

Total No. of Questions : 8]

SEAT No. :

P-7504

[Total No. of Pages : 2

[6180]-11
T.E. (Civil)
HYDROLOGY AND WATER RESOURCES
ENGINEERING
(2019 Pattern) (Semester - I) (301001)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Q.No 1 or Q. No 2, Q.No 3 or Q.No 4, Q.No 5 or Q.No 6, Q.No 7 or Q. No 8.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right 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]**

Q5) a) Derive the formula to calculate discharge of a well in a confined aquifer and unconfined aquifer. **[10]**

P.T.O.

- 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. :

P-7505

[Total No. Of Pages : 3

[6180]-12
T.E. (Civil Engineering)
WATER SUPPLY ENGINEERING
(2019 Pattern) (Semester - I) (301002)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Use of Calculator is allowed.*
- 3) *Assume Suitable data if necessary.*
- 4) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8*

- Q1) a)** Differentiate between coagulation and flocculation by considering different points. **[6]**
- b) A clariflocculator is to be designed for an average flow of 50 MLD. Assuming, inlet velocity as 1.2 m/s, and detention time in flocculator and clarifier as 30 min and 120 mins, respectively, surface overflow rate in clarifier as $40 \text{ m}^3/\text{m}^2/\text{d}$, G in flocculator 40 s^{-1} , and depth of flocculator basin as 2.5 m, determine diameter of inlet pipe, flocculator and clarifier. **[6]**
- c) Discuss in details various mechanisms involved in the filtration process.**[6]**

OR

- Q2) a)** What is Flocculation? State factors affecting the flocculation. **[6]**
- b) A filter unit is of size $4\text{m} \times 8\text{m}$. After filtering $8000 \text{ m}^3/\text{day}$ in 24 hr period, the filter is back washed for 30 minutes at the rate of $10 \text{ lit}/\text{m}^2/\text{sec}$ for 10 minutes. Compute the average filtration rate, quantity and percentage of treated water used in washing and the rate of wash water flow in each trough. The unit has 4 collecting troughs. **[6]**
- c) Explain in detail: operational problems of RSG filter. (Min 03 to be explained) **[6]**

P.T.O

- Q3) a)** Enlist various methods of disinfection. Explain any two methods in detail. [6]
- b) What is Residual Chlorine? Find the dose of chlorine and chlorine demand for water quantity of 40,000 m³/day. Chlorine used is 15 kg per day and residual chlorine after 10 minutes of contact time is 0.2 mg/ lit. [6]
- c) Write with a neat sketch a detailed note on Reverse Osmosis [2 + 3 = 5]

OR

- Q4) a)** Explain in detail: fluoridation & defluoridation of water. [6]
- b) Explain in detail: Super chlorination, Dechlorination, Prechlorination [6]
- c) Write with a neat sketch: a detailed note on Electrodialysis. [2 + 3 = 5]
- Q5) a)** Write in detail: any 02 methods of water distribution. Support your answer with a suitable sketch. [8]
- b) Designed demand of a town is 3 MLD. It is pumped into an elevated service reservoir at a uniform rate from 5 am to 9am and 5pm to 9pm. The variation in demand of water is given below. [10]

Period	5 am to 9 am	9 am to 5 pm	5 am to 9 pm	9 am to 12 am	12 am to 5am
demand	40%	15%	30%	10%	05%

Determine the balancing Capacity of the reservoir.

OR

- Q6) a)** Write difference between continuous and intermittent system. (Min 06 points of comparison are expected) [6]
- b) Calculate the storage capacity and dimensions of the tank to store rain water for the given data: [6]
- Terrace area = 200 m², average annual rainfall = 720 mm
- Runoff coefficient = 0.8, Assume L:B = 2, D = 2m
- c) Write a detailed note on detection and prevention of leakage. [6]

- Q7)** a) Write a note on: 1) Gate valve, 2) Pressure relief valve [6]
- b) Explain in detail Packaged WTP. [5]
- c) Explain with neat sketch: one pipe system partially ventilated. [6]

OR

- Q8)** a) Write a note on: 1) Reflux valve, 2) Air relief valve [6]
- b) Explain in detail with neat sketch: two pipe system. [5]
- c) Enlist initiatives taken by Government in water infrastructure. Explain one of them in detail. [6]



Total No. of Questions : 8]

SEAT No. :

P-7506

[Total No. of Pages : 3

[6180]-13
T.E. (Civil)
DESIGN OF STEEL STRUCTURES
(2019 Pattern) (Semester - I) (301003)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
- 2) *Neat sketches must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks*
- 4) *Take $f_y = 250$ and $f_e = 410$ grade of steel.*
- 5) *Take ultimate stress in bolt, $f_{ub} = 400 \text{ N/mm}^2$.*
- 6) *Assume suitable data, if necessary.*
- 7) *Use of electronic pocket calculator, IS : 800-2007 and steel table are allowed.*
- 8) *Use of cell phone is prohibited in the examination hall.*

- Q1) a)** Give definition of beam-column along with appropriate illustrations. **[3]**
- b) Design a moment resisting base plate that can resist the given factored axial compressive load of 1500 kN and factored bending moment of 100 kNm, assuming that the concrete pedestal used is of M20 grade. The column section to which the base plate will be attached is ISHB 350 weighing 67.4 kg/m. **[14]**

OR

- Q2) a)** Explain the distinctions between a slab base and a gusseted base. **[3]**
- b) A column having effective length of 4 m is subjected to factored axial load of 500 kN and factored moment of 75 kNm. Design the column section. Check for section strength only. **[14]**
- Q3) a)** Explain in brief web buckling and web crippling with suitable sketches. **[4]**
- b) A simply supported steel joist of 5 m effective span carries a working uniformly distributed load 50 kN/m on entire span and a point load of 70 kN at mid span. The section is laterally supported throughout the span. Design an appropriate section. Apply usual checks for strength along with check for deflection. **[14]**

OR

P.T.O.

- Q4) a)** Explain modes of failure of beam with suitable sketches. **[4]**
- b)** Design a suitable I section for simply supported beam of span 4.5 m carrying a dead load of 30 kN/m and imposed load of 50 kN/m. The beam is laterally unsupported throughout the span. **[14]**

Q5) Design a gantry girder supporting an electronically operated crane to the following data : **[17]**

1. Capacity of crane = 120 kN
2. Span between crane rails = 20 m
3. Self-weight crane girder = 100 kN
4. Weight of crab, electric motor, hook etc. = 15 kN
5. Minimum hook approach = 1.2 m
6. Wheel base = 2m
7. Span of Gantry 5.5 m

OR

Q6) Determine panel point dead load, imposed load and wind load for a truss as shown in Figure 1. Assume design wind pressure as 1170 N/m^2 , use G.I. Sheet and the centre to centre spacing of truss as 3.5 m. Assume self weight of purlin as 20 N/m^2 on plan area. **[17]**

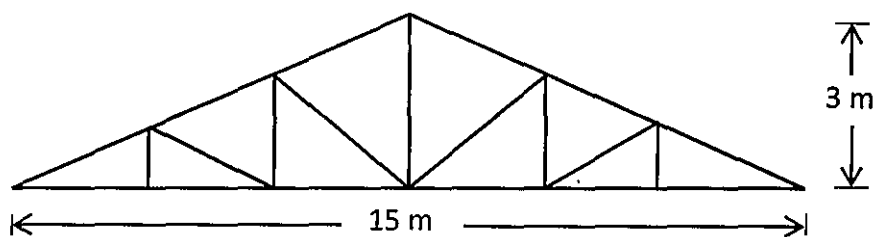


Fig. 1

- Q7) a)** Explain in brief IS provisions for length and spacing of intermittent weld. **[4]**
- b)** Design the cross-section of a simply supported welded plate girder with an effective span of 20 m. The girder is subjected to a working uniformly distributed load of 43 kN/m throughout the span, including self-weight. Assume that the compression flange is laterally supported throughout the span. Apply checks for bending and shear. **[14]**

OR

- Q8)** a) Explain in brief flange curtailment of plate girder. **[4]**
- b) A simply supported welded plate girder has been designed for a span of 20 m and is subjected to a shear force of 1800 kN and a bending moment of 18500 kNm. The girder's cross-section comprises flanges that are 800 mm wide and 50 mm thick, and a web that is 20 mm thick and 2500 mm deep. Assume stiff bearing length at support as 300 mm.
- Design the intermittent welded connections between the flange and web, as well as the end bearing stiffener for the girder. **[14]**



Total No. of Questions : 8]

SEAT No. :

P-7507

[Total No. of Pages : 3

[6180]-14

T.E. (Civil)

**ENGINEERING ECONOMICS AND FINANCIAL
MANAGEMENT**

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

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.*
- 5) *Use of non-programmable calculator is allowed.*

- Q1)** a) Who is responsible for Construction Financial Management? State the role of each. [6]
- b) How to treat various items in contract account? [6]
- c) What is Contract Costing? State the features of Contract Costing. [5]

OR

- Q2)** a) The following were the expenses on a contract which commenced on 1st January 2015. [6]

Particular	Amount (Rs.)
Material Purchased	1,10,000
Materials at the end	1,250
Direct Wages	15,000
Plant issued	5,000
Direct Expenses	8,000

The contract price was Rs. 1,50,000. It was duly received when the contract was completed on 31-3-2015. Charge indirect expenses at 15% on wages and provide Rs. 1,000 for depreciation on plant; Prepare the contract account.

P.T.O.

- b) Explain the role of Financial Management in Construction Project management. [5]
- c) Enlist different Contractors document used on site. Also state various facts and information recorded from these documents. [6]

- Q3)** a) Define: Budget. Explain the purpose of budget. [6]
- b) What are different types of Budget? Explain any two in details. [5]
 - c) The initial investment in project A and B is Rs. 3000 lakh each. The present value of cash inflow for both the projects mentioned in the following table : [6]

Sr. No.	Present value of cash inflow for project A (in lakh Rs.)	Present value of cash inflow for project B (in lakh Rs.)
1	1181.79	818.10
2	908.60	743.40
3	675.90	675.90
4	437.12	614.70
5	397.44	558.90

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

OR

- Q4)** a) What is capital budgeting? Explain aspects of capital budgeting. [6]
- b) Write down a detailed note on “Operating Budget”. [5]
 - c) A concrete mixer was purchased at Rs. 8,00,000. Assuming Scrap Value to be Rs. 5,50,000 after 10 years. Calculate the depreciation at the end of 5 years by : [6]
 - i) Straight Line Method
 - ii) Constant Percentage Method

- Q5)** a) Explain in detail “Need of Working Capital in Construction Industry”. [6]
- b) Explain in details various Financing Resources of Working Capital. [6]
 - c) What are objectives of inventory management and explain Economic Order Quantity. [6]

OR

- Q6)** a) A construction company purchases 10000 bags of cement annually. Each bag cement cost Rs. 500 and cost incurred in procuring each lot is Rs. 150. The cost of carrying is 25%. What are the most EOQ and number of orders? If lead time is 5 days, calculate order point. [6]
- b) What is operating cycle? Explain various phases associated with it. [6]
- c) What is safety stock? Explain the types of cost associated and importance of Safety stock. [6]

- Q7)** a) What is Goods and Services Tax (GST). Also write down the impact of GST on construction industry. [6]
- b) Calculate the tax to be paid on property in Delhi, from following data : [6]

Covered area = 900 sq. ft.

Unit area value for one month = 6.0 per sq.ft.

Age factor = 1.0

Use factor = 1.2

Structure factor = 1.0

Occupancy factor = 1.0

Tax rate = 11%

- c) What is property tax? Explain Annual rental value system of calculation of property tax. [6]

OR

- Q8)** a) Write down the roles and functions of following financial regulatory bodies : [6]
- i) ICRA (Information and Credit Rating Agency)
- ii) SEBI (Security and Exchange Board of India).
- b) Explain “Capital Value System” for the calculation of property tax. [6]
- c) What is Direct Tax? Explain any four types of direct taxes which are imposed in India. [6]



Total No. of Questions : 8]

SEAT No. :

P-7508

[Total No. Of Pages : 3

[6180]-15

T.E. (Civil)

**ADVANCED FLUID MECHANICS AND HYDRAULIC MACHINES
(2019 Pattern) (Semester - I) (301005 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) *Answers to the all questions should be written in single answer-book.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*

Q1) a) A jet of water issuing from an orifice 25 mm diameter under a constant head of 1.9 m falls 0.95 m vertically before it strikes the ground at a distance of 2.4 m measured horizontally from the vena-contracta. The discharge was found to be 108 lit/min. determine Cd, Cv, and Cc for the orifice. **[10]**

b) Explain one complete cycle of water hammer. **[8]**

OR

Q2) a) Why does water hammer occur in a pipe flow? What is its effect and what are the methods to reduce water hammer? **[8]**

b) Calculate the velocity of propagation of a pressure surge in a circular conduit with rigid walls in the following cases:

- i) water with $K = 2.22 \times 10^3$ MPa
- ii) oil with $K = 1.5 \times 10^3$ MPa, specific gravity = 0.8. **[10]**

Q3) a) A jet of water having a velocity of 42 m/s impinges without shock a series of vanes moving at 12 m/s, the direction of motion of the vanes being inclined at 20° to that of the jet. The relative velocity at outlet is 0.9 of that at inlet and the absolute velocity of the water at exit is to be normal to motion of the vanes. Find

- i) vane angles at entrance and exit
- ii) work done on vanes per unit weight of water supplied by the jet hydraulic efficiency **[9]**

P.T.O

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

OR

- Q4)** a) A jet of water moving at 20 m/s impinges on a symmetrical curved vane shaped to deflect the jet such that the vane angles at inlet and exit are each equal to 25° . If the vane is moving at 5 m/s, find the angle of the jet so that there is no shock at inlet. Also determine the absolute velocity of exit in magnitude and direction and the work done. [9]
- b) Obtain expressions for the force acting, work done and efficiency in case of a single moving curve vane when the jet of water strikes and leaves the vane tangentially. [8]
- Q5)** a) A Pelton wheel has to be designed for the following data. Power to be developed = 5000 kW. Net head available = 250 m, speed = 450 rpm, ratio of jet diameter to wheel diameter = 0.1 and overall efficiency = 85%. Find number of jets, diameter of the wheel and quantity of water required, number of buckets. [10]
- b) What are operating characteristic curves of a turbine? How do they differ from main characteristic curves? [8]

OR

- Q6)** a) A Pelton wheel develops 10,000 kW, under a head of 350m with an overall efficiency of 85% when revolving under a speed of 292 rpm. Find the unit discharge, unit power and unit speed. If the head on same turbine falls to 260 m, find discharge, power and speed for this head. [10]
- b) A model of Francis turbine is prepared to a scale of 1:6 and is tested under a head of 6m. The model generates 0.215 kW power when running at 1232 rpm. What will be the speed and power generated by the prototype when working under a head of 80 m? [8]
- Q7)** a) Differentiate between a single stage and multistage pump. Describe multistage pumps with impellers in series and parallel. [8]

- b) The outer diameter and outlet width of a centrifugal pump is 50 cm and 5 cm respectively. The pump develops total head of 25 m, when running under 1000 rpm. If the vane angle at outlet is 40° and manometric efficiency is 80 %, find
- i) velocity of flow at outlet
 - ii) velocity of water leaving the vane
 - iii) angle made by absolute velocity at outlet discharge [9]

OR

- Q8) a)** Explain – i) Pumps in series, iii) pumps in parallel [8]
- b) The inlet and outlet blade angles of the impeller of centrifugal pump are 60° and 40° respectively. The width of the impeller is 30 mm. The inlet and outlet diameters of the impeller are 180 mm and 600 mm respectively. Find the speed of the pump to deliver $0.15 \text{ m}^3/\text{s}$ of water. Flow at inlet is entirely radial. Find also the head generated by the impeller and the manometric head and the impeller power. The manometric efficiency of the pump is 85 %. [9]



Total No. of Questions : 8]

SEAT No. :

P-7509

[Total No. Of Pages : 2

[6180]-16

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 bracket indicate full marks.*
- 4) *Assume suitable data, if necessary and clearly state.*

- Q1) a)** Why tabulation is considered essential in a research study? Narrate the characteristics of a good table. **[9]**
- b)** Differentiate the following with suitable example **[9]**
- i) Participant observation versus Non-Participant observation
 - ii) Structured interview versus Non—structured interview.

OR

- Q2) a)** Write down the differences in the methods of data collection qualitative and quantitative research. **[9]**
- b)** State and discuss the factors affecting the inferences drawn from a sample. **[9]**
- Q3) a)** Differentiate between bibliography and footnotes or references. Illustrate your answer with examples. **[8]**
- b)** Explain the technique and importance of oral presentation of research findings. Is only oral presentation sufficient? If not, why? **[9]**

OR

- Q4) a)** State the different criteria for judging the research. **[8]**
- b)** Discuss the linear regression analysis in details. **[9]**

P.T.O

- Q5) a)** Explain the rights of reproduction in copy rights. **[8]**
- b) Explain why agencies responsible for intellectual Property Registration with any two examples. **[9]**

OR

- Q6) a)** Write few lines about IPR? Do you think this is useful rights for us? Explain. **[8]**
- b) How does WIPO promote the protection of intellectual property? **[9]**

- Q7) a)** Explain the process of the Patent Application. **[9]**

- b) Write about the following terms: **[9]**

i) Trademark and Service marks

ii) Copyrights

iii) Patent

iv) Trade Secrets

OR

- Q8) a)** When the procedure for fill the application and registration of copyright. **[9]**

- b) Describe the procedure for restoration of Copyright. **[9]**



Total No. of Questions : 8]

SEAT No. :

P-7510

[Total No. Of Pages : 2

[6180]-17

T.E. (Civil)

CONSTRUCTION MANAGEMENT

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a) Explain the importance of working capital in construction projects. [6]
- b) Explain project cash flow projections. [6]
- c) Explain minimum wages act and building and other construction worker act 1996. [6]

OR

- Q2) a) Explain the project balance sheet with suitable example. [6]
- b) Explain child labor act. [6]
- c) Explain the interstate migrant workers act. [6]

- Q3) a) What are the steps in risk management? [6]
- b) Write note on mitigation of risk. [6]
- c) Explain simulation analysis. [5]

OR

- Q4) a) Explain break even analysis. [6]
- b) Write short note on role of insurance in construction projects. [6]
- c) State the need of value engineering. [5]

P.T.O.

- Q5)** a) What are the objectives of material management? [6]
b) What is the importance of ERP in material management? [6]
c) Explain the role of material manager. [6]

OR

- Q6)** a) Explain the concept of EOQ in detail. [6]
b) Explain the various phases of material flow. [6]
c) What is the importance of inventory control? [6]

- Q7)** a) Write short note on genetic algorithm. [6]
b) Write short note on training and development. [6]
c) Write short note on staffing policy and pattern. [5]

OR

- Q8)** a) Write short note on compensation and benefits. [6]
b) What are the applications of fuzzy logic in Civil Engineering? [6]
c) Explain artificial neural network. [5]



Total No. of Questions : 8]

SEAT No. :

P-7511

[Total No. Of Pages : 2

[6180]-18
T.E. (Civil)
ELECTIVE - I: ADVANCED CONCRETE TECHNOLOGY
(2019 Pattern) (Semester - I) (301005-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 and Q.7 or Q.8.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagram must be drawn wherever necessary.*

- Q1) a)** List any five characteristic properties of plasticizers. **[9]**
- b) Explain classification of super plasticizers. **[9]**

OR

- Q2) a)** Describe the role of accelerators in concrete with suitable examples. **[9]**
- b) What are polycarboxylate based admixtures? **[9]**
- Q3) a)** What properties are affected by the addition of steel fibers to the concrete? **[8]**
- b) Write a note on polypropylene fibers. **[9]**

OR

- Q4) a)** Explain the various types of synthetic fibers used in concrete. **[8]**
- b) Describe how the addition of polypropylene fibers to concrete reduces plastic shrinkage cracking. **[9]**

P.T.O

Q5) a) List the factors affecting the durability properties of concrete and explain any one of them. **[9]**

b) Explain the difference between plastic shrinkage and the drying shrinkage of concrete. **[9]**

OR

Q6) a) Describe how a sulphate attack occurs in concrete. **[9]**

b) Explain the mechanism of corrosion in concrete. **[9]**

Q7) a) With a neat diagram, describe the procedure for an ultrasonic pulse velocity test. **[8]**

b) How is corrosion measured in concrete? Explain with a neat diagram. **[9]**

OR

Q8) a) Explain with a neat diagram how the permeability test on concrete is performed. **[8]**

b) In an existing structure, explain where the concrete core samples are taken. **[9]**



[6180]-19

T.E. (Civil)

MATRIX METHODS OF STRUCTURAL ANALYSIS
(2019 Pattern) (Semester - I) (301005e) (Elective - I)

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, Q7 or Q8.
- 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) Determine displacements at B and find the member forces of the given square truss subjected to $P_1 = 30$ kN and $P_2 = 60$ kN, using stiffness member approach. Length of vertical and horizontal members is 3 m. Consider area of members = 400 mm^2 and the modulus of elasticity $E = 200 \text{ GPa}$. **[18]**

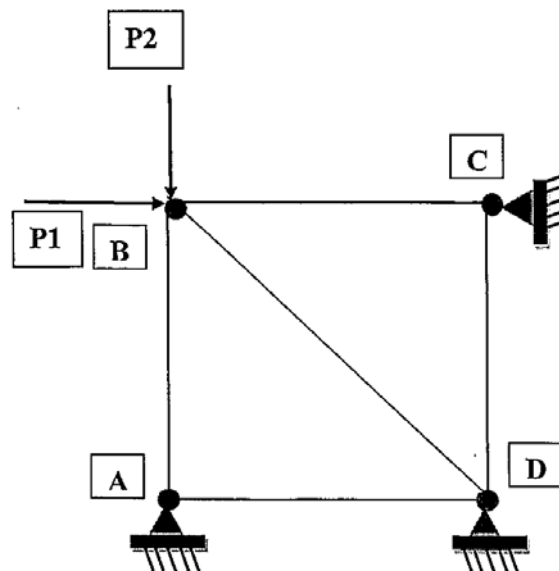


Fig. 1

OR

P.T.O.

