choices. **[8]**

Q3) a) Define 'operational model' in the context of software engineering. **[6]**

b) Explain the importance of understanding operational model design techniques in software development. **[6]**

c) List three service qualities relevant to operational models. **[6]**

OR

Q4) a) Define the term 'operational pattern' and discuss its relationship with operational models. Provide examples to illustrate your explanation. **[9]**

b) Discuss the advantages and disadvantages of various operational model design techniques in different project contexts. Use specific scenarios to illustrate your points. **[9]**

P.T.O.

Q5) a) Define "metadata" and "master data" in the context of data management. Explain the importance of clear terminology in data-related projects. **[6]**

b) Identify and discuss service qualities crucial for effective metadata management. Explain how these qualities contribute to the success of metadata management initiatives. **[6]**

c) Provide definitions for 'business scenario' and 'component deep dive' in the context of software engineering. Explain how these terms are relevant to system design and development. **[5]**

OR

Q6) a) Describe a business scenario where effective metadata management is critical. Explain how proper metadata management practices can benefit the scenario. **[9]**

b) Describe three service qualities crucial for master data management systems. Explain how these qualities contribute to the reliability and consistency of master data across the organization. **[8]**

Q7) a) Explain the key principles and objectives of SABSA, COBIT, and TOGAF frameworks. Discuss the relationships between these frameworks and how they complement each other in enterprise architecture. **[9]**

b) Explain how CMMI can be used to monitor, measure and report the progress of architecture development activities within an organization. Discuss the key process areas and metrics relevant to this task. **[9]**

OR

Q8) a) Provide a real-life example of an organization that has successfully implemented SABSA, COBIT, and TOGAF frameworks in its enterprise architecture. Discuss the benefits achieved and challenges encountered during the implementation process. **[9]**

b) Outline the steps involved in using SABSA, COBIT, and TOGAF to develop an enterprise security architecture. Discuss the specific contributions of each framework in the process. **[9]**

Total No. of Questions : 8]

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PC1971

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T.E. (Computer Engineering)

HONORS IN DATA SCIENCE

Statistics and Machine Learning

(2019 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.7or Q.8.***
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 linear equation? What are the different methods 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) Write a short note on: **[9]**

i) Partial derivative

ii) Multivariate calculus

b) What is the significance of chain rule in calculus? Explain chain rule with suitable Example. **[9]**

Q3) a) Draw and Explain Reinforcement Learning. Explain how does it work.**[9]**

b) Difference between supervised and unsupervised learning. **[8]**

OR

Q4) a) What are the different types of machine learning? **[9]**

b) What are the Applications, Perspective and Issues in Machine Learning.**[8]**

Q5) a) What is the role of cross-validation in evaluating a regression model?**[9]**

b) Explain the process of training a regression model using a dataset. **[9]**

OR

P.T.O.

Q6) a) What do you mean by a linear regression? Which applications are best modeled by linear regression? **[6]**

b) Write a short note on: Simple Regression. **[6]**

c) Explain following Terms **[6]**

i) Cost function

ii) Gradient descent with respect to Multivariable regression

Q7) a) Define Bayes Theorem. Elaborate Naive Bayes Classifier working with example. **[9]**

b) Explain with example hypothesis space search in decision tree learning.**[8]**

OR

Q8) a) How to construct Decision trees? Write a short note on Classification of decision tress. **[8]**

b) Write short notes on: **[9]**

i) Bernoulli naive Bayes.

ii) Multinomial naive Bayes.

iii) Gaussian naive Bayes

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Total No. of Questions : 8]

SEAT No. : [ ]

PC1972

[Total No. of Pages : 2

[6353]-307

T.E. (Computer Engineering)

HONORS IN INTERNET OF THINGS

Internet of Things Architecture, Protocols and Systems Programming

(2019 Pattern) (Semester - II) (310603)