- Q2) a) For a standard axial bar element, derive the member stiffness matrix. [4]
- b) For the given bar subjected to axial forces as shown in Fig 2, determine the displacements at B and A. Consider end C as fixed. Also find the corresponding strains and stresses. Take $P = 50 \text{ kN}$. $E = 200 \text{ GPa}$ [14]

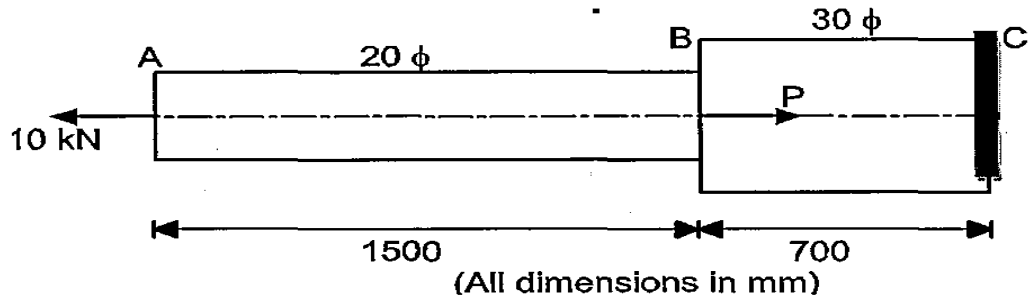


Fig 2

- Q3) A continuous beam ABC is fixed at A and simply supported at B and C. $AB = 3 \text{ m}$ and $BC = 4 \text{ m}$. The span AB is subjected to 20 kN/m over the entire span. Span BC is subjected to a central point load of 30 kN . Determine the slopes at B and C using stiffness member approach. Draw the shear force and bending moment diagram. [17]

OR

- Q4) a) Determine the stiffness matrix and transformation matrix for plane frame member AB shown in the figure 3. Take $A = 200 \text{ mm}^2$, $E = 200 \text{ GPa}$ and $I = 800 \text{ mm}^4$. [8]

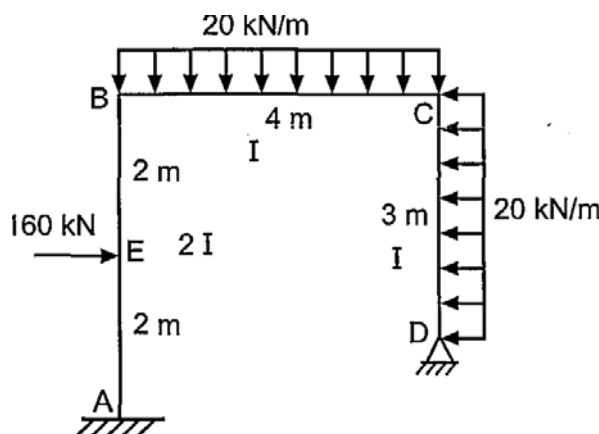


Fig. 3

- b) Determine the slope and deflection at free end of a cantilever beam of length 5 m which is subjected to a uniformly distributed load of 30 kN/m . Use stiffness member approach. [9]

- Q5)** a) Explain the necessity of the transformation matrix and derive it for a grid member. [9]
- b) Derive the local stiffness matrix for grid member. Draw neat sketches for each unit displacement. [8]

OR

- Q6)** A grid consisting of two perpendicular members AB and BC of length 4m each is fixed at A and subjected to uniformly distributed load of 5 kN/m on both the members AB and BC. Length of both members is 3 m. Considering EI and GJ as constant, using structure approach, analyze the grid and find the vertical displacement at C. [17]

- Q7)** a) Derive the stiffness matrix for a space frame member. Draw neat sketches for each unit displacement. [9]
- b) Write the local stiffness matrix for bar element, plane truss element and space truss element. Drawing neat sketches for direction cosines, write the global stiffness matrix for space truss element. [9]

OR

- Q8)** a) Write flowchart for solution of space truss problem. [9]
- b) Write flowchart for solution of space frame problem. [9]



[6180]-20

T.E. (Civil)

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

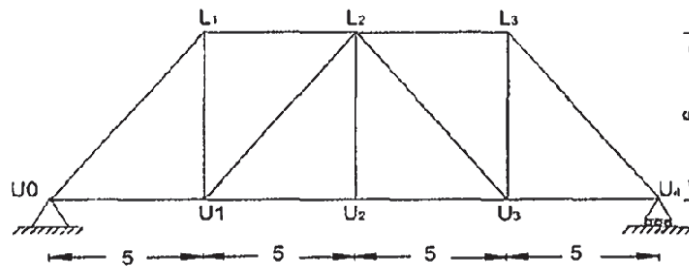
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** 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)** Construct the influence line for the force in member L_2U_3 of the bridge truss shown in Figure. [6]

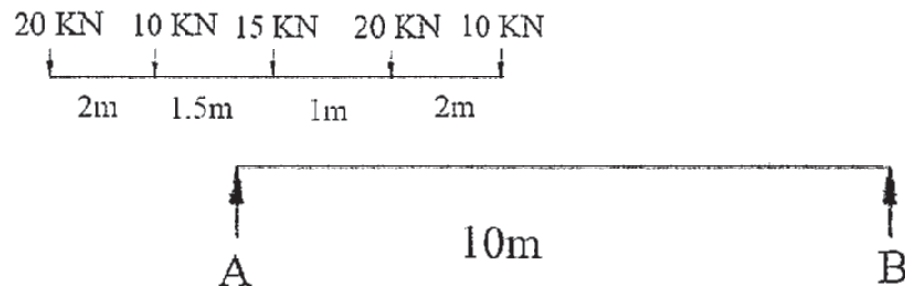


OR

- Q2) a)** State Muller Breslau's principle. [6]
- b)** A simply supported beam has a span of 15 m and subjected to an UDL of 30 kN/m, 5 m long travelling from left to right. Draw the ILD for shear force and bending moment at a section 6 m from the left end. Use these diagrams for calculating the maximum BM and SF at this section. [12]

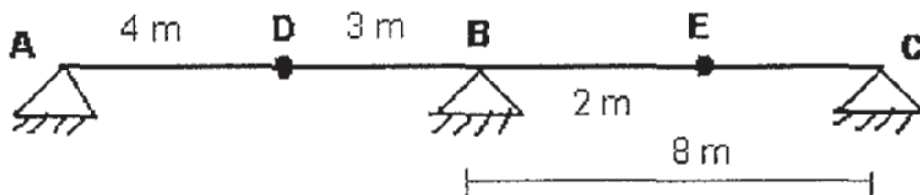
P.T.O.

- Q3) a)** 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. [7]
- b)** A system of concentrated load shown in figure, role beam left to right, S.S beam span of 10m and 10 kN load leading. Find Absolute max +ve S.F, Absolute max ve S.F and Absolute max BM. [10]



OR

- Q4) a)** A beam ABC is supported at A, B and C as shown in Fig. It has the hinge at D. Draw the influence lines for, Reactions at A, B and C, Shear to the right of B and Bending moment at E. [9]



- 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 leading. 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. [8]
- Q5) a)** Derive stresses in curved beam. [14]
- b)** Write different cross section for curved beam. [4]
- OR
- Q6) a)** Explain Winkler-Bach theory. [9]
- b)** What are the assumptions made in curved beam analysis. [9]

- Q7) a)** Derive the expression for horizontal thrust in a two hinged parabolic arch carrying a point load P at distance one fourth spans from left support. Assume $I = I_0 \sec \theta$. **[9]**
- b)** 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. **[8]**

OR

- Q8) a)** What is a three hinged arch and two hinged arch? **[8]**
- b)** 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. **[9]**



Total No. of Questions : 8]

SEAT No. :

P-7514

[Total No. Of Pages : 4

[6180]-21
T.E. (Civil)
WASTE WATER ENGINEERING
(2019 Pattern) (Semester - II) (301012)

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 08*
- 2) *Figures to the right indicates full marks*
- 3) *Draw neat figures wherever necessary*
- 4) *Assume necessary data*
- 5) *Use of scientific calculators is allowed*

- Q1) a)** What do you understand by biological treatment of wastewater? List the different types of microorganisms and explain their role in wastewater treatment. **[8]**
- b) An activated sludge process is treating wastewater in an aeration tank of volume 10000 m³. MLSS in aeration tank is 3000 mg/l. If the sludge wasted at a rate of 200 m³/day with a suspended solids of 10000mg/l then find sludge age(days) and HRT (hrs) if flow rate is 15000 m³/day and effluent suspended solids concentration is 40mg/l **[6]**
- c) An aeration tank of volume 2000 m³ treating 10000 m³/day of waste water with influent BOD 150 mg/l aimed to reduce BOD to 30 mg/l. Find F/M ratio used in the design. Take MLSS : 3000 mg/l **[4]**

OR

- Q2) a)** Explain the following terms . i)F/M ratio, ii) Hydraulic retention time
iii) Sludge age, iv) SVI **[8]**

P.T.O.

- b) Conventional activated sludge plant is designed for a town to treat settled domestic sewage with diffused air aeration system for the given data as follows [6]

- i) Population of town: 1 lakh
- ii) Per capita sewage contribution: 100 lpcd
- iii) Settled sewage BOD = 100 mg/l
- iv) Effluent BOD desired = 10mg/l
- v) MLSS in aeration tank = 3000mg/l
- vi) $F/M = 0.2$

Find A) BOD loading in Kg/d, B) Aeration tank volume C) Volumetric loading in kg BOD/m³

- c) Calculate the SVI (in ml/gm) for an activated sludge sample for the given data: [4]

Volume of sludge sample = 500 ml

30-minute settleable solids volume = 75 ml

MLSS = 3000 mg/l

Comment on settling characteristics based on SVI value.

- Q3)** a) What are Oxidation ponds? Explain the bacteria - algae symbiosis with a neat sketch [7]
- b) A town having a population of 1.2 lakhs is producing sewage at a rate of 100 lpcd having 200 mg/l of BOD. A trickling filter having recirculation ratio 1.5 is design to produce effluent of BOD 20mg/l. The operating depth of filter is 2.5m. Find the diameter of the trickling filter is m. [6]
- c) The volume of a single stage high-rate trickling filter having efficiency of 82% is 1365 m³ along with the recirculation ratio of 1.5. Take treatability factor = 0.9. Find the BOD entering the filter unit (in kg/day,). Use NRC formula [4]

OR

- Q4)** a) Explain wastewater treatment principle of phytoremediation technology with neat sketch and give its application. [7]
- b) A single stage trickling filter is designed for an organic loading of 10,000 kg of BOD in raw sewage per hectare meter per day. This filter treats a flow of 4 MLD of raw sewage with BOD of 220mg/L. Considering no recirculation determine the BOD concentration in the effluent. Assume primary clarifier removes 30% of total BOD. [6]

- c) Find the recirculation factor (R), required for a single stage trickling filter of volume 800 m^3 with recirculation having BOD load of raw sewage as 800 kg/day desired to have BOD load in the effluent as 200 kg/day . Use NRC formula. [4]
- Q5) a)** Explain the working principle with neat sketch of following terms with the advantages and applications: [8]
- Up-flow Anaerobic Sludge Blanket (UASB)
 - Moving Bed Bio Reactor (MBBR)
- b) Design a septic tank for 290 users. Water allowance is 120 L per head per day. Assume suitable data if required. [6]
- c) Explain the importance of advanced oxidation processes used for wastewater treatment. [4]

OR

- Q6) a)** Explain the working principle with neat sketch of following terms with the advantages and applications: [8]
- Packed Bed Reactor (PBR),
 - Sequential Batch Reactor (SBR)
- b) Design the dimensions of septic tank for small colony of 165 persons provided with an assured water supply from municipal head works at the rate of 120 lit per person per day. Assume suitable data if required. [6]
- c) Difference between Secondary treatment and Tertiary treatment of wastewater. [4]
- Q7) a)** What is a Sludge? Why Sludge digestion is necessary. In activated sludge process, 1 MLD (by volume) of secondary sludge has to be returned to keep the required MLSS concentration in the aeration tank. This sludge has a water content of 99%. If the sludge water content is reduced to 98%, what volume of the sludge will be needed to be recycled? [7]
- b) Explain the wastewater reuse opportunities in municipal, industrial and agricultural sector. [6]
- c) Explain what do you understand by primary and secondary sludge [4]

OR

- Q8)** a) Enlist any three different processes involved in sludge treatment. The moisture content of a sludge is found out to be 99%. After dewatering the sludge water content was reduced to 95%. What will be the percentage change in the volume of sludge? Find the volume of the sludge after dewatering if volume of sludge before dewatering was 5 MLD. [7]
- b) Explain the working principle of anaerobic digestion. Enlist the different factors governing anaerobic digestion. [6]
- c) Explain the characteristics of sludge produced in different treatment processes. [4]



Total No. of Questions : 8]

SEAT No. :

P-7515

[Total No. of Pages : 6

[6180]-22
T.E. (Civil)
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) Bold figures to the right indicate full marks.
- 3) IS 456-2000 and non programmable calculator are allowed in the examination.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Mere reproduction from IS Code as answer, will not be given full credit.
- 6) If necessary, assume suitable data and indicate clearly.

Q1) a) Design an intermediate flight of a dog legged staircase of a residential building as shown in **Figure 1** with the following data: **[13]**

- i) Floor to floor height = 3.15m
- ii) Tread = 250mm;
- iii) Width of supporting beams = 230mm
- iv) Live load = 4.0 kN/m²; Floor finish= 0.75 kN/m²
- v) Material = M25, Fe 500, Use LSM
- vi) Draw details of reinforcement of only one flight.

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

OR

Q2) Design a simply supported reinforced concrete floor beam **B10** as shown in **Figure 1** with following data: **[18]**

- i) Center to center Span of beam = 3.73 m
- ii) Width of supporting columns = 300mm
- iii) Beam width = 230 mm
- iv) The beam supports slab of thickness 120mm on both side of beam
- v) For slab- Live load = 2kN/m²; Floor finish= 1.0 kN/m²
- vi) The wall on this beam is 120mm thick and 2.7 m high.
- vii) Material- M25, Fe 500

Show details of reinforcement along with zoning of shear reinforcement. Use LSM.

P.T.O.

Q3) Design a continuous floor beam **B11-B12-B13** as shown in **Figure 1** using IS code coefficients. Thickness of the all floor slab is 130 mm, live load and floor finish load on all slabs are 2.5 kN/m^2 and 1.5 kN/m^2 , respectively. The wall on this beam is 230 mm thick and 2.6 m high. Use M 30 and Fe 500 steel. Design longitudinal reinforcement for all the spans and support for flexure. Design shear reinforcement only for beam B12. Draw neat sketch showing details of main and shear reinforcement. Use LSM. **[17]**

OR

Q4) Design a continuous floor beam B17-B23 (A-B-C) as shown in **Figure 1** using moment redistribution method. Thickness of the all floor slab is 130 mm, live load and floor finish load on all slabs are 3.0 kN/m^2 and 1.5 kN/m^2 , respectively. The wall on this beam is 120 mm thick and 2.7 m high. Calculate design moment for **span AB and support B** after 22 % redistribution of moments. Design span BC and support B for **flexure only**. Draw the reinforcement details.

Material- Concrete of grade M30 Fe 500 reinforcement. **[17]**

- Q5)** a) Design a uni-axial short column by limit state method with material M25 and Fe 500 to carry a working load of 900 kN, working moment of 80 kN-m about major axis bisecting the depth of column. The unsupported length of column is 4.2m. The column is fixed at one end and hinged at the other. Show detailed design calculations and reinforcement details.**[13]**
 b) Explain the role of longitudinal and transverse reinforcement of column.**[4]**

OR

Q6) Design a bi-axial short column by limit state method to carry Ultimate load of 1200 kN. Ultimate moment of 100 kN-m about major axis bisecting the depth of column and 20 kN-m about minor axis bisecting the width of column. The unsupported length of column is 4.2m. The column is fixed at one end and hinged at the other. Use M25 grade of concrete and Fe 500 grade of steel. Show details of reinforcement in plan and sectional elevation. **[17]**

Q7) Design rectangular isolated pad footing for an ultimate working axial load of 1500 kN. The column size is 300 x 450mm. SBC of soil is 250 kN/m^2 . Use M30 grade of concrete and Fe 500 grade of steel. Show detailed design calculations and reinforcement details in plan and sectional elevation. **[18]**

OR

Q8) Design a slab type rectangular combined footing for two columns A and B subjected to working axial load 1000 kN and 1050 kN, respectively. Center to center to distance between two columns is 2.8m. Size of both the columns is 400 x 400mm. Safe bearing capacity of soil is 180 kN/m^2 . Use M30 concrete and Fe500 steel. Neglect check for one way shear. Show reinforcement details in sectional elevation. **[18]**

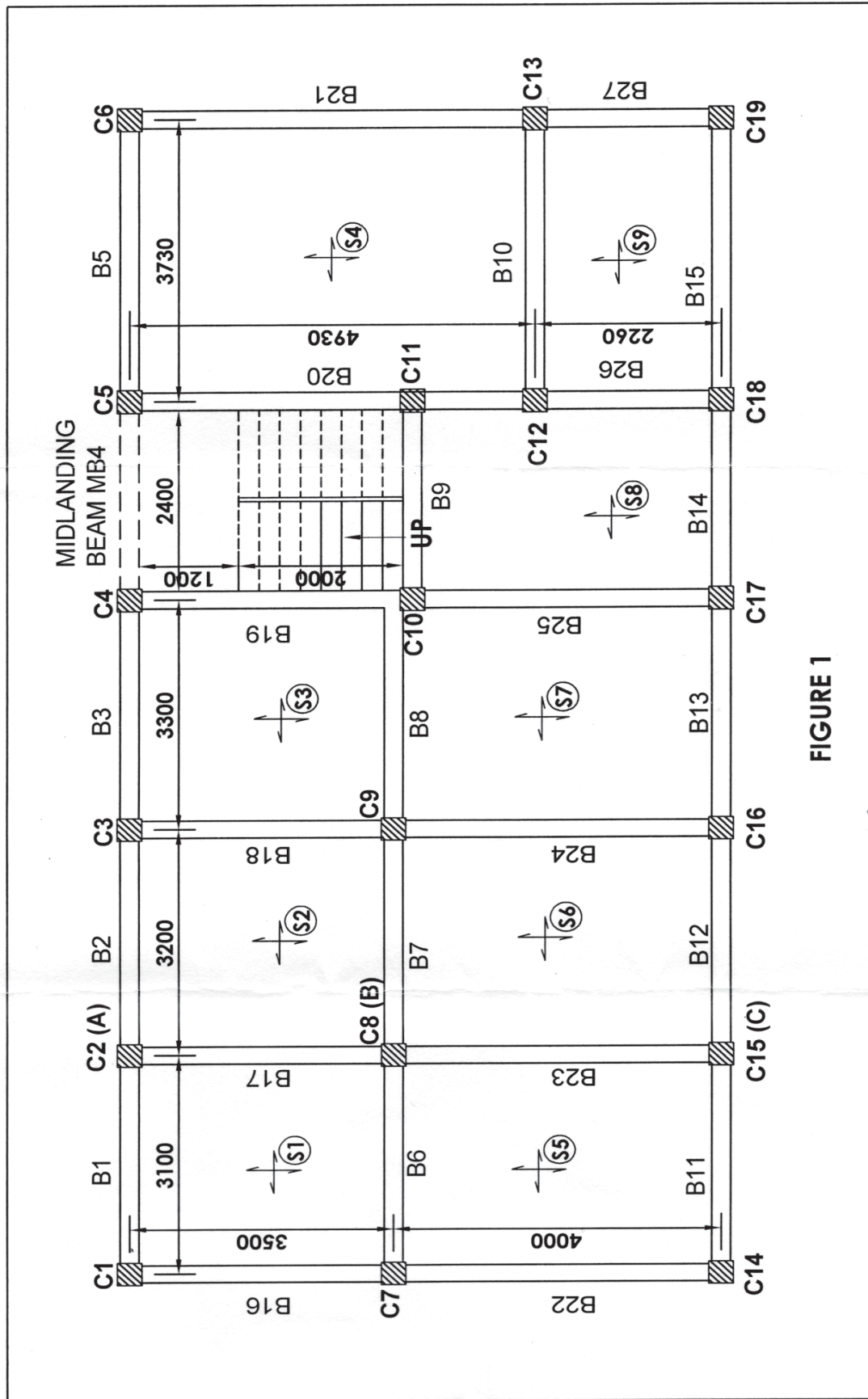


FIGURE 1

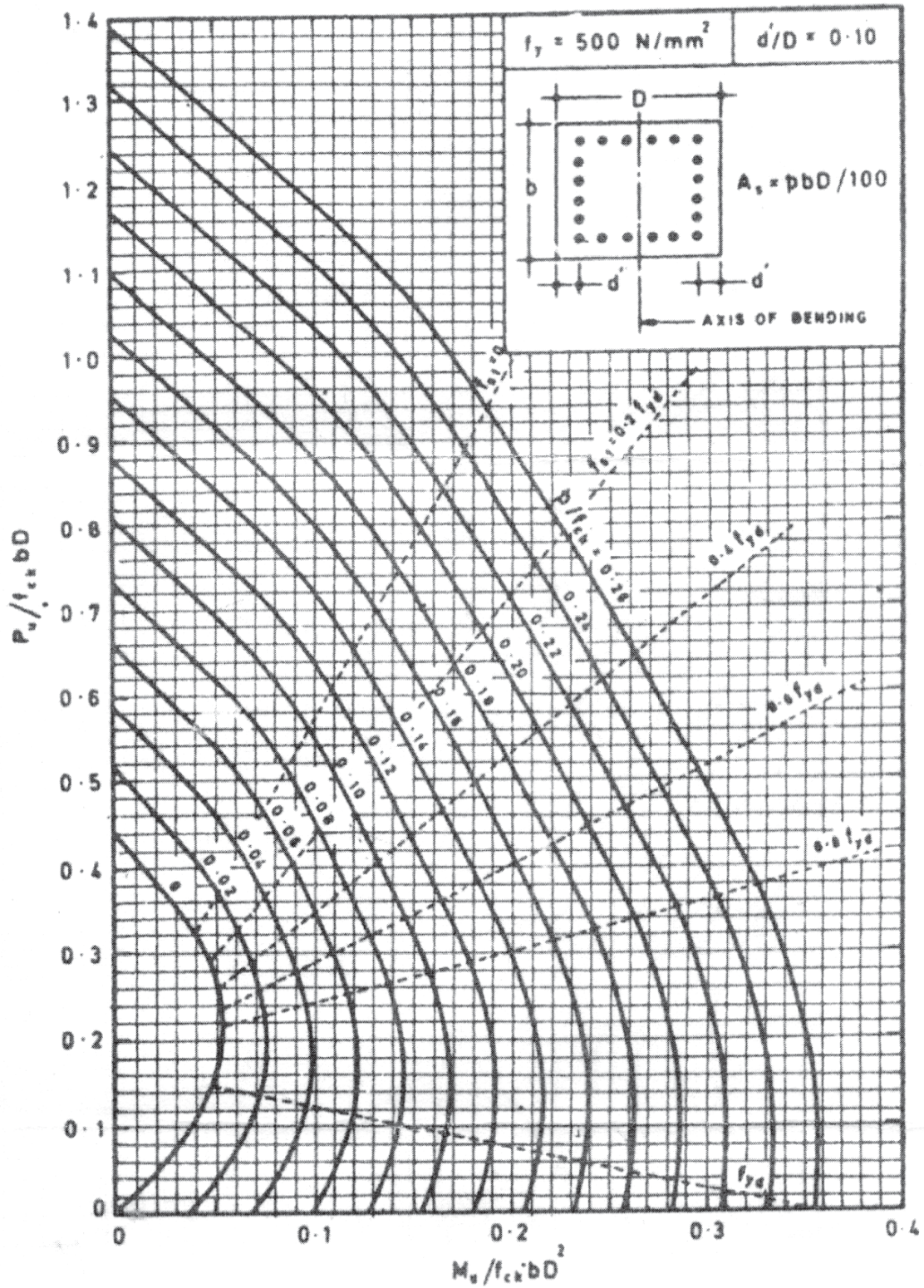


Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

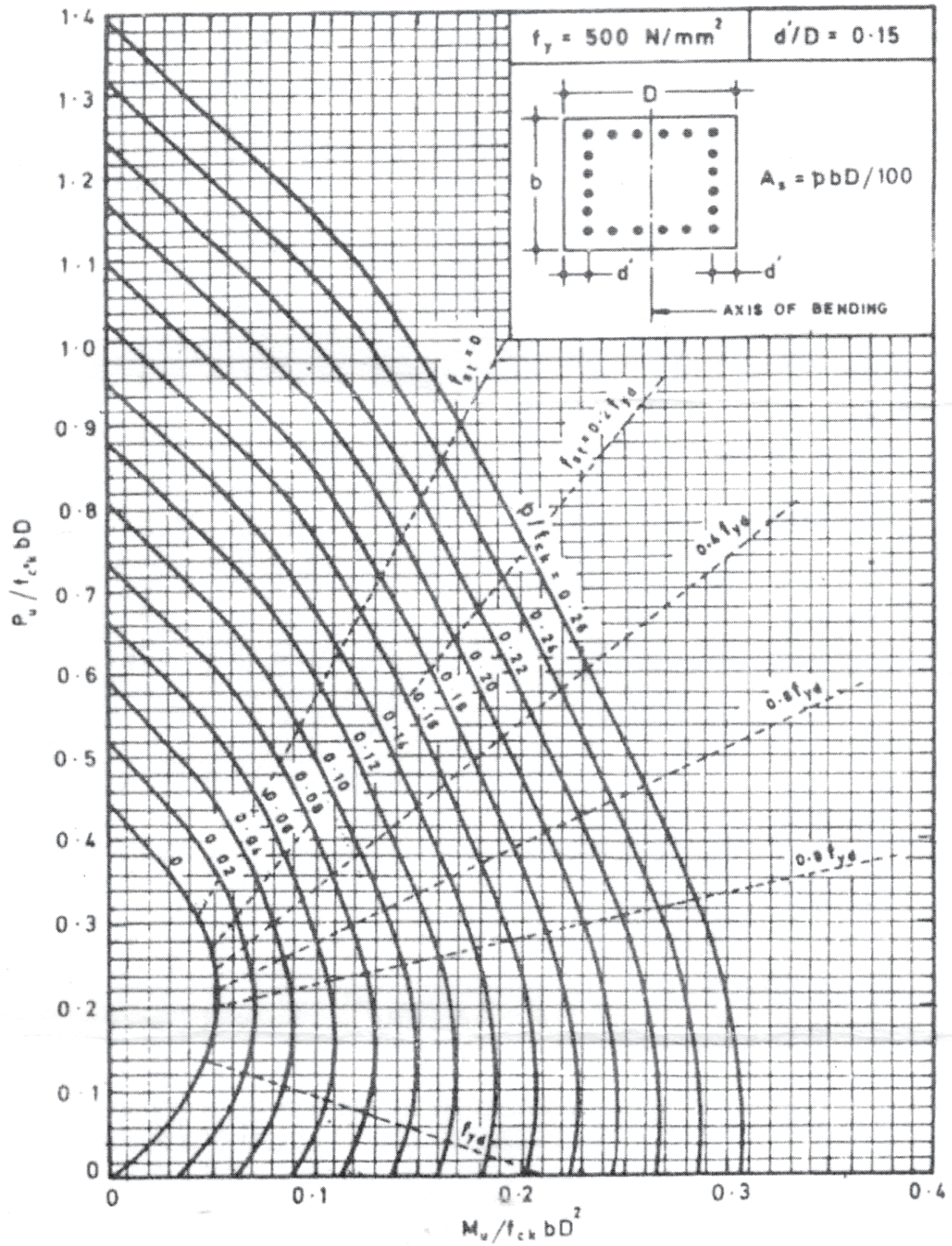


Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

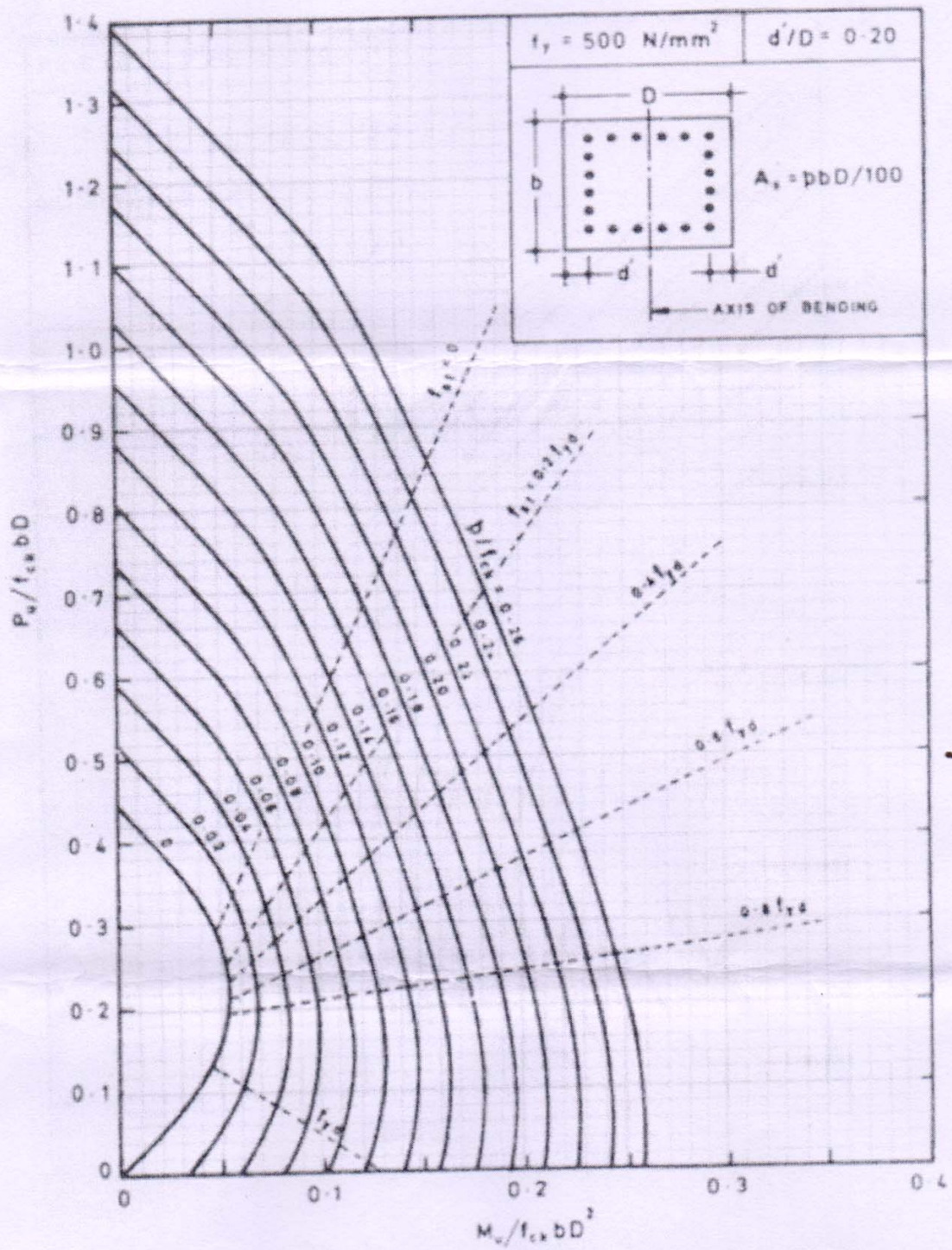


Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides



Total No. of Questions : 8]

SEAT No. :

P-7516

[Total No. Of Pages : 2

[6180]-23
T.E. (Civil)
REMOTE SENSING & GEOGRAPHIC INFORMATION
SYSTEM
(2019 Pattern) (Semester - II) (301014)

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 electronic pocket calculator is allowed in the examination.*
- 5) *Neat diagrams must be drawn wherever necessary.*

- Q1) a)** What are the three segments of GPS? Describe them briefly. **[6]**
- b) Write a short note on following: i) GLONASS system ii) Galileo system. **[6]**
- c) Write a note on types of GPS tracking. **[5]**

OR

- Q2) a)** Describe sources of error in SBPS. **[6]**
- b) Define IRNSS and illustrate its structure. **[6]**
- c) What is augmentation and explain about satellite-based augmentation. **[5]**

- Q3) a)** What are elements of visual elements of image interpretation? **[6]**
- b) Differentiate between supervised and unsupervised image classification. **[6]**
- c) Explain in detail the concept of post processing and pre processing. **[6]**

OR

- Q4) a)** Write a note on digital image and analog image. **[6]**
- b) Explain in detail spectral signature curve with neat sketch. **[6]**
- c) Differentiate between Visual and Digital image interpretation. **[6]**

P.T.O.

- Q5)** a) What are the functionalities of GIS? [6]
b) Discuss the difference between drafting software's and GIS. [6]
c) Write a note on data retrieval and data storage. [5]

OR

- Q6)** a) Write in detail about various components of GIS. [6]
b) Explain the role of layer combination in map making. [6]
c) Illustrate Cloud computing with types and applications. [5]

- Q7)** a) Discuss differences between raster and vector data formats. What type of data is raster format best suited for? [6]
b) Explain the application of GIS in Demarcation of Dam Catchment. [6]
c) Illustrate the different projection systems and explain any one in detail.[6]

OR

- Q8)** a) Enumerate different Attribute Data models and explain any one of them.[6]
b) Explain in detail how to use remote sensing data in GIS. [6]
c) What is Georeferencing of GIS data? And explain its importance in the field of GIS? [6]



Total No. of Questions : 8]

SEAT No. :

P-7517

[Total No. of Pages : 2

[6180]-24
T.E. (Civil Engg.)
ADVANCED ENGINEERING GEOLOGY WITH ROCK
MECHANICS
(2019 Pattern) (Semester - II) (301015a) (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) Neat diagrams must be drawn wherever necessary.

- Q1)** a) What is earthquake? Describe various Seismic zones of India. [6]
b) Will dam building activity cause a major earthquake? Explain. [6]
c) What is landslide? Explain the causes and control measures of landslide.[6]

OR

- Q2)** a) Write note on compact basalt as a construction material. [6]
b) Describe influence of geological factors upon urban development and planning. [6]
c) Explain suitability of DTB as construction material. [6]
- Q3)** a) Explain various Physical properties of rocks. [6]
b) Calculate RQD recovery and Core recovery from following table. [6]

Run in m	Piece No.	Length in cm	Nature of fracture
3 - 6m	1	11	J
	2	10	J
	3	45	M
	4	90	M
	5	13	M
	6	55	J
	7	50	J
	8	6	J
6 - 9m	9	8	J
	10	80	M
	11	90	M
	12	109	M
	13	09	M

P.T.O.

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

Sr.No.	R	a	$2\pi aR$
1	1.66	1	?
2	1.87	2	?
3	132	3	?
4	1.47	4	?
5	1.09	5	?
6	1.19	10	?

OR

- Q4)** a) Explain in detail R.S.R classification. [6]
 b) What is Rock Quality Designation (RQD)? Explain How to calculate Core recovery and RQD? [6]
 c) Explain Electrical Resistivity method of Geophysical Exploration. [6]

- Q5)** a) What treatment is to be given to fracture occurring at a Dam site? [6]
 b) Discuss reasons of success and/or failure of percolation tanks on various basalts. [6]
 c) Discuss the strength and water tightness characters of DTB from foundation, point of view. [5]

OR

- Q6)** a) How economy has been achieved by proper geological interpretation? Discuss any one case study. [6]
 b) Discuss various suitable and unsuitable conditions for dam construction on dipping strata. [6]
 c) Write any one case history of tail channel erosion in Deccan Trap area. [5]

- Q7)** a) Describe geological conditions responsible for roof collapsing of tunnel. [6]
 b) Explain standup time of rock during tunneling. [6]
 c) Explain in detail engineering geological investigations for bridge foundation. [5]

OR

- Q8)** a) Explain favorable and unfavorable conditions for tunneling. [6]
 b) Is the columnar basalt suitable/unsuitable for tunnel excavation? Give reasons. [6]
 c) Explain in brief safe bearing capacity during bridge construction. [5]



Total No. of Questions : 8]

SEAT No. :

P-7518

[Total No. Of Pages : 3

[6180]-25

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) Figures to the right indicate full marks.
- 3) Your answers will be valued as a whole.
- 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 $3 \times 2 \times 1$ 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]**

OR

- Q2) a)** Discuss Overfitting of ANN in brief with its cause and effect. How to avoid overfitting. Discuss data preprocessing. **[9]**
- b) Determine the functional value of the $3 \times 2 \times 1$ neural network in forward pass with the following data. Inputs [6,6,8], First layer weights (input to hidden): [0.4 - 0.5 0.6; - 0.3 0.8 -0.7], First layer bias: [3; - 3.7], Second layer weights (hidden layer to output layer): [0.35 0.55], Second layer bias: [2]. Use sigmoidal transfer function between the first layer and hidden layer and hyperbolic tangent function between the hidden layer and output layer. **[9]**
- Q3) a)** Distinguish between Radial basis function networks and Generalized regression neural networks. Give suitable example for each. **[8]**

P.T.O.

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

- a) Input and output parameters
- b) Architecture with figure
- c) Size of weight and Bias matrix
- d) Activation function/s between the layers
- e) performance function

OR

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

- a) Input and output parameters
- b) Architecture with figure
- c) Size of weight and Bias matrix
- d) Activation function/s between layers
- e) performance function/s

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

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

OR

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

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

- a) Input and output parameters
- b) No. of trees
- c) Data division
- d) Out of bag estimates
- e) 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 quantity (in Kg/m³) of Cement, Fine aggregate, coarse aggregate and water. Design a model using Model Tree, using the above parameters and give the following details: [9]

- a) Input and output parameters
- b) No. of rules
- c) Splitting criteria
- d) Standardization of data
- e) performance function/s



Total No. of Questions : 8]

SEAT No. :

P-7519

[Total No. of Pages : 2

[6180]-26

T.E. (Civil)

ADVANCED SURVEYING

(2019 Pattern) (Semester - II) (301015C) (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 indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain the principle of nautical sextant. [6]
- b) Discuss the procedure to measure the horizontal angle using nautical sextant. [6]
- c) Define celestial sphere, zenith, nadir, azimuth, hour angle and latitude. [6]

OR

- Q2)** a) List out the methods to locate soundings. Explain any two. [6]
- b) Explain graphical method to solve three point problem. [6]
- c) Explain the procedure for determination of shortest distance between two points on the earth. [6]

- Q3)** a) Derive an expression to determine scale of photograph. [6]
- b) Explain different types of aerial photographs. [6]
- c) Define exposure station, principal point, isocentre, angle of tilt and swing. [5]

OR

P.T.O.

- Q4)** a) A line PQ measures 12 cm on a photograph taken with a camera having focal length 22.5 cm. The same line measures 4 cm on a map drawn to a scale of 1/45000. Determine the flying height of the aircraft if the average altitude is 360 m. [6]
- b) Define relief displacement. Derive the expression for relief displacement. [6]
- c) Explain the procedure to determine number of photographs required to cover a given area. [5]
- Q5)** a) Explain different GIS data models. [7]
- b) Explain the advantages and disadvantages of raster and vector data models. [6]
- c) Define and explain Digital elevation model. [5]

OR

- Q6)** a) Explain raster and vector data models. [7]
- b) Explain the advantages and disadvantages of raster and vector data models. [6]
- c) Explain the sources of errors in total station. [5]
- Q7)** a) Define GPS and state the procedure of GPS working. [8]
- b) State and explain the segments of GPS. [9]

OR

- Q8)** a) Explain the different modes of GPS positioning. [8]
- b) Explain real time Differential GPS surveying. [9]



Total No. of Questions : 8]

SEAT No. :

P-7520

[Total No. of Pages : 2

[6180]-27

T.E. (Civil)

ADVANCED GEOTECHNICAL ENGINEERING
(2019 Pattern) (Semester - II) (301015D) (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 indicate full marks.
- 4) Assume suitable data, if necessary and mention it clearly.
- 5) Use of non-programmable calculator is allowed.

- Q1)** a) Differentiate between unconsolidated undrained test, consolidated undrained test and consolidated drained test for determination of shear strength of soil. [6]
- b) Write a note on : [6]
- i) Consolidated drained strength (CD strength) from direct shear test
 - ii) Differentiate between shear strength parameters obtained from total and effective stress considerations.
- c) Explain in detail: Factors affecting Pore water Pressure of cohesive and cohesion less soils. [6]

OR

- Q2)** a) In a drained triaxial compression test, a saturated specimen of cohesionless sand fails under a deviator stress of 400 kN/m² when the cell pressure is 100 kN/m². Find the effective angle of shearing resistance of sand and the approximate inclination of the failure plane to the horizontal. [6]
- b) 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]
- c) Explain the shear characteristics of sand and normally loaded clays. [6]

P.T.O.