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) Explain TCP and UDP Protocols in detail? **[6]**

b) Explain HTTP and MQTT in detail. **[6]**

c) What are the responsibilities of transport layer in IoT? **[5]**

OR

Q2) a) Explain DCCP and SCTP protocol in detail. **[6]**

b) Explain CoAP protocol architecture. **[6]**

c) Explain transport layer security protocol? **[5]**

Q3) a) Explain IoT vulnerabilities and security challenges. **[6]**

b) What are the misuse cases in IoT security? Explain. **[6]**

c) Explain the attacks in different layer of IoT. **[6]**

OR

Q4) a) Describe IoT security model. **[6]**

b) Explain key elements in IoT security. **[6]**

c) Explain IoT Architecture with its layers? **[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 role of IoT for Smart Cities development. **[6]**

b) Describe the role of IoT for Industry. **[6]**

c) Describe the role of IoT for Telecom/5G. **[6]**

OR

Q8) 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 Health and Lifestyle. **[6]**

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Total No. of Questions : 8]

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PC1973

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[6353]-308

T.E. (Computer Engineering)

HONORS IN VIRTUAL REALITY AND AUGMENTED REALITY

Augmented Reality

(2019 Pattern) (Semester - II) (310703)

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.7or 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 Computer Vision? Explain how it is used in Augmented Reality? **[9]**

b) Write a short note on Multiple camera Infrared tracking? **[8]**

OR

Q2) a) Describe the various software components used in AR? **[9]**

b) Explain the marker tracking in AR? **[8]**

Q3) a) What are different types of Markers in AR? Explain the 2D barcode markers? **[6]**

b) Explain the term Localization based augmentation? **[6]**

c) Explain hybrid tracking in details? **[6]**

OR

Q4) a) How to Select market'type? Explain with respect to system requirement. **[6]**

b) Write a note on **[6]**

i) Imperceptible markers

ii) Marker camera pose identification.

c) Explain the term feature based tracking? **[6]**

P.T.O.

Q5) a) Explain AR monitoring system in detail. **[8]**

b) Explain virtual retinal system in detail. **[9]**

OR

Q6) a) Describe Projection display in detail. **[8]**

b) Explain all AR devices with suitable example. **[9]**

Q7) a) Explain the difference between computer vision and mixed reality. **[10]**

b) Define term: Mixed reality and what are input and output in Mixed Reality? **[8]**

OR

Q8) a) Explain the different variants of SLAM in detail. **[10]**

b) Explain the term PTAM in detail. **[8]**

Total No. of Questions : 8]

SEAT No. : [ ]

PC4984

[Total No. of Pages : 2

[6353]-309R

T.E. (Mechanical Engineering)

HONORS IN SYSTEMS ENGINEERING

Model Based Systems Engineering

(2019 Pattern) (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.7or 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 purpose and significance of SysML in Model-Based Systems Engineering (MBSE). Discuss its evolution and key features. **[9]**

b) Differentiate between diagrams and models in SysML. Discuss their roles and how they relate to each other within the modeling process. **[9]**

OR

Q2) a) Explain the principles and methodologies of Object Oriented Systems Engineering (OOSEM). Discuss how OOSEM is applied in MBSE. **[9]**

b) Describe the Vee-Model and Iterative Model frameworks used in Systems Engineering. Discuss their structure and application in System development processes. **[9]**

Q3) a) Explain the methodology used in Model-Based Systems Engineering (MBSE). Discuss its phases and the activities involved in each phase. **[9]**

b) Explain the differences between modeling tools and diagramming tools used in MBSE. Discuss their features and functionalities. **[8]**

OR

P.T.O.