- Q3)** a) Derive the expression for the slope of failure line in compression of $t-s, s'$ stress path for pure sand. [6]
b) Draw and explain the stress path ($t - s, s'$) for stress changes near retaining wall. [6]
c) State and explain the variants of MIT plot. [5]

OR

- Q4)** a) Show that the slope of failure line in compression of $q-p, p'$ plot for pure sand is $6\sin \phi'/(3-\sin \phi')$. [6]
b) Draw and explain the stress path ($t - s, s'$) for stress produced below foundation due to undrained loading. [6]
c) What is stress path? State the factors influencing the stress path. [5]

- Q5)** a) Why soils are to be stabilized? Discuss the principles of soil - fly ash stabilization and associated benefits. [6]
b) What is the need for stabilization of expansive soils? [6]
c) What are the different admixtures that are used in expansive clay soil stabilization? Discuss any one. [6]

OR

- Q6)** a) Discuss the applicability of industrial wastes in soil stabilization. [6]
b) Explain in detail physico-chemical reactions in stabilization of clay with lime. [6]
c) What do you mean by soil stabilization? Explain the principle and mechanism of lime stabilization. [6]

- Q7)** a) State the purpose of sand drain and explain functions of vertical sand drain. [6]
b) Explain ground improvement by excavating and replacing of soil. [6]
c) Discuss any three methods of soil improvement. [5]

OR

- Q8)** a) State different methods of grouting. Explain ground improvement by stone column. [6]
b) Discuss various grouting techniques with their suitability. [5]
c) Describe the procedure of vibro-flotation technique for ground improvement. [6]



Total No. of Questions : 8]

SEAT No. :

P-7521

[Total No. of Pages : 2

[6180]-28

T.E. (Civil)

ARCHITECTURE AND TOWN PLANNING

(2019 Pattern) (Semester - II) (301015E) (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) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

Q1) a) Explain concept of new town and satellite town with need & proper examples of each. [9]

b) Elaborate various levels of planning. [9]

OR

Q2) a) Write a note on neighbourhood planning with proper examples. [9]

b) Explain various types of data collected for preparation of Development Plan. [9]

Q3) a) Write an explanatory note on Civic Survey and purpose of formation of CIDCO. [9]

b) What is traffic management? Mention it's importance and write a short note on Intelligent Traffic system. [8]

OR

Q4) a) Explain hierarchy of urban roads with examples. [8]

b) Explain the organization of MHADA and its role in housing sector. [9]

Q5) a) Elaborate the need of URDPFI for land use and infrastructure. [9]

b) Write a short note on Land Acquisition Rehabilitation and Resettlement Act, 2013. [9]

OR

P.T.O.

- Q6)** a) Write a short note on MahaRERA along with its key components.[9]
b) What guidelines are observed in AMRUT? What is its importance? [9]

- Q7)** a) Explain meaning and importance of GIS and GPS during disasters. [8]
b) Write an explanatory note on Special township along with proper examples. [9]

OR

- Q8)** a) Write a short note on SEZ and its importance in economic development. [8]
b) What is rural planning? Elaborate the need, strategies and various government initiatives applicable for rural planning. [9]



Total No. of Questions : 8]

SEAT No. :

P-7522

[Total No. of Pages : 2

[6180]-29

T.E. (Civil)

SOLID WASTE MANAGEMENT

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q1 or Q.2, Q3 or Q4, Q5 or Q6, Q7or Q8.
- 2) Figures to the right indicate full marks.
- 3) Draw neat figures wherever necessary.
- 4) Assume necessary data.
- 5) Use of scientific calculator is allowed.

- Q1)** a) State the terms related to Solid waste management- [6]
i) Segregation ii) Recovery
iii) Recycling iv) Reuse
b) Explain thermal volume reduction method of processing technique. [6]
c) State the factors considered during evaluation of on-site processing equipment's. [6]

OR

- Q2)** a) Write a note on material recovery facility. [6]
b) Specify the role of transfer station in municipal solid waste management. [6]
c) Explain integrated waste management. [6]
- Q3)** a) What are factors affecting anaerobic digestion? [6]
b) Describe the incineration technologies and air emissions and its control in detail Explain the following : [6]
i) Pyrolysis
ii) Refuse derived fuel
iii) Bio gasification
c) How to estimate of low and high heating value of any material [5]

P.T.O.

OR

- Q4)** a) What are the different types of incinerators? Explain any one. [6]
b) Write environmental impacts of waste to energy system. [6]
c) Write working principle, advantages and disadvantages of anaerobic digestion process. [5]

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

OR

- Q6)** a) What is bioreactor landfill? What are the different types of bioreactor landfill? [6]
b) Enlist methods of Biomining and explain any one method of it [6]
c) What is Leachate? How it is formed? How its movement is controlled? [6]

- Q7)** a) Explain any one case study of material recovered from e-waste. [6]
b) Explain any one case study of processing and reuse of construction & demolition waste. [6]
c) Write objectives and major provision in plastic waste management rules - 2016. [5]

OR

- Q8)** a) Discuss the present scenario of recycling of E-waste in India. [6]
b) Explain EPA - identification of hazardous and toxic waste. Write down the characteristics of hazardous waste. [6]
c) Write objectives and major provision in construction and demolition (C&D) waste management rules - 2016. [5]



Total No. of Questions : 8]

SEAT No. :

P7523

[Total No. of Pages : 2

[6180]-30

T.E. (Chemical)

MASS TRANSFER - I

(2019 Pattern) (Semester - I) (309341)

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

- b) 5,000 kg/hr of a SO₂ - air mixture containing 5% by volume SO₂ is to be scrubbed with 2,00,000 kg/hr. of water in a packed tower. The exit concentration of SO₂ is reduced to 0.15%. The tower operates at 1 atm. The equilibrium relationship is given by Y=30X Where, Y=Mole SO₂/Mole air & X = Mole SO₂/Mole water. If the packed height of the tower is 420 cm, estimate the height of transfer unit (HTU)? **[9]**

OR

Q2) a) A packed tower is designed to recover 98% CO₂ from a gas mixture containing 10% CO₂ & 90% air using water The equilibrium relation is given as Y = 14X.

Where Y = KgCO₂/Kg dry air & X =Kg CO₂/kg water The water to gas rate is kept 30% more than the minimum value. Calculate the height of tower if (HTU) OG = 1m. **[9]**

- b) What is Absorption & Stripping factor? Explain minimum L/G ratio? **[8]**

Q3) a) Explain Adiabatic Saturator 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 **[9]**

- i) Absolute Humidity
- ii) Saturation humidity
- iii) Percentage humidity
- iv) Percentage Relative humidity

P.T.O.

- v) Relative humidity
- vi) Humid Heat
- vii) Humid Volume

Data : Vapour pressure of water at 26.7°C is 3.5 KPa.

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) Nitrogen and ii) Carbon dioxide. (Data: $P_A = 0.362$ std. atm.) [9]
- Q5)** a) What are the various equipment's used for gas-liquid contact. With neat sketch explain Venturi Scrubber & Spray Towers? [9]
 b) What are the different types of Column? Explain in detail? [9]

OR

- Q6)** a) Explain mechanically agitated vessels with different types of impellers? [9]
 b) What is Tray efficiency? Explain types of Tray efficiencies? [9]
- Q7)** a) Explain experimental determination of Rate of drying curve? [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 60% to 6% under the same drying conditions? [10]

OR

- Q8)** a) What is the time required for Drying? Derive the equation to calculate time required in constant rate period? [8]
 b) A batch of solid for which the following table of data applies is to be dried from 25% to 6% (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 1 m²/8 kg dry weight. [10]
 Determine the time for drying?

X	0.35	0.25	0.2	0.18	0.16	0.14	0.12	0.10	0.09	0.08	0.064
Kgmoisture/ Kg dry solid											
R	0.3	0.3	0.3	0.266	0.239	0.208	0.18	0.15	0.097	0.07	0.025
Kgmoisture/ hr.m ²											



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P7524

[6180]-31

T.E. (Chemical)

CHEMICAL TECHNOLOGY-II

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is permitted.
- 5) Assume Suitable data if necessary.

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) What is carbonization of coal? Compare types of coal carbonization. **[9]**

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

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

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

OR

Q4) a) Discuss production of producer gas with its major engineering problems. **[9]**

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

Q5) a) Explain in detail manufacturing of penicillin with major engineering problems. **[9]**

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

OR

P.T.O.

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 dichloride (EDC) with suitable example. **[9]**

OR

Q8) a) Explain production of vinyl chloride production from ethylene dichloride. **[9]**

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



[6180]-32
T.E. (Chemical)
CHEMICAL ENGINEERING MATHEMATICS
(2019 Pattern) (Semester - I) (309343)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Fit a straight line to the following set of data. **[8]**

x	1	2	3	4	5
y	3	4	5	6	8

b) Fit a second order polynomial to the data in the table below: **[9]**

x	1	2	3	4
y	6	11	18	27

OR

Q2) a) Given the table of data, obtain a regression plane to fit the data. **[9]**

x1	1	2	3	4
x2	0	1	2	3
y	12	18	24	30

b) Fit a straight line to the x and y values in the following set of data **[8]**

x	1	2	3	4	5	6	7
y	0.5	2.5	2	4	3.5	6	5.5

Q3) a) Use Runge Kutta method of forth order to find y when x=1.2 in steps of 0.1, given that $dy/dx = x^2 + y^2$ and $y(1)=1.5$. **[9]**

b) Given the equation $dy/dx = 3x^2 + 1$ with $y(1) = 2$. Estimate $y(2)$ by Euler's method using **[9]**

- i) $h = 0.5$ and ii) $h = 0.25$

OR

P.T.O.

Q4) a) Use the classical RK forth order method to estimate $y(0.4)$ when $y'(x) = x^2 - y^2$ with $y(0) = 0$ Assume $h=0.2$. [10]

b) Find by Taylors series method, the values of y at $x=0.1$ and $x=0.2$ to five places of decimals from $dy/dx=x^2y-1$, $y(0) = 1$ [8]

Q5) a) Consider a steel plate of size $15\text{cm} \times 15\text{ cm}$. If two of the sides are held at 100°C and the other two sides are held at 0°C , what are the steady state temperature at interior points assuming a grid size of $5\text{ cm} \times 5\text{ cm}$. [10]

b) Solve the Poisson equation $g(x,y) = 2x^2y^2$ over the square domain $0 \leq x \leq 3$ and $0 \leq y \leq 3$ with $f = 0$ on the boundary and $h=1$. [7]

OR

Q6) Solve numerically the wave equation [17]

$$f_u(x,t) = 4 f_{xx}(x,t) \quad 0 \leq x \leq 5$$

with the boundary conditions

$$f(0,t) = 0 \text{ and } f(5,t) = 0$$

and initial values $f(x,0) = f_t(x,0) = x(5-x)$

$$f_t(x,0) = g(x) = 0 \text{ consider } h = 1$$

Q7) a) What is Simplex method? Explain the method in detail. [10]

b) What are the six steps of optimization? Enlist and Explain. [8]

OR

Q8) Maximize $z = x_1 - x_2 + 3x_3$ [18]

$$\text{Subject to } x_1 + x_2 + x_3 \leq 10$$

$$2x_1 - x_2 \leq 2$$

$$2x_1 - 2x_2 + 3x_3 \leq 0$$

$$x_1, x_2, x_3 \geq 0$$



Total No. of Questions : 8]

SEAT No. :

P7525

[Total No. of Pages : 3

[6180]-33

T.E. (Chemical)

CHEMICAL ENGINEERING THERMODYNAMICS

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

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

Q1) a) Discuss various criteria for phase equilibrium. **[6]**

- b) Assuming Raoult's law to be valid prepare $p - x - y$ diagram for a temperature of 363.15K (90°C) for 1-Chlorobutane (1)/Chlorobenzene (2) system. Antoine equation and constants are **[12]**

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

Compound	A	B	C
1-Chlorobutane	13.7965	2723.73	218.265
Chlorobenzene	13.8635	3174.78	211.700

OR

Q2) a) Write a note on effect of temperature on P-x-y diagram. **[6]**

- b) As benzene and toluene are the members of same chemical family, they are expected to form ideal liquid solutions. Calculate the data needed to construct a t-x-y diagram for this system at a pressure of 1 bar (750 mm Hg). Constant in the Antoine equation are given for the equation: **[12]**

$\log P^{\text{sat}} = A - B/T+C$, with P^{sat} in mm Hg and T in °C. The parameters are

Compound	A	B	C
Benzene	6.90565	1211.033	220.790
Toluene	6.95334	1343.943	219.377

P.T.O.

Q3) a) Develop a mathematical expression which will indicate that all irreversible processes occurring at constant T & P proceed in such a direction as to cause decrease in Gibbs free energy of the system. [8]

b) Show that at constant T and P, The condition for stability for a single phase binary system is given as $\frac{d \ln \gamma_1}{dx_1} > -\frac{1}{x_1}$. [10]

OR

Q4) a) Explain in brief the three types of constant pressure liquid/liquid solubility diagrams. [8]

b) The following results were obtained by experimental VLE measurements on the system Ethanol (1)/Benzene (2) at 101.3 KPa. Test whether the data are thermodynamically consistent or not. [10]

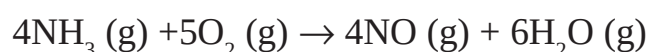
X_1	0.003	0.449	0.700	0.900
Y_1	0.432	0.449	0.520	0.719
P_1^{sat} , KPa	65.31	63.98	66.64	81.31
P_2^{sat} , KPa	68.64	68.64	69.31	72.24

Q5) a) Estimate the equilibrium constant K_a at 1000 K and 0.1 MPa for the reaction. $\text{CO}_2(\text{g}) + \text{H}_2(\text{g}) \rightarrow \text{CO}(\text{g}) + \text{H}_2\text{O}(\text{g})$. [9]

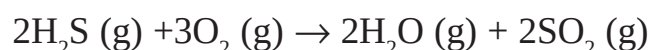
K_a at 298 K is 8.685×10^{-6} and $\Delta H_{298}^\circ = 41.45 \text{ KJ}$, $\Delta a = -15.463$, $\Delta b = 4.489 \times 10^{-3}$, $\Delta c = 0$, $\Delta d = 0$, $\Delta e = 9.677 \times 10^5$.

b) Develop expression for the reacting species as functions of the reaction coordinates for [8]

i) A system initially containing 2 mol NH_3 and 5 mol O_2 and undergoing the reaction.



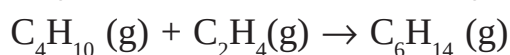
ii) A system initially containing 3 mol H_2S and 5 mol O_2 and undergoing the reaction



OR

Q6) a) Derive an expression showing the effect of temperature on equilibrium constant. [9]

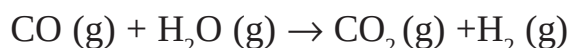
b) Calculate the standard free energy change at 298 K in the gas phase alkylation of isobutene with ethylene to form neohexane. [8]



The free energies of formation at 298 K are -21000 J/mol, 68460 J/mol and -9950 J/mol for isobutene, ethylene and neohexane respectively.

Q7) a) Write short note on phase rule and Duhems theorem for reacting systems. [8]

b) The water gas shift reaction [9]



is carried out under different sets of conditions described below. The equilibrium constant for the reaction, $K=1$. Calculate the fraction of steam reacted in each case. Assume the mixture behaves as an ideal gas.

- i) The reactants consist of 1 mol H_2O vapour and 1 mol CO . The temperature is 1100 K and pressure is 1 bar.
- ii) Same as a except that the pressure is 10 bar.
- iii) Same as a except that 2 mol N_2 is included in the reactants.

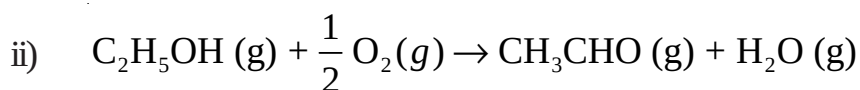
OR

Q8) a) A feed stock of pure n-butane is cracked at 750K and 1.2 bar to produce olefins. Only two reactions have favourable equilibrium conversion at these condition: [9]



If these reactions reach equilibrium, what is the product composition?

b) Calculate the standard Gibbs free energy change and the equilibrium constant at 298.15 K for the following reactions: [8]



Free energies of formation at 298.15K are given as follows:

$$\Delta G^\circ_f(\text{NH}_3) = -16.747 \text{ KJ/mol}, \Delta G^\circ_f(\text{CH}_3\text{CHO}) = -133.978 \text{ kJ/mol}$$

$$\Delta G^\circ_f(\text{H}_2\text{O}) = -228.600 \text{ kJ/mol}, \Delta G^\circ_f(\text{C}_2\text{H}_5\text{OH}) = -174.883 \text{ kJ/mol}.$$



Total No. of Questions : 8]

SEAT No. :

P7526

[6180] - 34

[Total No. of Pages : 2

T.E. (Chemical Engineering)
CHEMICAL INDUSTRY MANAGEMENT
(2019 Pattern) (Semester - I) (Elective - I) (309345 A)

Time : 2 ½ 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) 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. **[10]**

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

OR

Q2) Explain the following (any three) **[18]**

- a) Principles of lending
- b) Inventory Control.
- c) FIFO
- d) LIFO

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

b) What are the types of pricing strategies. Explain any one in detail. **[9]**

OR

Q4) a) Write a descriptive note on Marketing Mix. **[9]**

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

P.T.O.

- Q5) a)** Explain in detail International trade. **[10]**
b) What do you mean by IPR? Explain patent and patent rights. **[8]**

OR

- Q6) a)** Write a detailed note on Inflation, its types, causes, effect, and its control. **[10]**
b) Explain in detail TQM and role of ISO in TQM. **[8]**

- Q7) a)** Write a brief note on concept of guarantee and warranty. **[9]**
b) Explain the classification of types of contracts. **[8]**

OR

- Q8) a)** Write short notes on : **[9]**
i) Flow Chart and Flow Diagram
ii) MRTP
b) Define work measurement. Explain the objectives and procedures of work measurement. **[8]**



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P7527

[6180] - 35

T.E. (Chemical)

FOOD TECHNOLOGY

(2019 Pattern) (Semester - I) (Elective - I) (309345 B) (Theory)

Time : 2 ½ 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 Q8.*
- 2) *Figure to the right indicate full marks.*
- 3) *Neat diagram must be drawn wherever necessary.*
- 4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1) a)** Discuss about natural and ventilated low temperature storage methods of fruit and vegetable. **[8]**
- b) Write short notes on preservation of fruits and vegetables by **[8]**
- i) Fermentation.
 - ii) Drying.

OR

- Q2) a)** Explain glass containers seaming technology for canning of fruits and vegetables. **[8]**
- b) Write Short note on Fruit and vegetable juices. **[8]**
- Q3) a)** Discuss about various unit operations involved in food engineering processing of food grains. **[10]**
- b) Explain applications and effect on food materials for freezing. **[8]**

OR

- Q4) Write Short Notes on.** **[18]**
- a) Hot oil frying theory and equipment's.
 - b) Baking theory and equipment's.
 - c) Roasting theory and equipment's.

P.T.O.

Q5) Describe following. [18]

- a) Various methods to extend shelf-life of foodstuff.
- b) Food packaging materials and their properties.

OR

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

- i) Food packages in bags and crates.
- ii) Food packages in pouches and wrappers.

b) Explain flexible packaging materials and their properties. [8]

Q7) a) Describe Objectives, importance, and functions of quality control of food. [9]

b) Explain quality assessment of food materials in cereals and dairy products. [9]

OR

Q8) a) Write short note on Food regulations, grades and standards. [9]

b) Explain concept of USFDA/ISO 9000 in food quality assurance. [9]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P7528

[6180]-36

T.E. (Chemical)

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

Q1) List and explain the different types of Molecular weights related to Polymer engineering. **[18]**

OR

Q2) A polymer shipment is to be made up by blending three lots of polyethylene, A, B, and C. How much of each lot is needed to make up a shipment of 50,000 kg with a weight-average molecular weight of 2,50,000 and a PDI of 3.65? Let $w_i = W_i / \sum W_i$. **[18]**

Lot	Mw	PDI
A	5,00,000	2.50
B	2,50,000	2.00
C	1,25,000	2.50

Q3) Discuss in detail the Kinetics of free radical polymerization.

[17]

OR

P.T.O.

Q4) Discuss in detail the Kinetic of Step growth polymerization. **[17]**

Q5) Write a note on the need of the Polymer additives with proper example of the properties, it is used for. **[18]**

OR

Q6) a) Write a note on polymer additives as Fillers with proper example. **[9]**

b) Write a note on polymer additives as lubricants with proper example. **[9]**

Q7) With a neat and labelled diagram, explain the production and application of Polyethylene. **[17]**

OR

Q8) With a neat and labelled diagram, explain the production and application of Nylon. **[17]**



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P7529

[6180]-37

T.E. (Chemical)

DOWNSTREAM PROCESSING

(2019 Pattern) (Semester-I) (Elective-I) (309345D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn whenever necessary
- 3) Assume Suitable data if necessary.

Q1) a) Explain gas-recovery-olefin in petrochemical industry? **[9]**

b) Explain downstream process in petrochemical industry. **[9]**

OR

Q2) a) Explain cryogenic distillation in detail. **[9]**

b) Explain desulfurisation in detail. **[9]**

Q3) a) Explain extractive distillation. **[9]**

b) Explain homogeneous azeotropic distillation. **[9]**

OR

Q4) Write short notes on: **[18]**

a) Pressure swing distillation.

b) Column sequences.

Q5) a) Explain the properties of molecular sieves. **[9]**

b) Explain manufacturing processes of molecular sieves. **[9]**

OR

Q6) a) Explain the hydrogel process and its applications. **[9]**

b) Give the example of energy conservation in separation processes. **[9]**

P.T.O.

Q7) Write short notes on

[16]

- b) Separation of nonazeotropic mixtures.
- b) Ion exchange

OR

Q8) Write short notes on:

[16]

- a) Separation of non-ideal liquid mixtures.
- b) Regeneration of resins.



Total No. of Questions : 8]

SEAT No. :

P7530

[Total No. of Pages : 3

[6180]-38
T.E. (Chemical)
CHEMICAL REACTION ENGINEERING - I
(2019 Pattern) (Semester - II) (309348)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and 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) For second order liquid phase reaction, $A \rightarrow R$ taking place in mixed

flow reactor, show that, $X_A = \frac{(1 + 2D_a) - \sqrt{1 + 4D_a}}{2D_a}$ [9]

Note : Damkohler Number, $D_a = k\tau C_{A0}$

- b) Derive performance equation of [9]
- i) Batch Reactor
 - ii) Mixed Flow Reactor
 - iii) Plug Flow Reactor

OR

Q2) a) For First order reaction $A \rightarrow R$ for changing density system taking place in Plug Flow Reactor, Prove that $k\tau = -(1 + \varepsilon_A) \ln(1 - X_A) - \varepsilon_A X_A$ [9]

- b) Write Advantages, Disadvantages and applications of the following. [9]
- i) Batch Reactor
 - ii) Mixed Flow Reactor
 - iii) Plug Flow Reactor

Q3) a) Give quantitative treatment of product distribution and of reactor size for parallel reaction. [8]

P.T.O.

- b) Consider the parallel decomposition of A different orders. [10]

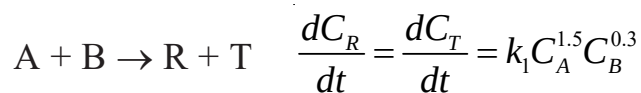


Determine the maximum concentration of desired product obtainable with C_{A0} in

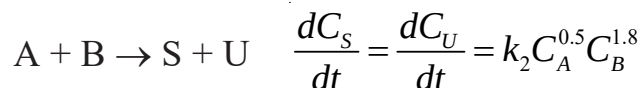
- i) Plug Flow Reactor
- ii) Mixed Flow Reactor, for $C_{A0} = 2$

OR

- Q4) a) The desired liquid phase reaction [8]



Is accompanied by the unwanted reaction



Order the contacting schemes given below for the product distribution from the most favorable to the least favorable.

Contacting schemes:

- i) A Plug Flow Reactor
 - ii) A Plug Flow Reactor with side streams of B
 - iii) A Plug Flow Reactor with side streams of A
 - iv) A Mixed Flow Reactor
- b) Explain quantitative treatment for the irreversible unimolecular first order reaction in series occurring in mixed flow reactor. [10]

- Q5) a) Explain the effect of temperature on the rate of reaction by following theories: [8]

- i) Collision Theory
- ii) Transition State Theory

- b) Derive the relation between conversion and temperature for an adiabatic reactor using the energy balance and explain how you determine the reactor size for adiabatic operation of Plug Flow Reactor and Continuous Stirred Tank Reactor. [9]

OR

- Q6)** a) Explain the effect of temperature, pressure and inert on equilibrium conversion X_C for exothermic and endothermic reactions. [9]
 b) Explain in detail the optimum temperature progression for [8]
 i) Irreversible reactions
 ii) Exothermic reversible reaction

- Q7)** a) Explain E, F, C Curves and find the relationship between them. [9]
 b) Calculate the mean residence time and the variance for a vessel from the following data: [8]

t, min	0	1	2	3	4	5	6	7	8	9	10	12	14
E, min ⁻¹	0	0.02	0.10	0.16	0.20	0.16	0.12	0.08	0.06	0.044	0.03	0.012	0

Note: These RTD Data is obtained from a pulse input

OR

- Q8)** a) Discuss Tank in series model and Dispersion Model. [9]
 b) A reactor with a number of dividing baffles is used to run the reaction $A \rightarrow B$ with $-r_A = 0.05 C_A$ mol/litre. min. [8]

A pulse tracer test gives the following output curve:

t, min	0	10	20	30	40	50	60	70
C (g/m ³)	35	38	40	40	39	37	36	35

Calculate the conversion assuming

- i) Plug Flow
 ii) Mixed flow



Total No. of Questions : 8]

SEAT No. :

P7531

[Total No. of Pages : 3

[6180]-39

T.E. (Chemical)

MASS TRANSFER-II

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve 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 side indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Nicotine (C) in a water (A) solution containing 1% nicotine is to be extracted with kerosene (B) at 293 K (20°C). Water and kerosene are essentially insoluble. 100 kg of a feed solution is to be treated with kerosene in three-stage cross current extraction system using equal quantity of solvent each time. If nicotine removed is 66.3% of that in feed determine the quantity of solvent used for each stage. Equilibrium data are as follows:

[10]

X=kg Nicotine/kg water	0	0.00101	0.00246	0.00502	0.00751	0.00998	0.0204
X=kg Nicotine/kg Kerosene	0	0.00807	0.00196	0.00456	0.00686	0.00913	0.0187

- b) Write a material balance for single stage solvent Extraction with immiscible solvents with graphical representation of equilibrium characteristics. **[8]**

OR

Q2) a) Explain the selection criteria of solvent used for Liquid-Liquid Extraction. **[5]**

- b) Discuss on the applications of Liquid-liquid Extraction with suitable examples. **[5]**

- c) Explain Binodal Solubility Curve with triangular diagram in solvent Extraction. What would be the effect of temperature on the Binodal Solubility Curve? **[8]**

P.T.O.

- Q3) a)** Explain the construction and mechanism of Rotocel Extractor for leaching operation with neat diagram. **[10]**
- b) Explain applications of leaching and the factors affecting the rate of leaching. **[7]**

OR

- Q4) a)** Discuss on the graphical representation of equilibrium characteristics of Leaching operation with diagram and proper notations. **[7]**
- b) Crushed oil seeds containing 55 % oil by weight are to be extracted at a rate of 4000 kg/h using 6000 kg/h of Hexane containing 5% by weight as a solvent in a counter current two stage Extraction system. The oil seeds retain 1 kg of solution per kg of oil- free cake. Calculate the percentage of oil recovery based on the original feed obtained under the above conditions. **[10]**

- Q5) a)** Explain Pressure Swing Adsorption and Temperature Swing Adsorption with their applications. **[8]**
- b) Halibut oil is to be extracted from granulated Halibut livers in a counter current 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 250 kg/hr. **[10]**
- i) Determine the number of theoretical stages required.
- ii) Determine % recovery of the oil.

The entertrainment 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

OR

- Q6) a)** Explain the characteristics of adsorbents and mention different types of adsorbents with their specific applications. **[8]**
- b) Describe the adsorption Isotherms in adsorption operation. Explain the Breakthrough Curve in detail giving its significance and mention the factors affecting the shape. **[10]**

- Q7) a)** Calculate the yield of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ crystals when 1000 g saturated solution of MgSO_4 at 353 K is cooled to 303K assuming 10% of water is lost by evaporation during cooling. **[10]**

Data: Solubility of MgSO_4 at 353K = 64.2 kg/100kg water

Solubility of MgSO_4 at 303K = 40.8 kg/100kg water

Molecular weight of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ = 246

- b) Enlist the methods of super saturation and explain Mier's theory of super saturation in crystallizaiton. **[7]**

OR

- Q8) a)** Classify the membrane processes and explain the principle and application of Reverse Osmosis. **[7]**

- b) Explain the Factors affecting the rate of crystallization. Explain the construction and working of Swenson Walker Crystallizer with diagram.**[10]**



Total No. of Questions : 8]

SEAT No. :

P7532

[6180]-40

[Total No. of Pages : 2

T.E. (CHEMICAL)
TRANSPORT PHENOMENA
(2019 Pattern) (Semester - II) (309350)

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)** Derive the expression of molar flux. concentration profile and average concentration for diffusion with homogeneous chemical reaction. **[12]**
- b) Explain mass balance equation for microscopic systems. **[6]**

OR

- Q2)** In studying rate of leakage of substance A from solid particles by solvent B, rate controlling step is diffusion from A from particle surface through liquid film into a main liquid stream. Solubility of A in B is C_{A0} mol/cm³ and concentration in the main stream is $C_{A\delta}$ mol/cm³. **[18]**

- a) Obtain differential equation for C_A as a function of Z.
- b) Show that in absence of chemical reaction in the liquid phase, the concentration profile is linear.
- c) Show that rate of leaching is then given by.

$$N_{AZ} = D_{AB} \frac{C_{A0} - C_{A\delta}}{\delta}$$

- Q3)** Derive Euler's equation of motion. **[17]**

OR

P.T.O.

- Q4) a)** Explain different types of derivatives used in deriving equation of change. [5]
- b) Use Navier-Stokes equation of motion to determine velocity distribution for laminar flow of Newtonian fluid through vertical pipe. [12]

- Q5) a)** Show that for laminar flow of fluid through the tube $f = 16/Re$. [6]
- b) 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]

OR

- Q6) a)** Derive Blake Kozeny equation for laminar flow of fluid through packed bed. [12]
- b) What pressure gradient is required to cause N, N-diethylamine to flow in a horizontal smooth tube of inside diameter 3 cm at a rate of 1.1 lit/sec. Density of diethylamine is 935 kg/m^3 and viscosity is 1.95 cp. Assume factor of ' f ' = 0.0063. [6]

- Q7) a)** Explain co-relation of binary mass transfer coefficient in one phase at low mass transfer rates. [9]
- b) A spherical water droplet, 0.05 cm in diameter is falling at velocity of 215 cm/sec through dry, still air at 1 atm pressure. Estimate instantaneous rate of evaporation from the drop if drop surface is at 21°C and air at 60°C . Vapor pressure of water at 21°C is 0.0247 atm. Assume pseudo steady state condition and $k_{xm} = 1.35 \times 10^{-3} \text{ mol S}^{-1} \text{ cm}^2$. [8]

OR

- Q8) a)** Explain Chilton and Colburn analogy. [9]
- b) Explain Martinnelli's analogy. [8]



Total No. of Questions : 8]

SEAT No. :

P7533

[Total No. of Pages : 2

[6180]-41

T.E. (Chemical)

ENERGY CONSERVATION IN CHEMICAL PROCESS INDUSTRIES

(2019 Pattern) (Semester - II) (Elective - II) (309351 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 whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain the different energy available for Industrial use. **[10]**

b) Write down motivation program for implementing conservation measures. **[7]**

OR

Q2) Which are the best practices those should be followed in Paper and Pulp industry for conversation of energy. **[17]**

Q3) a) Write in details about waste heat utilization for energy conservation in process industries. Give suitable examples? **[8]**

b) Which are different function of Energy Manager? **[10]**

OR

Q4) Enlist different activities for promoting energy conservation at present status. **[18]**

P.T.O.

Q5) a) Distinguish between Batch & continuous process in contest of energy saving. **[10]**

b) How energy conservation can be achieved in boilers? **[8]**

OR

Q6) How and where the energy losses can be minimized in a Mixing Vessel. **[18]**

Q7) a) Draw the sketch of heat pump and explain its principle and working. **[10]**

b) Explain the role of equipment manufacturer in the development and future prospects for a process industry. **[7]**

OR

Q8) Explain waste minimization and its classification, housekeeping, process change, recycling, product modification, waste minimization methodology steps, benefits of waste minimization in Sugar industry. **[17]**



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P7534

[6180]-42

T.E. (Chemical)

PROCESS INSTRUMENTATION AND CONTROL

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

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

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

b) Explain LVDT as pressure measuring device. **[8]**

OR

Q2) a) What are different types of manometers? With neat sketch explain well manometer. **[8]**

b) What are transducers? Explain types of transducers. **[8]**

Q3) a) Explain with diagram, construction and working of Rota meter with its industrial application. **[9]**

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

OR

P.T.O.

Q4) a) Draw neat diagram and explain construction, working, principle and application of pitot tube with its industrial application. **[9]**

b) Explain classification of level measuring instruments. **[9]**

Q5) a) With neat diagram describe IR absorption spectroscopy techniques of composition analysis. **[9]**

b) With neat diagram describe Gas chromatography techniques of composition analysis. **[9]**

OR

Q6) a) Explain principle with diagram, construction and working of colourimetric analysis. **[9]**

b) With neat diagram describe construction and working and application of pH meter. **[9]**

Q7) a) Describe the heat exchanger automatic control system with block diagram. **[9]**

b) Explain with equation, different control actions. **[9]**

OR

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

b) Classify process variable with respect to process control. **[9]**



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P7535

[6180]-43

T.E. (Chemical)

CORROSION ENGINEERING

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain in detail about dezincification. [2]
- b) What are the factors that influence corrosion. [8]
- c) Discuss Remedial Measure for dezincification and intergranular Corrosion.[8]

OR

- Q2)** a) What is erosion and cavitation? Explain in detail. [8]
- b) What is stress corrosion cracking? Explain Prevention of Stress Corrosion Cracking. [10]

- Q3)** a) Explain the Testing method for Different Metal. [7]
- b) Explain in detail about the Effect of temperature and composition on Media. [8]
- c) Define Corrosion. [2]

OR

P.T.O.

- Q4)** a) Explain the describe the Mechanism and Kinetic of Oxidation. [8]
b) Explain in detail about Corrosion of iron and steel in aqueous media.[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. :

[Total No. of Pages : 2

P7536

[6180]-44

T.E. (Chemical)

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right side indicate full marks.

Q1) a) Write down four tools of expert system. **[5]**

b) List at five advantages of using ANN models using examples. **[5]**

c) What are steps involved in training of ANN? **[8]**

OR

Q2) a) Write down applications of expert systems in chemical and bio-chemical processes. **[10]**

b) What are facets of Knowledge in AI? **[8]**

Q3) a) When to use and not to use expert systems? **[7]**

b) What is deductive retrieval? **[5]**

c) List at least five advantages of using ANN models. **[5]**

OR

P.T.O.

- Q4)** a) Explain Rule based systems. [7]
b) Explain STRIPS employed in planning. [10]

- Q5)** a) Explain Rule based Expert systems. [8]
b) Explain: [10]
i) Goal Stack Planning
ii) Plan space planning

OR

- Q6)** a) What is second order logic in Artificial Intelligence? [10]
b) Explain adaptive and learning system in detail. [8]

- Q7)** a) What are conditions required for input data for ANN model building? [8]
b) List the agents of learning of Knowledge-based learning with brief explanation. [5]
c) Explain: [4]
i) Nodes
ii) Weight

OR

- Q8)** a) Explain Knowledge-based learning in Artificial Intelligence. [10]
b) What is unified framework for planning? [7]



Total No. of Questions : 8]

SEAT No. :

P-7537

[Total No. of Pages : 2

[6180]-45

T.E. (Computer Engg./Artificial Intelligence & Data Science)

DATABASE MANAGEMENT SYSTEM

(2019 Pattern) (Semester - I) (310241)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is anomaly in relational model. Explain how normalization can be used to reduce the anomalies. [9]

b) Explain 2NF and 3NF and BCNF with example. [9]

OR

Q2) a) What are relational integrity constraints. Explain with example Domain constraints, Referential-Integrity and enterprise constraints. [9]

b) Elaborate the significance of codd's rule. Explain 12 rules proposed by codd's. [9]

Q3) a) 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]

b) Explain the two-phase lock protocol for concurrency control. Also explain its two versions: strict two-phase lock protocol and rigorous two-phase lock protocol. [8]

OR

P.T.O.

- Q4)** a) 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. [8]
- b) To ensure atomicity despite failures we use Recovery Methods Explain in detail following Log-Based Recovery methods with example. [9]
- i) Deferred Database Modifications
- ii) Immediate Database Modifications

- Q5)** a) Compare SQL and NOSQL Database. [6]
- b) Explain BASE Properties of NOSQL Database. [6]
- c) Explain Document Based and Key value data model of NOSQL Database. [6]

OR

- Q6)** a) Explain the CRUD operations used in MongoDB with example. [6]
- b) State and Explain CAP Theorem. [6]
- c) Explain Map Reduce with example. [6]

- Q7)** a) What are spatial data. Explain Geographic and Geometric data. [8]
- b) What is the significance of XML databases? Explain with proper example when to use XML database. [9]

OR

- Q8)** a) Write a short note on complex data types : [8]
- i) Semi-structured data
- ii) Features of semi-structured data models
- b) What is object relational database system. Explain Table inheritance with example. [9]



Total No. of Questions : 8]

SEAT No. :

P-7858

[Total No. of Pages : 3

[6180]-46A
T.E. (Computer Engineering)
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) Check whether the string 10010 is a member of the language generated by following grammar by using Cocke-Younger-Kasami Algorithm- **[9]**

$S \rightarrow AB|BC$

$A \rightarrow BA|0$

$B \rightarrow CC|1$

$C \rightarrow AB|0$

b) Obtain grammar to generate the following language : **[8]**

$L = \{w : n_a(w) \bmod 2 = 0 \text{ where } w \in \{a, b\}^*\}$

i.e. Language of a and b in which number of number of a's in the string is either zero or in multiple of 2 only.

OR

Q2) a) **[9]**

$S \rightarrow aB|bA$

$A \rightarrow a|aS|bAA$

$B \rightarrow b|bS|aBB$

Derive using Leftmost Derivation and Rightmost Derivation:

i) bbaaba ii) aaabbb.

Draw parse tree for the same.

P.T.O.

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

i) $L_1 = \{a^i b^j c^k \text{ such that } i = j+k \text{ where } i, j, k \geq 1\}$

ii) $L_2 = \{a^i b^j c^k \text{ such that } j = i+k \text{ where } i, j, k \geq 1\}$

Q3) a) Construct a PDA equivalent to following CFG [10]

i)

$X \rightarrow 0$

$X \rightarrow 0X$

$X \rightarrow 1XX$

$X \rightarrow XX1$

$X \rightarrow X1X$

ii) $S \rightarrow BD|BC$

$D \rightarrow SC$

$C \rightarrow AA$

$B \rightarrow 0$

$A \rightarrow 1$

b) Design a PDA for a language $L = \{a^n b^{2n} | n \geq 1\}$ [8]

OR

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

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

c) Obtain a PDA to accept the language -

$L = \{w | w \in \Sigma^*, \Sigma = \{a,b\} \text{ and } n_a(w) = n_b(w)\}$ by final state [6]

Q5) a) Design a Turing machine for well formed parenthesis. [6]

b) Design a TM that accepts all strings over $\{1,0\}$ with even number of 0's and even number of 1's. [8]

c) Construct TM that recognizes language over alphabet 0,1 such that string ends in 10. [4]

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 1's Complement. [4]

- Q7)** a) What is post correspondence problem? Explain PCP with following instance of the set of the strings A and B. [8]

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

- b) State and explain with suitable example [9]
 i) Decidable Problem
 ii) Undecidable Problem
 iii) Church-Turing Thesis.

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) Explain with suitable example and diagrams [9]
 i) Halting problem of TM
 ii) Multitape TM
 iii) Universal TM



Total No. of Questions : 8]

SEAT No. :

P-7539

[Total No. of Pages : 2

[6180]-47

T.E.(Computer Engineering)

**SYSTEM PROGRAMMING AND OPERATING SYSTEM
(2019 Pattern) (Semester - I) (310243)**

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 and Q.No 7 or Q.No 8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Explain in brief Compile and Go loading scheme. What are advantages and disadvantages of it. **[10]**

b) Describe the concept of DLL? How dynamic linking can be done with or without import. **[8]**

OR

Q2) a) Write short notes on : **[10]**

- i) Subroutine Linkage
- ii) Overlays

b) With the help of diagram explain General Loading Scheme. **[8]**

Q3) a) List different types of Operating Systems? Describe any two of them.**[9]**

b) Differentiate Preemptive and non preemptive scheduling. **[8]**

OR

Q4) a) What is time quantum and its significance in Round robin scheduling.**[9]**

b) Explain multithreaded mode and Process Control block in detail. **[8]**

Q5) a) What is semaphore? Justify how semaphore is used to solve critical section problem. **[10]**

b) Explain necessary conditions for occurrence of deadlock. **[8]**

OR

Q6) a) Explain hardware approach for Mutual Exclusion with its advantages and disadvantages. **[10]**

b) Write a solution to Reader Writer problem using Semaphore with Readers have priority. **[8]**

Q7) a) Given a memory partitions of 100K, 500K, 200K, 300K and 600K (in order), how would each of the first fit, best fit and worst fit algo. Place processes of size 212K, 417K, 112K, 426K (in order)? Which also makes the most efficient use of memory. **[9]**

b) What is internal fragmentation? Explain same with suitable diagram/example. **[8]**

OR

Q8) a) Write and explain Deadlock Avoidance Bankers Algorithm. **[9]**

b) Compare Paging and Segmentation with the help of example. **[8]**



Total No. of Questions : 8]

SEAT No. :

P-7540

[Total No. of Pages : 2

[6180]-48

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, 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) Give short note on : [6]

- i) ARP
- ii) RARP

- b) Explain Distance vector routing. [6]
- c) Differentiate between Circuit Switching, Message Switching and Packet Switching. [6]

OR

Q2) a) Give short note on : [6]

- i) ICMP
- ii) IGMP

- b) Explain Link state routing. [6]
- c) 192.168.5.51 / 26 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 0e 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]

P.T.O.