Q4) a) Provide an introduction to the Iterative Model framework. Discuss its iterative nature and how it differs from other process models. **[8]**

b) Discuss the process of requirement and assumption validation in MBSE. Explain its importance in ensuring the quality and reliability of system designs. **[9]**

Q5) a) Provide an overview of the Systems Engineering process. Discuss its phases and the activities involved in each phase. **[9]**

b) Provide an introduction to requirement modeling in Model-Based Systems Engineering (MBSE). Discuss its significance in System development.**[9]**

OR

Q6) a) Explain the concept of process modeling in Systems Engineering. Discuss its importance and how it contributes to system development. **[9]**

b) Discuss how process models are integrated into the system development lifecycle. Explain their role in guiding project management and decision-making. **[9]**

Q7) a) Explain the Approach to Context-based Requirements Engineering (ACRE). Discuss how it helps in capturing and analyzing system requirements. **[8]**

b) Describe the general concept of diagrams in SysML. Discuss how diagrams are used to represent different aspects of system models. **[9]**

OR

Q8) a) Discuss how models are used for requirements analysis in MBSE. Explain the benefits of using models for analyzing and validating system requirements. **[8]**

b) 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. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC1975

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[6353]-310

T.E. (Mechanical)

HONORS IN ENERGY MANAGEMENT IN UTILITY SYSTEMS

Energy Efficiency of Thermal Utilities

(2019 Pattern) (Semester - II) (302023 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.7or 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) What is steam trap? Name two functions of a steam trap? **[5]**

b) Define dry saturated steam and why dry saturated steam is preferred for heating applications. **[5]**

c) Write in detail about "flash steam recovery" from steam condensate. **[8]**

OR

Q2) a) Explain why low-pressure steam is preferred for indirect heating? **[5]**

b) Explain working of mechanical float type trap with neat schematic diagram. **[5]**

c) Discuss various ways for efficient steam utilization. **[8]**

Q3) a) Explain any type of furnace with neat schematic diagram. **[7]**

b) Discuss energy conservation opportunities in furnaces. **[10]**

OR

Q4) a) Explain efficiency of furnace. List out factor on which it depends. **[7]**

b) Explain important properties of Ceramic Fibers used in furnaces. **[10]**

P.T.O.

Q5) a) Explain the concept of cogeneration with a neat sketch. **[8]**

b) Compare "Topping Cycle" and "Bottoming Cycle" with one example each and schematic diagram. **[10]**

OR

Q6) a) Explain Diesel engine cogeneration system with neat schematic sketch? **[8]**

b) Discuss the need of cogeneration. Explain any two cogeneration application with neat schematic diagram. **[10]**

Q7) a) Explain the concept of waste heat recovery with suitable examples. **[5]**

b) Explain the operating principle of a regenerator. **[5]**

c) What are the direct and indirect benefits of waste heat recovery? **[7]**

OR

Q8) a) What is a "heat pipe"? Explain its working principle. **[5]**

b) Write short note on "WHRS". **[5]**

c) What are waste heat recovery boilers? Explain the need and benefits? **[7]**

Total No. of Questions : 8]

SEAT No. : ____

PC1976

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T.E. (Mechanical/Electrical)

HONORS IN ELECTRIC VEHICLES

E - Vehicle System Design

(2019 Pattern) (Semester - II) (302033MJ)

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 jf necessary.***

Q1) a) Explain with neat diagram topology of tyres design and its different component. **[8]**

b) Explain Topology design of wheels. **[9]**

OR

Q2) a) Explain elements of vehicle dynamics system. **[8]**

b) Explain vehicle and body centre of gravity for movement design of e- vehicles. **[9]**

Q3) a) Explain Powertrain in e-vehicle. **[8]**

b) Explain three wheel drive layout design. **[9]**

OR

Q4) a) Explain Transmission system in e- Vehicle. **[8]**

b) What is differential system and mention its types. **[9]**

P.T.O.

Q5) a) Explain heat shrink tubing used in battery assembly. **[9]**

b) Classify different geometry for assembling batteries in battery compartment. **[9]**

OR

Q6) a) Explain Battery compartment. **[9]**

b) Explain with neat diagram Liquid cooling used for battery compartment. **[9]**

Q7) a) Explain vehicle dynamics of EV. **[9]**

b) Explain crash analysis of EV. **[9]**

OR

Q8) a) Explain ergonomic design of roll cage frame. **[9]**

b) How optimization technique used in ergonomics design in EV. **[9]**

Total No. of Questions : 8]

SEAT No. : ____

PC1977

[Total No. of Pages : 2

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T.E. (Mechanical)

HONORS IN 3D PRINTING

Design for Additive Manufacturing

(2019 Pattern) (Semester - II) (302013MJ)

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. 7or 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) Enlist most common 3D Printing Problem. Write any four 3D Printing problems with their cause and solution. **[10]**

b) Explain Experimental Quality Monitoring Methods in Metal Additive Manufacturing. **[7]**

OR

Q2) a) Sketch a flow chart of process plan. Explain process plan for Additive manufacturing. **[10]**

b) Summarize Process selection based on process parameters of various Additive Manufacturing Processes. **[7]**

Q3) a) What is 3D Printing Error Analysis? Explain Height Error Analysis & Supporting Setting Analysis. **[10]**

b) Enlist slincing software. Write its application. **[8]**

OR

Q4) a) Classify 3D Printing Error Type. Explain any three 3D Printing Error.**[10]**

b) Explain 3D slicing stratergy in detail. **[8]**

P.T.O.

Q5) a) Types of analysis in engineering design. Explain any three types of the engineering analysis in AM. **[10]**

b) Enlist problem faced during 3D model creation in AM. **[7]**

OR

Q6) a) List down file formats used for 3D Printing. Explain any three file formats used in 3D printing. **[10]**

b) Enlist STL repair sofiware. Explain any two STL repair softwares. **[7]**

Q7) a) Classify measuring devices in reverse engineering, state its advantages & limitations. **[10]**

b) Explain 3D scanning process and its applications in 3D printing. **[8]**

OR

Q8) a) Explain data handling & reduction methods in additive manufacturing. **[10]**

b) Write application of reverse engineering in product development and Manufacturing. **[8]**

Total No. of Questions : 8]

SEAT No. : ____

PC1978

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T.E. (Honors)

ROBOT PROGRAMMING & SIMULATION

(2019 Pattern) (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. 7or Q. 8,***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Briefly explain the Production rate calculations used for robot in detail. **[6]**

b) List the commands used in VAL II programming and describe its functions. **[6]**

c) Explain motion control, hand control, program control with the help of VAL language commands. **[6]**

OR

Q2) a) Explain Robot welding application using VAL program. **[6]**

b) Explain Wait, DELAY, SIGNAL commands with suitable examples. **[6]**

c) With respect to VAL-II Programming language explain simple pick and place application. **[6]**

Q3) a) List and explain the sensor commands used in AML language with example. **[6]**

b) Explain the various Move master commands with example. **[5]**

c) Explain pick and place operation of industrial robot using rapid robot language. **[6]**

OR

Q4) a) With suitable example explain different Program control statements are used in AML language of robot. **[6]**

b) Explain manual and automatic mode of operation of industrial robot. **[6]**

c) With the help of AML language explain Statements, Constant and Variables. **[5]**

P.T.O.

Q5) a) Describe use of Computer vision, Augmented Reality & Virtual Reality in robotics. **[6]**

b) Explain Robot studio online software. **[6]**

c) Discuss how collision detection works in robotics. **[6]**

OR

Q6) a) Write short note on soft robotics. **[6]**

b) What is robotic process automation? Explain with an example. **[6]**

c) Discuss machine interference w. r. t. Multiple robots. **[6]**

Q7) a) What is simulation? Write down advantages and disadvantages of simulation. **[6]**

b) Compare simulation packages with programming languages. **[6]**

c) Write in brief about cobweb models continuous models. **[5]**

OR

Q8) a) Explain Monte Carlo method in detail. **[6]**

b) Describe Analog and Hybrid simulation. **[6]**

c) Distinguish between hybrid and Analog model. **[5]**

Total No. of Questions : 8]

SEAT No. : [ ]

PC1979

[Total No. of Pages : 2

[6353]-314

T.E. (Electronics & Telecommunication)