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]

- 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. :

P-7541

[Total No. of Pages : 2

[6180]-49

T.E. (Computer Engineering)

INTERNET OF THINGS AND EMBEDDED SYSTEMS

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

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

- Q1)** a) Explain the steps involved in the IoT design methodology. **[6]**
b) Explain the concept of Machine-to-Machine (M2M) communication in the context of IoT. **[6]**
c) Illustrate the different pillars of IoT. **[6]**

OR

- Q2)** a) Identify and explain the key components of an IoT network architecture. **[6]**
b) Demonstrate the Web socket API with suitable IoT system. **[6]**
c) Discuss the advantages and limitations of using IoT communication APIs in home automation systems. **[6]**

- Q3)** a) Analyze the characteristics and functionalities of M2M protocols used in IoT applications. **[6]**
b) Analyse the Modbus protocol and its usage in industrial IoT applications. Discuss the features and functionalities of Modbus, its communication modes, and the benefits it offers in connecting devices in industrial automation. **[6]**
c) Analyse the working principles and applications of the RFID protocol in IoT system. **[5]**

P.T.O.

OR

- Q4)** a) Classify between M2M and SCADA Protocol with proper example. [6]
b) Demonstrate the use of IP based protocols in the IoT Applications. [6]
c) Show the use of LoRa protocol in the smart irrigation system development. [5]

- Q5)** a) Examine how Cloud Computing is an IoT enabling technology with the suitable applications. [8]
b) Design a cloud storage model for an IoT-based healthcare application. Consider the storage requirements, data security, and privacy concerns associated with sensitive patient health records. Discuss the pros and cons of using public, private, and hybrid cloud storage options. [10]

OR

- Q6)** a) Show that Cloud computing is the fusion of Grid Computing and SOA. [8]
b) Design a home automation system using the AutoBahn for IoT and Xively Cloud for IoT communication APIs. Discuss how these APIs can be used to enable device control, data collection, and remote monitoring of various home appliances and sensors. [10]

- Q7)** a) Design an introduction to IoT security, highlighting the unique challenges and vulnerabilities associated with IoT deployment. [8]
b) Illustrate the challenges in securing IoT applications. [9]

OR

- Q8)** a) Predict the possible vulnerabilities in designing smart home intrusion detection system. [8]
b) Design a case study on designing a secure IoT home intrusion detection system. Identify the challenges and considerations involved in ensuring the confidentiality, integrity, and availability of data, as well as the timely detection and response to potential security breaches. [9]



Total No. of Questions : 8]

SEAT No. :

P-7542

[Total No. of Pages : 2

[6180]-50

T.E. (Computer Engineering / A.I & D.S)

HUMAN COMPUTER INTERFACE

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn whenever necessary.*
- 4) *Make suitable assumption whenever necessary.*

- Q1)** a) What is Ergonomics? Explain the Arrangement of controls and display with respect to cognitive aspects of design. [6]
- b) List the interaction styles and explain any one in detail. [6]
- c) Write a short note on Human Memory and its types. [6]

OR

- Q2)** a) What are the psychological reactions to poor interface designs? [6]
- b) What is Usability Engineering? Explain Scenario based usability Engineering. [6]
- c) List the Principles of User Interface of design and explain any one in detail. [6]

- Q3)** a) List the seven commandments and explain “Soliciting early and ongoing user involvement” in detail. [6]
- b) Explain the importance of multimodal interaction with respect to “Sound in interface”. [6]
- c) Explain the Cognitive Walkthrough concept With example. [5]

OR

P.T.O.

- Q4)** a) Explain GOMS model with an example. [6]
b) Explain the Summative and Formative Evaluation techniques. [6]
c) Write a note on “Usability testing in Laboratory”. [5]

- Q5)** a) What is CSCW? Give example. [6]
b) Explain Heuristic evaluation with example. [6]
c) Explain the five stage search framework. [6]

OR

- Q6)** a) Write a comparison between Dynamic queries and faceted search in a user interface. [6]
b) What is the role of Pattern Recognition in HCI? Explain with example. [6]
c) What factors should be considered for data entry designing for any HCI? [6]

- Q7)** a) Explain the difference between good and bad interface in a mobile based app with example. [6]
b) Which factors are important in designing an interface for a handheld device. [6]
c) What are the important aspects to be considered when designing help screens in a mobile app? [5]

OR

- Q8)** a) Explain the design principles for user interface in mobile devices. [6]
b) Explain the importance of using carousels in designing mobile apps. [6]
c) How can drawers and secondary drawers help in better designing of a mobile app? [5]



Total No. of Questions : 8]

SEAT No. :

P-7543

[Total No. of Pages : 2

[6180]-51

T.E. (Computer Engineering)

DISTRIBUTED SYSTEMS

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn whenever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data whenever necessary.

- Q1)** a) Explain in short, physical and logical clocks synchronization. [6]
b) What is mutual exclusion? List its requirements. [6]
c) What is the goal of an election algorithm? Explain it in detail. [6]

OR

- Q2)** a) Explain how mutual exclusion is handled in distributed system? [6]
b) Explain Aggregation as a Gossip-Based Contribution. [6]
c) Explain in short, following Election Algorithms: [6]
i) Bully Algorithm
ii) Ring Algorithm

- Q3)** a) Explain the need of Distributed File System. List any three distributed file systems. [6]
b) Explain why Naming is essential in DFS? Describe Flat Naming in DFS. [6]
c) Explain in brief, File service architecture of Distributed File System. [5]

OR

P.T.O.

- Q4)** a) Explain distributed file system requirements. [6]
b) Explain the following Naming in DFS. [6]
i) Structured naming
ii) Attributed Based Naming
c) Explain in short : Andrew file system of DFS. [5]

- Q5)** a) What is Replication? Explain replication as a scaling technique. [6]
b) Explain the methods of Content Replication and Content Distribution. [6]
c) Explain with suitable example, Cache Coherence Protocols. [6]

OR

- Q6)** a) Explain how Data-Centric consistency models are different than the from Client-Centric Consistency models? [6]
b) Explain the following consistency protocols. [6]
i) Continuous Consistency
ii) Sequential Consistency
c) Explain the terms : Monotonic Reads and Monotonic Writes of Consistency models. [6]

- Q7)** a) What is Failure Masking? Explain Failure Masking by Redundancy. [6]
b) Explain Reliable Client Server Communication in terms of Point-to-Point Communication. [6]
c) What is RPC? Explain RPC semantics in the presence of failure. [5]

OR

- Q8)** a) What is Fault Tolerance? Explain the failure models of fault tolerance. [6]
b) What do you mean by Failure Recovery? Explain the various failure recovery Techniques. [6]
c) Define the terms of group communication: Atomic multicast and Distributed Commit. [5]



Total No. of Questions : 8]

SEAT No. :

P-7544

[Total No. of Pages : 2

[6180]-52

T.E. (Computer)

SOFTWARE PROJECT MANAGEMENT

(2019 Pattern) (Semester - I) (310245(D)) (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) Neat diagrams must be draw,, wherever necessary.
- 4) Assume suitable data, if necessary.
- 5) Use of non-programable calculator is allowed.

- Q1)** a) Define the term activity table? Explain activity table of forward pass? [6]
- b) List and explain activity relationships used in software project management. [6]
- c) What is critical path? List the limitations of critical path. [6]

OR

- Q2)** a) Differentiate between forward and backward pass techniques. [6]
- b) Explain formulating a network model in detail with the neat diagram. [6]
- c) Write short note on : [6]
- i) Activity float
 - ii) Shortening the project duration

- Q3)** a) Write short note on Earned Value Analysis. [6]
- b) List and explain different types of project status reports. [6]
- c) Explain the term contract management. List the different terms of a contract. [5]

P.T.O.

OR

- Q4)** a) Explain in detail change control process with neat diagram. [6]
b) What are the different methods used in visualizing project progress explain in detail? [6]
c) Write short notes on cost monitoring. [5]

- Q5)** a) What is Agile Project? Explain the stages of Agile Project. [6]
b) Explain Scrum methodology with different stakeholders. [6]
c) Differentiate between Non-Agile and Agile Project. [6]

OR

- Q6)** a) Explain the term Scheduling and Tracking in agile projects. [6]
b) What is Agile methodology? List the advantages of Agile methodology. [6]
c) What is Product backlog? Explain it with neat diagram. [6]

- Q7)** a) State and explain the basic steps involved in a typical selection procedure. [6]
b) With neat diagram explain Z theory features. [6]
c) What is Decision Making? Explain its types. [5]

OR

- Q8)** a) With neat sketch explain Virtual Teams. Explain challenges in working with virtual team. [6]
b) List and explain all the stages of team development. [6]
c) Write short note on Communication Plan. [5]



Total No. of Questions : 8]

SEAT No. :

P-7545

[Total No. of Pages : 3

[6180]-53

T.E. (Computer Engineering)

DATA SCIENCE AND BIG DATA ANALYTICS

(2019 Pattern) (Semester - II) (310251)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer 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 Scientific calculator is permitted.

- Q1)** a) Explain Data Analytics Cycle with suitable diagram and its phases. [8]
b) List and Explain the various activities involved in identifying potential data resources as a part of discovery phase in Data Analytics Life Cycle? [9]

OR

- Q2)** a) List and explain the key roles for successful analytics project. [8]
b) Write short note on : [9]
i) Common Tools for the Model Building
ii) Model selection for Data Analytics

- Q3)** a) List and explain the various types of analytics in Big data. [9]
b) Calculates the support and confidence value for all the possible item sets.[9]

Transaction ID	Items bought
1	Onion, Potato, Cold Drink
2	Onion, Burger, Cold Drink
3	Eggs, Onion, Cold Drink
4	Potato, Milk, Eggs
5	Potato, Burger, Cold Drink, Milk, Eggs

OR

P.T.O.

- Q4) a)** Explain the need of logistic regression along with its various types. [9]
- b)** Explain the following terms with suitable example. [9]
- Removing Duplicates from dataset.
 - Handling Missing Data

- Q5) a)** Suppose that the given data the task is to cluster points (with (x, y) representing location) into three clusters, where the points are A1 (2, 10), A2(2, 5), A3(8, 4), B1(5, 8), B2(7, 5), B3(6, 4), C1(1, 2), C2(4, 9). The distance function is Euclidean distance. Suppose initially we assign A1, B1 and C1 as the center of each cluster, respectively. [8]

Use the k-means algorithm to show only show only the first round of execution with cluster center.

- b)** Explain the following Text Analysis steps with suitable example [9]
- Part-of-speech(POS)tagging
 - Lemmatization

OR

- Q6) a)** Given the confusion matrix, Calculate Accuracy, Precision, Recall, Error rate with description on Diabetic Risk. [8]

	Classes	Predicted classes	
		Diabetic Risk -Yes	Diabetic Risk -No
Actual classes	Diabetic Risk- Yes	90	210
	Diabetic Risk- No	140	9560

- b)** Explain the Text Preprocessing steps with suitable example. [9]

- Q7) a)** List the few data visualization tools and discuss any four applications of data visualization along with the use of the various plots with Python/R or suitable tool. [9]

- b)** List the challenges of Data Visualization. Explain the types of visualization with example. [9]

OR

- Q8)** a) Explain in detail the Hadoop Ecosystem with suitable diagram along with the various components. **[9]**
- b) Write a short note on the following. **[9]**
- a) Map Reduce
- b) Pig



Total No. of Questions : 8]

SEAT No. :

P-7546

[Total No. Of Pages : 2

[6180]-54
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, 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 Servlet architecture with diagram and explain servlet lifecycle. **[9]**

b) Explain the concept of DTDs with example. Differentiate DTD Vs XML Schema (Min 4). **[9]**

OR

Q2) a) Explain the Servlet and MySQL database connectivity with example code to display data from employee(emp_id, emp_name, emp_dept) table. **[9]**

b) Write note on: **[9]**

i) AJAX

ii) XML

Q3) a) Explain the concept of JSP with syntax and sample example. Explain the analogy of JSP and Servlets. **[9]**

b) Explain the concept of WSDL and SOAP. **[8]**

OR

P.T.O.

- Q4)** a) Explain JSP with support for Model View Controller. [9]
- b) Explain the concept of struts with architecture, actions, interceptors and exception handling. [8]

- Q5)** a) Explain different types of arrays in PHP with example [9]
- b) Write note on: [9]
- i) ASP.NET
- ii) NodeJS

OR

- Q6)** a) Write php code to connect MYSQL database to display records from the table [9]
- b) Explain the concepts of WAP, WML and .NET framework. [9]
- Q7)** a) Explain scalar types, operations and pattern matching in Ruby. [9]
- b) Explain documents requests and processing forms in Rails. [8]

OR

- Q8)** a) Explain the concept of classes and arrays in Ruby. [9]
- b) Explain concepts of Rails with AJAX and EJB. [8]



Total No. of Questions : 8]

SEAT No. :

P-7547

[Total No. of Pages : 3

[6180]-55

T.E. (Computer Engineering)

ARTIFICIAL INTELLIGENCE

(2019 Pattern) (Semester - II) (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) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.

Q1) a) List All problem solving strategies. What is backtracking, explain with n queen problem. [8]

b) Write Minimax Search Algorithm for two players. How use of alpha and beta cut-offs will improve performance? [9]

OR

Q2) a) Define Game theory, Differentiate between stochastic and partial games with examples. [9]

b) Define is Constraint satisfaction problem, State the types of consistencies Solve the followiig Crypt Arithmetic Problem. [8]

$$\begin{array}{rcccc} & B & A & S & E \\ + & B & A & L & L \\ \hline G & A & M & E & S \end{array}$$

Q3) a) What is an Agent. Name any 5 agents around you Explain Knowledge based agent with Wumpus World. List and explain in short the various steps of knowledge engineering process [9]

Consider the following axioms: If a triangle is equilateral then it is isosceles.

b) If a triangle is isosceles, then its two sides AB and AC are equal. If AB and AC are equal, then angle B and C are equal. ABC is an equilateral triangle. Represent these facts in predicate logic. [9]

OR

P.T.O.

- Q4) a)** Write the following sentences in FOL(using types of quantifiers) [9]
- i) All birds fly
 - ii) Some boys play cricket
 - iii) A first cousin is a child of a parent's sibling
 - iv) You can fool all the people some of the time and some of the people all the time, but you cannot fool all the people all the time
- b) What is Knowledge Representation using propositional Logic? Compare propositional and predicate Logic. [9]

- Q5) a)** Explain Forward Chaining and Backward Chaining. With its Properties, advantages and Disadvantages. [9]

Explain :

- b) i) Unification in FOL [8]
- ii) Reasoning with Default information

OR

- Q6) a)** Explain FOL inference for following Quantifiers [8]
- Universal Generalization
 - Universal Instantiation
 - Existential Instantiation
 - Existential introduction
- b) What is Ontological Engineering, in details with its categories object and Model. [9]

- Q7) a)** Explain with an example Goal Stack Planning (STRIPS algorithm). [5]
- 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 [5]
- 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. [8]



Total No. of Questions : 8]

SEAT No. :

P-7548

[Total No. of Pages : 2

[6180]-56

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) *Neat diagram must be drawn wherever necessary*
- 3) *Assume suitable data if necessary.*

Q1) a) Explain Diffie-Hellman key exchange algorithm. [6]

b) Determine the value of x using the Chinese remainder theorem. [6]

$$x \equiv 2 \pmod{3}$$

$$x \equiv 3 \pmod{5}$$

$$x \equiv 2 \pmod{7}$$

c) What are the different types of attacks possible on RSA? Explain in brief. [6]

OR

Q2) a) Explain the “Man in the middle” attack in Diffie Hellman Key Exchange algorithm with the help of an example. [6]

b) Perform encryption and decryption using RSA algorithm for the following : [6]

$$P = 5; q = 11; e = 3; M = 9$$

c) Explain El-Gammal Algorithm in detail. [6]

Q3) a) Compare between IPSec and TLS. [6]

b) Explain the steps to create the digital certificate with diagram. [5]

c) Define hash function. List the requirements of hash function. [6]

OR

P.T.O.

- Q4)** a) List and describe the contents of the Encapsulating Payload header in IPSec with diagram. [6]
b) Explain the contents of X.509 format of certificate with diagram. [5]
c) What is a message authentication code? What is the difference between a message authentication code and a one-way hash function? [6]

- Q5)** a) Explain any two types of Intrusion detection systems? [6]
i) Network based IDS
ii) Host based IDS
iii) Anomaly based IDS
iv) Signature based IDS
b) Explain packet filtering firewall in detail. [5]
c) Discuss operating system security in detail. [6]

OR

- Q6)** a) Write a short note on any one : [6]
i) Honeypot
ii) Distributed DOS attack
b) What are the capabilities and limitations of Firewall? [5]
c) Explain access control and its types in detail. [6]

- Q7)** Write short note on any three : [18]
a) Cyber Terrorism
b) Examples of Cyber Crime
c) Social Engineering
d) Types of cyber stalkers

OR

- Q8)** Write short note on any three : [18]
a) Phishing attack
b) Keyloggers and Spywares
c) Aim and objectives of IT act
d) Password Cracking



Total No. of Questions : 8]

SEAT No. :

P-7549

[Total No. of Pages : 2

[6180]-57

T.E. (Computer Engineering)

AUGMENTED AND VIRTUAL REALITY

(2019 Pattern) (Semester - II) (310254(B)) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or 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) How virtual world is represented? Explain. [6]
b) Differentiate between Aural and Haptic representation in Virtual reality. [6]
c) Describe haptic rendering methods in detail. [6]

OR

- Q2)** a) Describe how haptic information is used in a VR experience. [6]
b) How to render complex haptic scenes with force displays? [6]
c) Describe visual representation in Virtual Reality. [6]

- Q3)** a) What are the different ways to navigate in virtual world? [6]
b) State and explain different forms of manipulating a virtual world. [6]
c) What is collaborative interaction? [5]

OR

- Q4)** a) Enlist different properties of manipulation of the world. [6]
b) Explain the substance of the virtual world. [6]
c) What is Direction Selection? Enlist different ways of selecting direction. [5]

P.T.O.

- Q5)** a) Explain working of Augmented reality in detail. [9]
b) Explain different categories of sensors used in Augmented Reality. [9]

OR

- Q6)** a) Explain all hardware used in Augmented reality. [9]
b) List the different ingredients of an Augmented Reality applications. Explain any three in detail. [9]

- Q7)** a) Describe different software used to create content for the Augmented reality application. [8]
b) What is Mobile Augmented Reality? Write down different advantages and disadvantages of Mobile Augmented Reality. [9]

OR

- Q8)** a) Explain applications of Augmented reality in mobile. [8]
b) Explain the following terms related to interaction in virtual world. [9]
i) Manipulation
ii) Communication
iii) Navigation



Total No. of Questions : 8]

SEAT No. :

P-7550

[Total No. Of Pages : 2

[6180]-58

T.E. (Computer/A.I & D.S)

CLOUD COMPUTING

(2019 Pattern) (Semester - II) (310254 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. 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 virtual clustering in cloud computing? **[9]**

b) Describe the importance of hypervisor in cloud computing? Differentiate Type I and Type 2 hypervisor? **[8]**

OR

Q2) a) Compare grid computing and cloud computing? **[9]**

b) Define virtualizations? Describe the advantages and disadvantages of Virtualization? **[8]**

Q3) a) Draw & explain the working of Amazon simple storage service(S3)? **[9]**

b) Describe the different steps for configuring Amazon EC2 VM instance?**[8]**

OR

Q4) a) Enlist an applications of cloud computing in different Area? Describe any two applications? **[8]**

b) Identify the different components of AWS? **[9]**

P.T.O.