HONORS IN BLOCK CHAIN TECHNOLOGY

Decentralize & Blockchain Technologies

(2019 Pattern) (Semester - II) (304183)

Time : 2½ Hours] ***[Max. Marks : 70***

Instructions to the candidates:

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

Q3) 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]**

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 deploying 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 blockchian 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 one future of Block-chain, along with one application.**[9]**

Total No. of Questions : 10]

SEAT No. :

PC1980

[Total No. of Pages : 2

[6353]-315
T.E. (Civil)
HONORS IN METRO CONSTRUCTION
Planning & Quantity Estimation for Metro Construction
(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 Q.7or Q.8 and. 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 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 main purpose of land acquisition under the Right to fair compensation Act 2013. Explain in Brief. **[7]**

b) Explain merits and demerits of Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (New Act)? **[7]**

OR

Q2) a) Explain the rules for land acquisition? **[7]**

b) Explain the types of Land acquisition? **[7]**

Q3) a) Prepare detailed estimate of Elevated section (viaduct). **[7]**

b) Explain the steps involved in construction of Underground section by Cut and Cover. **[7]**

OR

Q4) a) Prepare detailed estimate of Underground station (Civil work). **[7]**

b) Explain steps involved in construction of Elevated station (E&M work including lift and escalator). **[7]**

Q5) a) Define which factors are influencing the investment decision? **[7]**

b) Explain cost of capital and its implications in budgeting decisions. **[7]**

OR

P.T.O.

Q6) a) Define the concept of cost of capital. State how you would determine the weighted average cost of capital of firm. **[7]**

b) Explain Risk identification techniques? **[7]**

Q7) a) Explain Financial Support for PPPs in Infrastructure. **[7]**

b) Explain Construction Contract Specifications? **[7]**

OR

Q8) a) Define how do you calculate compensation under Land Acquisition Act 2013? **[7]**

b) Explain the benefits of land acquisition? **[7]**

Q9) a) Explain 3G and 3H in land acquisition? **[7]**

b) Enlist capital budgeting techniques and explain any 2 in brief. **[7]**

OR

Q10)a) Distinguish between Internal Rate of Return and Net Present Value techniques. Which method would you recommend for evaluating investment? **[7]**

b) Explain types of contract documents used for construction. **[7]**

Total No. of Questions : 8]

SEAT No. : ____

PC1981

[Total No. of Pages : 2

[6353]-316

T.E. (Civil)

HONORS IN ARCHITECTURE AND TOWN PLANNING

Sustainable Architecture and Landscape Design

(2019 Pattern) (Semester - II) (301403)

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. 7or Q.8.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) a) Write a note "smart city". **[6]**

b) Explain the need of green belt and its outcome. **[6]**

c) What is the role of urban planner in sustainable planning? **[5]**

OR

Q2) a) What is a green building? Enlist the concepts observed in green building. **[6]**

b) Write a note on green residential cluster. **[6]**

c) How existing water bodies are developed for benefiting adjoining area? **[5]**

Q3) a) What is geomorphology and its significance in landscaping? **[6]**

b) Write a note on: "Landscape Assessment". **[6]**

c) Enlist types of landscaping and elaborate any one type of landscaping. **[5]**

OR

Q4) a) Enlist the principles of landscaping and elaborate any one with sketch. **[6]**

b) What is the need of drainage in landscaping? Also explain any one type of subsurface drainage system. **[6]**

c) Write a note on: Environmental factors in landscaping. **[5]**

Q5) a) Enlist the factors affecting landscaping and elaborate any one. **[6]**

b) Elaborate how to plan landscape area. **[6]**

c) Mention the components of landscape architecture and explain any one. **[6]**

OR

P.T.O.

Q6) a) What are different purposes and concerns of landscape? **[6]**

b) Enlist impacts of landscaping on environment and elaborate any one. **[6]**

c) What is meant by a green roof? How it is beneficial? **[6]**

Q7) a) In what way landscape is developed in urban area? **[6]**

b) Elaborate the means of improving landscape of existing road. **[6]**

c) Write a note on desert area as a type of landscape. **[6]**

OR

Q8) a) In what way landscape is developed in rural area? **[6]**

b) Elaborate the concept of industrialized areas as landscape and treatment to be offered. **[6]**

c) Write a note on coastal area as a type of landscape. **[6]**

Total No. of Questions : 8]

SEAT No. :

PC1982

[Total No. of Pages : 2

[6353]-317

T.E. (Printing)

HONORS IN ADVANCED PACKAGING TECHNOLOGY

Smart Packaging

(2019 Pattern) (Semester - II) (308213)

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. 7or 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) State the basic concepts of active and intelligent packaging. **[7]**

b) What is interactive packaging? **[10]**

OR

Q2) a) What is interactive packaging? State one example. **[6]**

b) Describe in detail active packaging. State one example. **[11]**

Q3) a) Name the three radio frequency bands that are used for RFID communication and the frequencies used. **[12]**

b) State and explain the working of the RFID bands used for any 2 packaging applications. **[6]**

OR

Q4) a) What do you understand by Wireless Networks? Where are they used? **[6]**

b) State the different types of RFID tags available in the market. Briefly explain the utility of each type. **[12]**

Q5) a) Explain the working principle of the operation of NFC. Name the different modes of operation of NFC systems. **[11]**

b) Briefly explain any three NFC applications. **[6]**

OR

P.T.O.

Q6) a) State and explain any 2 examples of NFC systems used in the packaging. Use any application of packaging. **[7]**

b) Name the different types of NFC tags. What are the advantages of NFC as compared to RFID systems? **[10]**

Q7) a) Give examples use of intelligent packaging in pharma packaging. **[12]**

b) Describe any implementation stage of smart packaging in a pharma packaging industry. **[6]**

OR

Q8) a) Give an overview of smart packaging in the pharmaceutical industry. **[6]**

b) Describe the stages of implementation for smart packaging for food packaging. **[12]**

Total No. of Questions : 10]

SEAT No. :

PC5152

[Total No. of Pages : 3

[6353]-401

T.E. (Mechanical/Automobile)
THEORY OF MACHINES -II
(2015 Pattern) (Semester-III) (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 Q8, 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) Determine the minimum number of teeth required on a pinion, in order to avoid interference which is to gear with, **[6]**

i) A wheel to give a gear ratio of 3:1 ; and

ii) An equal wheel.

The pressure angle is 20^o and a standard addendum of 1 module for the wheel may be Assumed.

b) Draw and explain force analysis of spiral gears. **[4]**

OR

Q2) a) Two helical gears having gear ratio of 4 and normal module 8mm with normal pressure angle 20^o and helix angle 28^o. If the center distance is approximately 650 mm apart, determine the number of teeth on each gear and exact center distance. **[6]**

b) Define Following Terms for Bevel Gear. **[4]**

i) Pitch cone angle

ii) Back cone angle

iii) Shaft angle

iv) Face width

Q3) a) An internal wheel B with 80 teeth is keyed to a shaft F. A fixed internal wheel C with 82 teeth is concentric with B. A compound wheel D-E gears with the two internal wheels; D has 28 teeth and gears with C while E gears with B. The compound wheels revolve freely on a pin which projects from a disc keyed to a shaft A co-axial with F. If the wheels have the same pitch and the shaft A makes 800 r.p.m., what is the speed of the shaft F? Sketch the arrangement. **[8]**

b) Draw a neat sketch of Epicyclic Gear train and Reverted gear train. **[2]**

OR

P.T.O.