- Q5) a)** Explain the different Cloud Security Services in detail? **[9]**
b) State the use of Content Level Security (CLS)? **[9]**

OR

- Q6) a)** What are the different types of testing in cloud computing? Explain briefly? **[9]**
b) Analyze the different types of security risk involved in cloud computing? **[9]**
- Q7) a)** Draw & Explain client - server architecture of docker? **[9]**
b) Explain Multimedia Cloud in detail? **[9]**

OR

- Q8) a)** Differentiate between Distributed Cloud Computing Vs Edge Computing? **[9]**
b) Describe the concept of DevOps in detail? **[9]**



Total No. of Questions : 8]

SEAT No. :

P-7551

[Total No. of Pages : 2

[6180]-59

T.E. (Computer Engineering/A.I & D.S)

SOFTWARE MODELING AND ARCHITECTURES

(2019 Pattern) (Semester - II) (310254(D)) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) What is activity diagram in software modelling? Draw activity diagram for Ticket vending machine [6]
- b) What is communication diagram in software modelling? Explain Communication diagram if you want to built software for online bookshop [6]
- c) What is state machine in software modelling? Draw state machine diagram for coffee vending machine [6]

OR

- Q2)** a) What is Interaction diagram in software modelling? What is the purpose Interaction diagram? How to draw the interaction diagram? [8]
- b) Explain the significance of timing diagram in software modelling. How do you create timing diagram? [6]
- c) What is the types of a state machine diagram? Explain its types in detail.[4]

- Q3)** a) What is architecture pattern? What is significance of architecting software product? [8]
- b) To Architect the project of online payment Gateway app like Paytm etc.. for payment of bills, transfer money, and other utility bills, with respect to above case study, understand the topmost Non-functional requirement. For any scenario about Non-Functional requirement generate logical, process, Development and physical view Suggest the suitable structure for those views [9]

OR

P.T.O.

- Q4)** a) What is the software architecture? What are the three different views of an architecture? [7]
b) Explain the following quality attribute consider during software architecture with suitable example [10]
i) Portability
ii) Scalability
iii) Performance
iv) Modifiability
v) Availability

- Q5)** a) What is layered architecture? Explain Layered architecture for Software Design with suitable example [8]
b) What is Object oriented software architecture ?what are the advantages and disadvantages of Object oriented software architecture [6]
c) Explain the broker pattern for design of service oriented architecture[4]

OR

- Q6)** a) What are the different types of software architecture patterns? [6]
b) Explain synchronous communication pattern in Client server architecture with example? [6]
c) What are architectural design patterns? What are various architectural patterns? Explain any one of the architectural pattern [6]

- Q7)** a) What is the Design pattern? What is the purpose of design patterns? What are the different types of design patterns? What is purpose of each type of design pattern? [9]
b) What are the different creational pattern? Explain any three creational pattern in short [8]

OR

- Q8)** a) What are the benefits of Design Patterns? Explain Factory and abstract factory patterns in detail with comparison between them and application of factory and abstract factory pattern [9]
b) What are the different structural pattern? Explain any three structural pattern in short [8]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P7828

[6180]-61

T.E. (AI & DS)

COMPUTER NETWORKS

(2019 Pattern) (Semester-I) (317521)

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 with suitable example the different Switching techniques in the network. [6]
- b) What is Network Address Translation (NAT)? Explain how it maps the multiple addresses in the network. [6]
- c) Give the different functions of the Network Layer. [6]

OR

- Q2)** a) Explain in detail, any two network layer protocols. [6]
- b) What is Routing? Explain the different routing protocols. [6]
- c) Write a short note on: Mobile IP. [6]

- Q3)** a) What is Socket? Explain the different Socket Primitives. [6]
- b) Compare TCP and UDP Transport layer protocols. [6]
- c) Give the different parameters of the Quality of Service (QoS). [5]

OR

- Q4)** a) What is Congestion? Explain the different causes of congestion. [6]
- b) Explain the following elements of the Transport Layer:
- i) Flow Control
 - ii) Congestion Control [6]
- c) Explain in short: RTP and SCTP Transport Layer Protocols. [5]

P.T.O.

- Q5)** a) What is DNS? Explain how DNS is used to resolve the mapping problem. [6]
- b) Explain the working of Dynamic Host Configuration Protocol (DHCP). [6]
- c) Explain the following Mail based protocols: [6]
- i) SMTP
 - ii) POP3

OR

- Q6)** a) Define HTTP. Explain persistent and Non-Persistent HTTP. [6]
- b) What is TELNET? How it provide a communication interface with a remote server? [6]
- c) What is SNMP? How it is used to manage network devices over an IP? [6]
- Q7)** a) Explain in detail, Static and Dynamic Channel Allocation. [6]
- b) What is CSMA/CA? How it is used in a wireless network for collision avoidance. [6]
- c) With a suitable diagram, explain the Binary Exponential Back-off algorithm. [5]

OR

- Q8)** a) Explain Point-to-Point and Client-Server Communication. [6]
- b) Differentiate between Pure Aloha and Slotted Aloha. [6]
- c) Explain: IEEE 802.15 and IEEE 802.16 Standard. [5]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P7552

[6180]-62

T.E. (AI & DS)

WEB TECHNOLOGY

(2019 Pattern) (Semester - I) (310252)

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.6, Q.No.7 or Q.No.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figure to the right indicates full marks.
- 4) Assume suitable data, if necessary.

- Q1) a)** Explain the Servlet lifecycle and session management in servlets. **[10]**
- b) Explain the concept of XML. Explain DTDs with example to use DTD in XML file. **[8]**

OR

- Q2) a)** Write the Servlet code for connecting MySQL with servlets. Explain servlet concurrency. **[8]**
- b) Write note on following:
- i) AJAX
 - ii) DTD Vs XML Schema (Min. 05) **[10]**

- Q3) a)** Explain the syntax of JSP with example and differentiate it with Servlet. Also explain the support of JSP for MVC. **[10]**
- b) What are web services? Explain the concept of WSDL. **[7]**

OR

- Q4) a)** Explain the JavaBeans classes in JSP with example. **[9]**
- b) Write note on struts. **[8]**

P.T.O.

- Q5)** a) Explain arrays and functions in PHP with example. [10]
b) Explain. NET framework with CLI and CLR. [8]

OR

- Q6)** a) Explain the PHP and MySQL connectivity steps with example. Explain the PHP function with example for executing MySQL DML statements. [10]
b) Write note on node JS. [8]

- Q7)** a) Explain the classes and arrays in Ruby. [8]
b) Give overview of Rails and documents requests. Explain Rails with AJAX. [9]

OR

- Q8)** a) Write note on: [12]
i) Code blocks and iterators in Ruby.
ii) Pattern machine in Ruby.
iii) Processing forms in Rails.
b) Explain the concept of EJB. [5]



Total No. of Questions : 8]

SEAT No. :

P7553

[Total No. of Pages : 2

[6180]-63

T.E. (Artificial Intelligence & Data Science)

ARTIFICIAL INTELLIGENCE

(2019 Pattern) (Semester-I) (310253)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn whenever necessary
- 3) Assume Suitable data if necessary.

Q1) a) Explain Min Max and Alpha Beta pruning algorithm for adversarial search with example: **[9]**

b) Define and explain Constraints satisfaction problem. **[9]**

OR

Q2) a) Explain with example graph coloring problem. **[9]**

b) How AI technique is used to solve tic-tac-toe problem. **[9]**

Q3) a) Explain Wumpus world environment giving its PEAS description. **[9]**

b) Explain different inference rules in FOL with suitable example. **[8]**

OR

Q4) a) Write an propositional logic for the statement, **[10]**

i) “All birds fly”

ii) “Every man respect his parents”

b) Differentiate between propositional logic and First order logic. **[7]**

Q5) a) Explain Forward chaining algorithm with the help of example. **[9]**

b) Write and explain the steps of knowledge engineering process. **[9]**

OR

P.T.O.

- Q6)** a) Explain Backward chaining algorithm with the help of example. [9]
b) Write a short note on [9]
i) Resolution and
ii) Unification

- Q7)** a) Write a short note on planning agent, state goal and action representation. [6]
b) Explain different components of planning system. [6]
c) Explain the components of AI [5]

OR

- Q8)** a) What are the types of planning? Explain in detail. [6]
b) Explain Classical Planning and its advantages with Example. [6]
c) Write note on hierarchical task network planning. [5]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P7554

[6180] - 64

T.E. (AI & DS)

EMBEDDED SYSTEMS AND SECURITY

(2019 Pattern) (Semester - I) (317522 A) (Elective - I)

Time : 2 ½ 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 Embedded firm ware design approaches. **[9]**

b) Explain Assembly Language based Development in detail. **[9]**

OR

Q2) a) Draw and Explain High Level Language to Machine Language conversion process. **[9]**

b) What is the difference between Compiler and Cross-compiler? Also explain use of C Language in Embedded Development. **[9]**

Q3) a) Define types of Real Time Operating System with example. **[9]**

b) Explain Monolithic Kernel model and Microkernel model. **[9]**

OR

Q4) a) Explain ucos-II along with its features and applications. **[9]**

b) What is process? Explain process life cycle with suitable diagram. **[9]**

P.T.O.

- Q5) a)** Draw and explain Embedded Linux kernel architecture. **[9]**
b) Discuss BusyBox and Bootloader in Embedded Linux. **[8]**

OR

- Q6) a)** Explain Embedded Linux hardware and Software components. **[9]**
b) Define root file system in Embedded Linux. **[8]**

- Q7) a)** Explain common attacks on Embedded System. **[9]**
b) Elaborate Side-channel analysis attacks in Embedded System. **[8]**

OR

- Q8) a)** What are security threats? Explain challenges of security threats in ES. **[9]**
b) How to prevent Embedded System from different security attacks? **[8]**



Total No. of Questions : 8]

SEAT No. :

P7829

[Total No. of Pages : 2

[6180]-65

T.E. (Artificial Intelligence and Data Science)

DESIGN THINKING

(2019 Pattern) (Semester-I) (Elective-I) (314445 (C))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Total number of questions are 8.*
- 2) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat sketches must be drawn wherever necessary.*

- Q1)** a) Describe the purpose and structure of a “How might we...” question in the context of problem definition in design thinking. [6]
- b) What is brainstorming? What are different variants of brainstorming?[6]
- c) Elaborate the concept “IDEATION using Deconstruct & Reconstruct”. [6]

OR

- Q2)** a) Explain the following terms: [6]
- i) Analogus Inspiration
 - ii) User Experience Journey
- b) What is purpose of Ideate? Explain Methods & Tools for ideate. [6]
- c) What is SCAMPER? Discuss the template of SCAMPER. [6]

- Q3)** a) Define Prototyping. How prototyping is carried out? [5]
- b) Differentiate between Wireframe and Realistic Prototypes. [6]
- c) Discuss the terms: Critical Experience Prototype (CEP) & Critical Function Prototype (CFP). [6]

OR

- Q4)** a) What is story boarding? Why is story boarding essential? Give an example of storyboarding. [5]
- b) Distinguish between HTML and WYSIWYG Editors. [6]
- c) Write a note on: [6]
- i) Darkhouse Prototype
 - ii) Funkey Prototype

P.T.O.

- Q5)** a) What is a testing sheet? How to use customer's feedback in product development? [5]
b) What are Visual Design Mock-Ups? Elaborate on Design Testing. [6]
c) Write a short note on A/B Testing. [6]

OR

- Q6)** a) Describe the CAP (Challenge. Accept. Progress) and 4s (Satisfied, Surprised, Struggled, Soothed) innovation tools. [6]
b) Define reflect in design thinking? How could it be used in process of solving the problem? [6]
c) How to create a pitch with lean canvas using a suitable example? [5]

- Q7)** a) Explain the case of redesigning the customer contact center at Toyota.[6]
b) How “MeYou Health” addresses social problems through design thinking and innovative solutions? Explain in detail. [6]
c) Explain Design Thinking in Healthcare with IDEO. [6]

OR

- Q8)** a) Describe the IBM framework for continuous understanding through design thinking. [6]
b) Describe the role of design thinking in healthcare innovation. [6]
c) Explain the transformation of Airbnb through design thinking. [6]



Total No. of Questions : 8]

SEAT No. :

P7555

[Total No. of Pages : 2

[6180] - 66

T.E. (AI & DS)

PATTERN RECOGNITION

(2019 Pattern) (Semester - I) (317522 B) (Elective - I)

Time : 2 ½ 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) Identify the different examples of String Generation as Pattern Description? **[9]**

b) What are the different types of String Grammar? Explain it? **[8]**

OR

Q2) a) Compare Grammar and Langugae with suitable example? **[9]**

b) Describe the Grammar Based Approach and its uses in detail? **[8]**

Q3) a) Clarify canonical definite finite state grammar (CDFSG) with suitable example? **[9]**

b) Identify Isomorphism if we are having two Graph G1 and G2, each with p nodes? **[8]**

OR

Q4) a) Examine various applications of Relational Graph to Pattern Recognition? **[8]**

b) Determine the Recursive procedure to find Cliques with suitable example? **[9]**

P.T.O.

- Q5) a)** CAM and other Neural Memory Structure? **[9]**
b) Draw and Explain Artificial Neuron Activation and output Characteristics? **[9]**

OR

- Q6) a)** Explain Neural Networks as a Black Box Approach? **[9]**
b) Describe the different reasons to adopt a Neural Computational Architecture? **[9]**

- Q7) a)** Draw & Explain Summary of the Back Propagation learning Procedure? **[9]**
b) Clarify how the character classification is done with Pattern Associator? **[9]**

OR

- Q8) a)** Draw & Explain how to train the feedforward network using Generalized delta Rule? **[9]**
b) Describe the structure of a Multiple Layer Feedforward Network? **[9]**



Total No. of Questions : 8]

SEAT No. :

P7556

[Total No. of Pages : 2

[6180]-68

T.E. (Artificial intelligence and Data Science)

DATA SCIENCE

(2019 Pattern) (Semester-II) (317529)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve questions 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 the diagram of data analytics life cycle in big data and briefly explain its phases. **[9]**
- b) List and explain the steps in data preparation phase of data analytics lifecycle. **[8]**

OR

- Q2) a)** What are different phases in data analytics life cycle? Explain Preprocessing phase in detail. **[9]**
- b) Explain in detail how the model building phase is built by team in data analytics life cycle? **[8]**

- Q3) a)** Write short note on the following: **[9]**
- i) FP growth
 - ii) Logistic Regression
 - iii) Decision Tree Classification
- b) What are association rules? Explain Apriori Algorithm in brief. **[8]**

OR

- Q4) a)** Write short note on the following: **[9]**
- i) Removing duplicates from data set.
 - ii) Handling missing data
 - iii) Data transformation
- b) What is Classification? Explain Naive Bayes Classification with example. **[8]**

P.T.O.

- Q5) a)** What is clustering? With suitable example explain the steps involved in k - means algorithm [9]
- b)** Write short note on the following: [9]
- i) Hierarchical Clustering
 - ii) Time-series analysis.

OR

- Q6) a)** Suppose that the given data the task is to cluster points (With (x,y) representing location) into three clusters, where the points are A1(2,10), A2(2,5), A3(8,4), B1(5,8), B2(7,5), B3(6,4), C1(1,2), C2(4,9). The distance function is Euclidean distance suppose initially we assign A1, B1 and C1 as the center of each cluster, respectively. use the k - means algorithm to show only the three cluster centers after the first round of execution with steps. [9]
- b)** Explain the TF/IDF (term frequency-inverse document frequency) terms in text analysis with suitable example. [9]

- Q7) a)** List the data visualization tools and discuss any four applications of data. [9]
- b)** Describe the challenges of data visualization. Draw box plot and explain its usages. [9]

OR

- Q8) a)** Write a short note on the following: [9]
- i) Map reduce.
 - ii) Pig
 - iii) Hive
- b)** Explain in detail the Hadoop Ecosystem with suitable diagram. [9]



Total No. of Questions : 8]

SEAT No. :

P7557

[Total No. of Pages : 2

[6180]-69

T.E. (Artificial Intelligence and Data Science)

CYBER SECURITY

(2019 Pattern) (Semester-II) (317530)

Time : 2½Hours]

[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) 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 $M=8$ [6]

b) what is authentication? Explain various methods for authentication. [6]

c) What is message digest? Compare MD5 with SHA-1 [5]

OR

Q2) a) Explain DSS Algorithm. [6]

b) Use A and B use the Diffie-Hellman Key exchange techniques with common prime $q=71$ and primitive root $\alpha=7$. [6]

i) If user A has private key $X_A=5$ what is A's public key Y_A ?

ii) If user B has private key $X_B=12$ what is B's public key Y_B ?

c) Distinguish between Kerberos and X.509 authentication service. [5]

Q3) a) Describe IPsec protocol with its components & security services. [6]

b) What is PGP? Explain operation of PGP. [6]

c) Explain Secure Socket Layer handshake protocol in brief. [6]

OR

Q4) a) Describe IPsec protocol with its Architecture. [6]

b) Explain VPN architecture with its component. [6]

c) Explain ISAKMP Protocol. [6]

P.T.O.

- Q5)** a) List and explain any two password management practices. [6]
b) Explain Architecture of firewall with its type. [6]
c) What is IDS? Explain types of Intrusion detection systems (IDS). [5]

OR

- Q6)** a) What are the various characteristics and types of firewalls? [6]
b) Explain methods for intrusion detection system (IDS). [6]
c) Explain limitations and challenges in IDS. [6]

- Q7)** a) Define cybercrime? Explain it with its type? [8]
b) Write short note on following. [10]
i) Cyber stalking
ii) Countermeasures that can be implemented in Cyber security

OR

- Q8)** a) Define hacking? Explain different types of hacking. [8]
b) Write short note on following. [10]
i) Information Protection Law
ii) PII



Total No. of Questions : 8]

SEAT No. :

P7558

[6180]-70

[Total No. of Pages : 2

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

- Q1)** a) What do you understand by associative memory? Also mention characteristics and applications for the same. [5]
- b) Write short Notes on the following. [5]
- i) State transition diagram
 - ii) False minima problem
- c) Illustrate the architecture of Boltzmann machine and its learning also its applications. [8]

OR

- Q2)** a) Explain Boltzmann machine. How does it differ from Hopfield net? [8]
- b) How does simulated annealing algorithm work? [5]
- c) Write short notes on the following. [5]
- i) Applications of Hopfield Network for Travelling sales man problem
 - ii) Associative Memory

- Q3)** a) What is competitive learning in neural networks? [5]
- b) Consider an ART-I network with input vector [1,1,0,0], [0,0,1,0], [1,1,1,0] and [1,1,1,1], want to produce clustering with following data, number of inputs $n = 4$, clusters to be formed $m = 3$ and vigilance parameter $\rho = 0.5$, Compute the result of the first iteration and comment on clustering. [8]
- c) Draw the network architecture of ART network. Explain the algorithm for designing the weights of ART network. [5]

OR

P.T.O.

- Q4) a)** Explain ART under the following headings : [5]
i) Architecture
ii) Working
iii) Training
iv) Implementation
b) Draw the architecture of Kohonen Network and explain the algorithm for training the weights of the Network. [5]
c) Define following : [8]
i) Learning vector quantization
ii) Adaptive pattern classification

- Q5) a)** Illustrate with example convolution and max pooling? [6]
b) What frameworks are used in deep learning? Define any seven. [5]
c) Explain the softmax regression with respect to hypothesis and cost function and write down its properties. [6]

OR

- Q6) a)** Exemplify convolution over volume with convolution on RGB images. Also illustrate multiple filters used in it. [6]
b) Consider a LeNet-5 a convolutional neural network, we want to perform the classification of digits, Write down the complete procedure followed in its architecture. [5]
c) What is transfer learning models for image classification? What are the 5 types of transfer learning? [6]

- Q7) a)** Which device recognize a pattern of handwritten or printed characters? And also illustrate it's working. [7]
b) Explain texture classification using convolution neural network. [5]
c) Write short notes on the following: [5]
i) NET Talk
ii) Texture classification
iii) Pattern classification

OR

- Q8) a)** You have been asked to develop a model of recognizing hand written digits. What are the chosen steps for activity? Explain each with detail. [7]
b) What is automatic translation? How does it work? What are its benefits? [5]
c) What is neocognitron neural network and how it is trained? [5]



Total No. of Questions : 8]

SEAT No. :

P7559

[Total No. of Pages : 2

[6180]-71

T.E. (Artificial Intelligence and Data Science)

ROBOTICS AND AUTOMATION

(2019 Pattern) (Semester - II) (Elective - II) (317532 (A))

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

Q1) a) What are Denavit Hartenberg parameter used for? How do we define DH parameter? **[6]**

b) What are the difference between forward and reverse Dynamic? **[6]**

c) What is Euler Lagrange equation of motion? Explain. **[6]**

OR

Q2) a) What are the difference between forward and reverse Kinematics? **[6]**

b) What is Newton Euler equation of motion? Explain. **[6]**

c) What is Jacobian in robotics? Explain. **[6]**

Q3) a) What are the different types of Grippers? Explain mechanical grippers with specification. **[6]**

b) Enlist what are the various process tools which can be used as a end effectors. Explain any one in detail. **[6]**

c) Explain Types of Power system in Robotics? **[6]**

OR

P.T.O.