Q4) a) In a reverted epicyclic train the arm F carries 2 wheels A and D and a compound wheel B-C. The wheel A meshes with wheel B and the wheel D meshes with wheel C. The number of teeth on wheel A,D and C are 80, 48, and 72 respectively. If arm makes 200 rpm and wheel A is fixed, find the speed and direction of wheel D. **[8]**

b) Define compound gear train with neat sketch. **[2]**

Q5) a) A cam drives a flat reciprocating follower in the following manner: During first 120^o rotation of the cam, follower moves outwards through a distance of 20 mm with simple harmonic motion. The follower dwells during next 30^o of cam rotation.. During next 120^o of cam rotation, the follower moves inwards with simple harmonic motion. The follower dwells for the next 90^o of cam rotation. The minimum radius of the cam is 25mm. Draw the profile of the cam. **[12]**

b) What do you mean by Advanced Cam Curves? Explain 3-4-5 Polynomial Curve. **[4]**

OR

Q6) a) Define following terms. **[4]**

i) Cam Profile
ii) Pressure angle
iii) Trace Point
iv) Pitch Point

b) A cam is to give the following motion to a knife-edged follower: **[12]**

i) Outstroke during 60^o of cam rotation
ii) Dwell for the next 30^o of cam rotation
iii) Return stroke during next 60^o of cam rotation, and
iv) Dwell for the remaining 210^o of cam rotation. The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile if the axis of the follower is offset by 20 mm from the axis of the cam shaft.

Q7) a) Calculate input and output angles θ_2, θ_3, ϕ_2, ϕ_3, a four-bar mechanism to generate a function y=sin xfor $0 \leq x \geq 90^o$. The range of the output crank may be chosen as 60^o while that of input crank be 120^o. Assume three precision points which are to be obtained from Chebyshev spacing. Asuume fixed link to be 52.5 mm long and θ_1=105^o and ϕ_1= 66^o **[10]**

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

i) Type synthesis
ii) Number synthesis
iii) Dimensional Synthesis

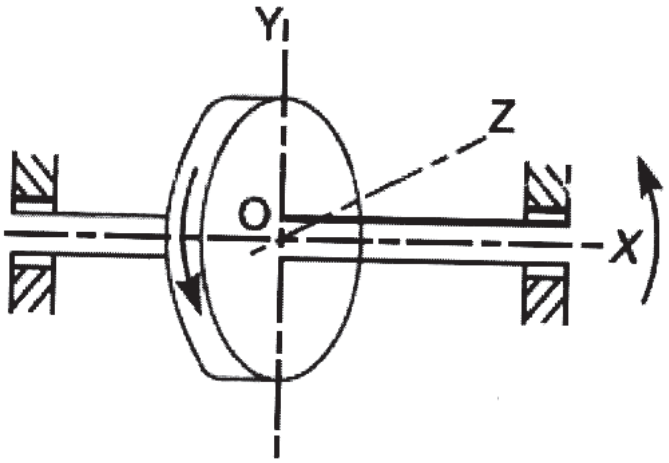
OR

Q8) a) Design a four bar mechanism to co-ordinate the input and output angles as follows: Input angles =15°, 30° and 45°; Output angles =30°, 40° and 55°. Assume length of fixed link as 1 unit. Use freudenstein's equation. **[10]**

b) Write a short note on Cone Variators **[6]**

Q9) a) Give the Effect of Gyroscopic couple on Aero plane. **[6]**

b) A uniform disc of 150 mm diameter has a mass of 5 kg. It is mounted centrally in bearings which maintain its axle in a horizontal plane. The disc spins about it axle with a constant speed of 1000 r.p.m. while the axle precesses uniformly about the vertical at 60 r.p.m. The directions of rotation are as shown in Fig. If the distance between the bearings is 100 mm, find the resultant reaction at each bearing due to the mass and gyroscopic effects. **[12]**



OR

Q10)a) Write a short note on Faceplate Variators. **[6]**

b) The turbine rotor of a ship has a mass of 3500 kg. It has a radius of gyration of 0.45 m and a speed of 3000 r.p.m. clockwise when looking from stern. Determine the gyroscopic couple and its effect upon the ship: **[12]**

i) When the ship is steering to the left on a curve of 100 m radius at a speed of 36 km/hr.

ii) When the ship is pitching in a sample harmonic motion, the bow falling with its maximum velocity. The period of pitching is 40 seconds and the total angular displacement between the two extreme positions of pitching is 12 degrees.

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Total No. of Questions : 10]

SEAT No. :

PC5153

[Total No. of Pages : 3

[6353]-402

T.E. (Mechanical)

REFRIGERATION & AIR CONDITIONING

(2015 Pattern) (Semester-IV) (302049)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Assume suitable data if necessary and mention it clearly.***
3) ***Use of steam table and psychrometric chart is allowed.***

Q1) a) Explain automotive air conditioning with its components. **[6]**

b) Explain any four thermodynamic properties of refrigerant. **[4]**

OR

Q2) a) Explain with diagram aqua ammonia vapour absorption refrigeration system. **[4]**

b) A vapour compression refrigerator uses methyl chloride (R40) as a refrigerant and operates between temperature limits of –10°C and 45°C. At entry to the compressor, the refrigerant is dry saturated and after compression it acquires a temperature of 60°C. There is no under-cooling.Find the COP of the refrigerator. Take C_{pv} =1.09 kJ/kg.K

The relevant properties of methyl chloride (R40) are as follows: **[6]**

Sat.Temp	h_f	h_g	s_f	s_g
°C	kJ/kg	kJ/kg	kJ/kg.K	kJ/kg.K
–10	45.38	460.76	0.183	1.762
45	132.98	483.6	0.485	1.587

Q3) a) Compare vapour compression refrigeration system and vapour absorption system. **[4]**

b) Calculate percentage change in COP of the system when generator temp changes from 150°C to 200°C, refrigeration temp decreases from –20°C to –40°C. Condensation takes place at 30°C. **[6]**

OR

P.T.O.

Q4) a) Explain analysis of two stage vapour compression refrigeration system with perfect Intercooler between two stages with single evaporator. Draw its schematic and p-h diagram. **[8]**

b) Enlist any two applications of low temperature refrigeration. **[2]**

Q5) a) Explain bypass factor. Derive the expression for bypass factor of heating coil. **[6]**

b) The humidity ratio of atmospheric air at 28°C dry bulb temperature and 760 mm of mercury is 0.016 kg/kg of dry air. Determine: **[10]**

i) Partial pressure of water vapour

ii) Relative humidity

iii) Dew point temperature

iv) Specific enthalpy

v) Vapour density

OR

Q6) a) Write a note on indoor air quality requirement. **[4]**

b) What is infiltration? **[2]**

c) Outside design conditions are 40°C and 30% RH. Room design conditions are 25°C and 50% RH. Room sensible heat is 50 kW and room latent heat is 10 kW. If the outside air quantity is 50m^3/ min and assuming by pass factor of cooling coil is 0.1. Find: GSHF and ESHF.**[10]**

Q7) a) Explain with neat sketch winter air conditioning system. **[6]**

b) Explain with neat sketch capillary tube. **[6]**

c) Explain with neat sketch working of thermostat. **[6]**

OR

Q8) a) Explain variable air volume system. State its advantages over constant air volume system. **[6]**

b) Explain with neat sketch water cooled condenser. **[6]**

c) Explain with neat sketch working of scroll compressor. **[6]**

Q9) a) Explain types of duct shapes and materials. **[6]**

b) A rectangular duct, 800 mm × 550mm size carries $5m^3/s$ of air having density 1.15 kg/m^3. Determine equivalent diameter of circular duct if **[10]**

i) Air flow is same.

ii) Air velocity is same. Further find pressure loss per 100 m for f =0.001. Also calculate total pressure required at inlet to the duct to maintain the same flow, and air power required.

OR

Q10)a) Explain types of filters used in air conditioning system. **[4]**

b) Explain any two types of supply air outlets with suitable diagrams. **[6]**

i) Grille outlets

ii) Ceiling diffuser outlets

iii) Slot diffuser outlets

c) Explain equal friction method of duct design. **[6]**

■■■■