- Q4)** a) Compare pneumatic & hydraulic grippers. [6]
b) Which devices can be used as end effectors? How to achieve end effector interface. [6]
c) Explain Types of Motion conversion in robotics? [6]

- Q5)** a) Explain, how do we integrate sensors and actuators? [6]
b) What are the functions of adaptive control? Explain. [6]
c) What are the types of PID control? Explain. [5]

OR

- Q6)** a) How Artificial Intelligence used in robotics? Explain. [6]
b) Explain Open loop and close loop with example. [6]
c) What is the architecture of Microcontroller in Embedded system? [5]

- Q7)** a) Classify different languages/methods used for robotics programming. Explain the structure of VAL language command along with example. [6]
b) Explain any three basic commands in VAL-II with examples. [6]
c) Explain motion control, hand control, program control commands used in robotic programming with example. [5]

OR

- Q8)** a) Explain any one of the following robotic application using VAL program: [6]
i) Pick and place applications
ii) Palletizing application using VAL
b) Using VAL-II programming language explain simple pick and place application. [6]
c) Explain WAIT, SIGNAL and DELAY command used in robotics for communication using simple application. [5]



Total No. of Questions : 8]

SEAT No. :

P7560

[Total No. of Pages : 3

[6180]-72

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) 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 whenever necessary.
- 4) Make suitable assumptions whenever necessary.

Q1) a) Consider the following CNF rules. Create a Parse tree for the sentence “The flight includes a meal” using CKY parsing algorithm. **[9]**

$S \rightarrow NP VP$

$NP \rightarrow Det N$

$VP \rightarrow V NP$

$V \rightarrow \text{includes}$

$Det \rightarrow \text{the}$

$Det \rightarrow \text{a}$

$N \rightarrow \text{meal}$

$N \rightarrow \text{flight}$

b) Explain why CFG is used to represent natural language in parsing. Differentiate between top-down and bottom-up parsing. **[9]**

OR

P.T.O.

Q2) a) Consider the following grammar rules. **[9]**

$S \rightarrow NP VP$

$S \rightarrow VP$

$NP \rightarrow DET N$

$NP \rightarrow N$

$VP \rightarrow V$

$VP \rightarrow V NP$

$Det \rightarrow \text{this} \mid \text{that} \mid \text{a} \mid \text{the}$

$Noun \rightarrow \text{book} \mid \text{flight} \mid \text{John} \mid \text{ball} \mid \text{meal}$

$Verb \rightarrow \text{book} \mid \text{include} \mid \text{read}$

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]**

Q3) a) What do you mean by Semantic and Thematic Roles? List out any 4 thematic roles with definitions and examples. **[9]**

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

i) WordNet

ii) FrameNet

OR

Q4) a) What is the significance of Word Sense Disambiguation in NLP? Explain any one WSD method. **[8]**

b) Explain the Scherer typology of affective states. What are the two families of theories of emotion? **[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 notes 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 retrieval. **[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]**



Total No. of Questions : 8]

SEAT No. :

P-7561

[Total No. Of Pages : 2

[6180]-75

T.E. (Electrical Engineering)

INDUSTRIAL AND TECHNOLOGY MANAGEMENT

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

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 additional data, if necessary.

- Q1) a)** What is Intellectual Property Rights (IPR)? Explain all its types? **[9]**
- b) What is Performance Appraisal? State the objective and Performance Appraisal? **[9]**

OR

- Q2) a)** Explain Patent format and structure in detail. **[9]**
- b) Explain types of training and Development method. **[9]**
- Q3) a)** What is meaning of Kaizen? How 5S is used in implementation of Kaizen? **[9]**
- b) Explain Environmental Management System Standard in details. **[8]**

OR

- Q4) a)** Explain in brief following: **[8]**
- i) Poka Yoke (Mistake proofing)
 - ii) Quality circle (QC)
- b) Explain Quality Management system standard ISO 14001:2004 **[9]**

P.T.O

- Q5) a)** Explain the concept of perfect competition. [9]
b) Describe the different types of taxes in detail. [9]

OR

- Q6) a)** Explain the terms [9]
i) Price
ii) Capital
iii) Credit and Debit
iv) Books of Account
b) Explain in detail [9]
i) Monopolistic competition
ii) Market survey

- Q7) a)** Explain decision making under certainty, uncertainty & risk. [9]
b) Define Motivation. With neat diagram show various needs, Explain Maslow's Hierarchy of need theory in detail. [8]

OR

- Q8) a)** Enlist the theories of work motivation. Explain Herzberg's Two factor theory in detail. [9]
b) What is group dynamics? Explain the stages of group dynamics in detail. [8]



[6180]-76
T.E. (Electrical)
POWER ELECTRONICS
(2019 Pattern) (Semester - I) (303142)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 2) *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) With neat circuit diagram explain operation of single phase fully controlled converter connected to RL Load. Derive the equation for average and rms output voltage. Draw output voltage and output current waveforms for $\alpha = 60^\circ$. **[9]**

b) A single phase semi converter is supplied from 120V, 60Hz source. The load consists of $R = 10\Omega$. If the average output voltage is 25% of the maximum possible average output voltage, determine- **[8]**

- i) Delay Angle
- ii) RMS & average output voltage
- iii) RMS & average thyristor current.

OR

Q2) a) With neat circuit diagram explain operation of single phase semi controlled converter connected to RL Load. Derive the equation for average and rms output voltage. Draw output voltage and output current waveforms for $\alpha = 45^\circ$. **[9]**

b) A single phase full converter is supplied from 230V, 50Hz source and delivering power to the resistance of 10Ω in series with large smoothing inductor. For a firing delay of 45° determine **[8]**

- i) Average output voltage
- ii) Average output current
- iii) Form Factor
- iv) Ripple Factor

- Q3)** a) Explain working of three phase half controlled converter with R Load. Draw output voltage and current waveforms. Derive the expression for average and RMS output voltage. [10]
- b) An On- off-type ac regulator is operating with a resistive load of $R = 10 \text{ Ohm}$ and RMS supply voltage is 230 V. The controller remains on for 40 cycles and is off for 60 cycles. Determine, [8]
- i) RMS Load voltage
- ii) Input power factor

OR

- Q4)** a) Explain working of three phase full controlled converter with RL Load. Draw output voltage and current waveforms. Derive the expression for average and RMS output voltage. [10]
- b) Explain operation AC voltage regulator with an output waveform for RL load. Derive the expression for average and RMS output voltage. [8]

- Q5)** a) What is need of controlling output voltage in an inverter? Explain any two method in detail. [8]
- b) Explain with circuit diagram and waveforms, operation of single phase single phase bridge inverter. Derive the expression for output voltage and current. [9]

OR

- Q6)** a) Explain with circuit diagram and waveforms, operation of single phase current source inverter. [8]
- b) Explain Sinusoidal Pulse width modulation with necessary waveforms. How voltage and frequency control is achieved. [9]

- Q7)** a) Explain working of three phase voltage source inverter in 120° mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in each step. [10]
- b) Write short note on Diode clamped multilevel inverter. [8]

OR

- Q8)** a) Explain cascaded multilevel inverter using 3 H-bridges connected to input supply. Draw output voltage waveforms. What are its advantages? [10]
- b) Explain various PWM techniques used in inverters. How sinusoidal PWM is used for harmonic elimination? [8]



Total No. of Questions : 8]

SEAT No. :

P-7563

[Total No. of Pages : 3

[6180]-77

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, 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 additional data, if necessary.*
- 5) *Use of non-programmable calculator is allowed.*

- Q1)** a) Draw the equivalent circuit diagram of 3 phase synchronous motor & state, why it is called doubly fed motor. [4]
- b) Draw the phasor diagram of 3 phase synchronous motor for lagging power factor & show [6]
- i) Load angle
 - ii) Internal angle
 - iii) Power factor angle on it
 - iv) Write the formula for back emf from phasor diagram.
- c) A 2300 V three phase star connected synchronous motor has armature resistance of 0.2 ohm/ph. and synchronous reactance of 2.2 ohm/ph. The motor is operated at 0.5 leading power factor and takes a current of 200 A from supply. Calculate back EMF generated in the motor & load angle δ . [8]

OR

- Q2)** a) Sketch V and inverted V curves of synchronous motor and show the power factor regions. [4]
- b) What is hunting in synchronous motor? How to minimise it? Explain. [6]

P.T.O.

- c) A 75 kW, 440 V, three phase star connected 50 Hz, synchronous motor has $Z_s = 0.04 + j0.4 \Omega/\text{ph}$ & operates at 0.8 leading power factor. The motor efficiency is 92.5 %. Calculate : [8]
- armature current
 - back emf and
 - mechanical power developed in armature P_m.

- Q3)** a) State the methods of speed control of 3 phase Induction motor on stator & rotor side. [3]
- b) Draw the block diagram & explain the V/f method of speed control of 3 phase induction motor. [6]
- c) With the neat construction diagram and explain the working of variable reluctance stepper motor. Show the truth table. How to reverse the direction of rotation. [8]

OR

- Q4)** a) Calculate step angle & resolution of 3-ph stepper motor with 08 stator poles & 06 rotor poles. [3]
- b) How the Energy Efficient three phase Induction Motor differ from Standard motor. [6]
- c) With the neat diagram describe the construction and working of PM A.C. motor. State its applications. [8]

- Q5)** a) Draw the torque speed characteristics of AC and DC series motor on common axis & comment on armature current & torque. [4]
- b) Compare conductively compensated and inductively compensated series motor. [6]
- c) A series motor having resistance 40Ω & inductance 0.3 H when connected to 240 V DC supply draws a current of 1 A and run at 2000 rpm. If it is supplied by 240 V, 50 Hz AC supply with same loading; Calculate : [8]
- speed
 - power factor
 - Gross power developed and
 - torque

OR

- Q6)** a) What are the modifications necessary in construction of dc series motor to operate it on ac supply? [4]
- b) Draw the approximate phasor diagram of AC series motor & explain. [6]
- c) Derive the expression for self-induced emf in field winding & rotational emf in AC series motor. [8]
- Q7)** a) State the types of 1-ph induction motors. Write applications of capacitor start IM. [3]
- b) How to reverse the direction of rotation of 1-ph induction motor, explain by connection diagram. [6]
- c) Sketch the torque-slip characteristics of 1-ph Induction motor based on double field revolving theory. Prove, how the 1-ph induction motor is not self-starting. [8]

OR

- Q8)** a) Compare single phase motor with 3 phase motor. [3]
- b) Draw the equivalent circuit of 1-ph induction motor under no load and blocked rotor test. Write the necessary formulae used. [6]
- c) 250W, 230V, 50Hz, single phase capacitor start induction motor has following constants [8]

Main winding : $Z_m = 4.5 + j 3.7 \Omega$ & Auxiliary winding;
 $Z_a = 9.5 + j3.5 \Omega$.

Determine value of C which will develop maximum torque.



Total No. of Questions : 8]

SEAT No. :

P-7564

[Total No. of Pages : 2

[6180]-78

T.E. (Electrical)

**ELECTRICAL INSTALLATION, DESIGN AND
CONDITION BASED MAINTENANCE
(2019 Pattern) (Semester - I) (303144)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) State and explain the different failure modes of transformer. [8]
b) What is maintenance? State its importance and its advantages. [4]
c) Explain following Terms : [6]
i) Polarization Index
ii) Dielectric absorption ratio

OR

- Q2)** a) Explain Hot Line Maintenance with advantages and special types of non-conducting Materials used for tools for hot line maintenance. [4]
b) Short note on Motor Current Signature Analysis. [6]
c) Explain in detail the concept of degree of polymerization and dissolved gas analysis in case of transformer. [8]

- Q3)** a) Difference between quotation & tender. [3]
b) Write short notes on the following: [6]
i) Price catalogues
ii) Labor rates
c) What are the qualities of a good estimator? [8]

OR

P.T.O.

- Q4)** a) Write a short note on Guidelines for inviting tenders. [3]
b) Explain the purpose of estimating and costing? [6]
c) State the general factors to be considered in estimation of LT lines. [8]

- Q5)** a) Short note on Minimum permissible size of the conductor. [4]
b) Procedure to determine the size of conductor for lines? [6]
c) Explain various commercial wiring methods. [8]

OR

- Q6)** a) Explain the procedure of estimation 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 PAT Tester with applications. [8]
b) Write a short note on : [9]
i) Contents of first aid box
ii) Precautions to be taken to avoid accidents.
iii) Treatment for cuts, burns and electrical shock

OR

- Q8)** a) Explain four CAT ratings with respect to information, examples & measurements involved. [8]
b) Explain : [9]
i) Various objectives of electrical safety.
ii) Different methods of artificial respiration.
iii) Dangers arising due to failure of insulation of the equipment.



Total No. of Questions : 8]

SEAT No. :

P-7565

[Total No. of Pages : 2

[6180]-79

T.E. (Electrical)

**ADVANCED MICROCONTROLLER AND EMBEDDED
SYSTEM**

(2019 Pattern) (Semester - I) (303145A) (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) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be draw,, wherever necessary.*
- 4) *Assume suitable additional data, if necessary.*
- 5) *Use of non-p rogrannzable calculator is allowed.*

- Q1)** a) Draw CCP1CON and list the steps involved in programming PIC18F458 microcontroller in capture mode. [9]
- b) Explain Speed control of DC motor using PWM mode of CCP module. [8]

OR

- Q2)** a) List out timers used for CCP module in PIC18F458. Also explain CCP registers used in detail. [9]
- b) Explain the steps of PWM Programming in CCP Module. Find the minimum and maximum PWM frequency allowed for XTAL=10MHz. [8]

- Q3)** a) Enlist Interrupt registers in PIC18F458. Explain any two. [9]
- b) Explain Enabling and Disabling of Interrupts in PIC18. Also state the steps to enable interrupts in PIC18. [9]

OR

- Q4)** a) State steps the microcontroller does perform upon activation of an interrupt. [9]
- b) Explain external INT0 interrupt programming in PIC18. [9]

P.T.O.

Q5) a) Explain in detail the function of following flags related to on board ADE of PIC microcontroller : [8]

- i) ADIF
- ii) Go/Done
- iii) ADFM
- iv) ADON

b) With the help of interfacing diagram and flow chart, explain how PIC microcontroller can be used to measure temperature using LM35 sensor. [9]

OR

Q6) a) Explain ADCON0 and ADCON1 registers in detail. [8]

b) Draw a neat diagram and flow chart, explain AC voltage measurement using PIC microcontroller. [9]

Q7) a) Write a C program for the PIC18 to transfer the message “A” serially at 9600 baud, 8-bit data, 1 stop bit. Do this continuously. Assume XTAL = 10MHz. [9]

b) Compare synchronous and asynchronous serial communication. [9]

OR

Q8) a) Draw and explain the block diagram of USART transmitter in PIC18. [9]

b) Explain the SPBRG register uses. Also find the value to be loaded in SPBRG register to have baud rate of 4800 and Fosc=10MHz. Assume asynchronous mode and low baud rate. [9]



Total No. of Questions : 8]

SEAT No. :

P-7566

[Total No. of Pages : 3

[6180]-80

T.E. (Electrical)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - I) (303145B) (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) Neat diagrams must be draw, wherever necessary.
- 4) Assume suitable data, if necessary.
- 5) Use of non-progameble calculator is allowed.

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

- i) Linearity
- ii) Frequency shifting

b) For the sequence given below find the frequency response, plot magnitude and phase response for $\omega = -\pi$ to π with step size of $\frac{\pi}{3}$

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

OR

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

b) Find the discrete-time Fourier transform of [9]

- i) $0.5^n u(n)$
- ii) $\delta(n-1) + \delta(n+1)$

iii) $\left(\frac{1}{3}\right)^n u(n-4)$

P.T.O.

- Q3)** a) Draw the structure of DIF-FFT algorithm for $N = 8$. [8]
 b) Find the DFT of the sequence $x(n) = \{0, 1, 2, 3\}$. [9]

OR

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

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

OR

- Q6)** a) Obtain direct form-II realization for the system described by difference equation $y(n) = 0.5y(n-1) - 0.25y(n-2) + x(n) + 0.4x(n-1)$. [6]
 b) Compare analog and digital filters. [6]
 c) Explain impulse invariance transformation used in design of digital filters from analog filters. [6]

- Q7)** a) Design an ideal low pass filter with frequency response [12]

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

$H_d(e^{j\omega}) = 0$ for all other values of ω Find the values of $h(n)$ for $N=11$.s

- b) Explain any one method used for measurement of voltage using DSP. [6]

OR

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

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

b) Differentiate between FIR and IIR filters. [6]

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



[6180]-82
T.E. (Electrical)
POWER SYSTEM - II
(2019 Pattern) (Semester - II) (303148)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 and 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)** Take base MVA=20MVA and base kV=6kV on motor load in figure 1 and draw per-unit impedance diagram to these base values. **[10]**

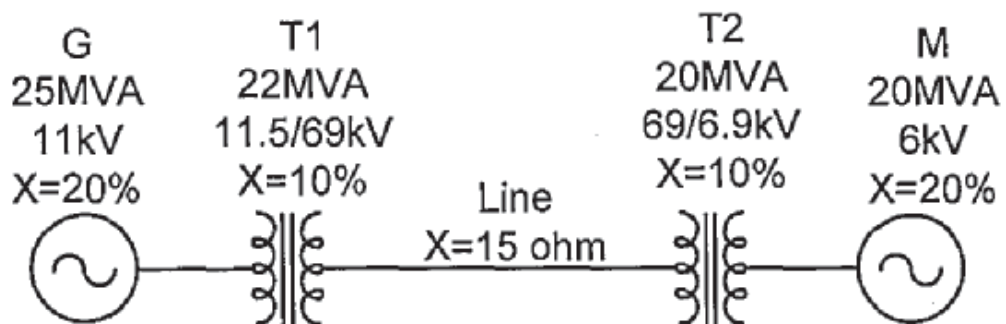


Figure 1

- b)** Justify the following statements. **[8]**
- i) For PV bus active power and voltage of the bus are unknowns.
 - ii) Per unit system is preferred over actual system parameters.
 - iii) The decoupled load flow method is faster than the Newton-Raphson load flow method.
 - iv) The Y-bus matrix is sparse matrix.

OR

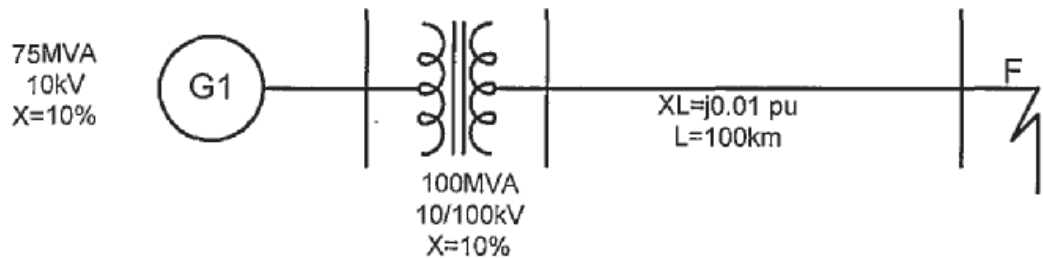
- Q2) a)** Prove that per unit impedance of transformer on both sides are same. **[8]**

P.T.O.

- b) In following Y_{BUS} matrix find the missing elements. Assume that shunt elements are neglected [10]

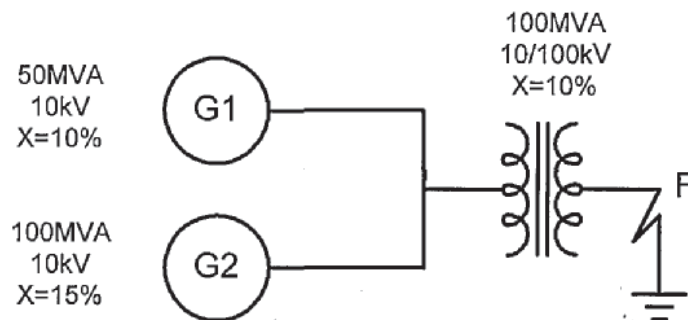
$$Y_{BUS} = \begin{bmatrix} -j10 & j5 & j2 & ? \\ ? & ? & j3 & 0 \\ ? & ? & ? & ? \\ ? & ? & j5 & ? \end{bmatrix}$$

- Q3) a)** What are the different types of current limiting reactor? With circuit diagram, elaborate operation of each type. [9]
- b)** For the following system if the symmetrical fault is at point F, calculate the fault current. [9]



OR

- Q4) a)** In case of three phase fault at the terminal of an unloaded alternator, prove that $x_d'' < x_d' < x_d$ and $I_f'' > I_f' > I_f$ with mathematical relation and diagram. (where I_f is fault current) [9]
- b)** Find the fault current supplied by each generator if the symmetrical fault is taken place at point F shown in following figure. [9]



- Q5) a)** In case of LLG fault, show that fault current [8]

$$I_f = \frac{-3E_{a1}Z_2}{Z_1Z_2 + Z_2Z_0 + Z_0Z_1}$$

- b) A three phase 100MVA synchronous generator with line to line voltage of 11kV having sequence reactance are $x_1 = j0.3pu$, $x_2 = j0.1pu$ and $x_0 = j0.05pu$. If the generator neutral is grounded through a reactance of $x_n = j0.05pu$, determine fault current for LG and LL fault. [9]

OR

- Q6)** a) An unsymmetrical loaded transmission line, show that [8]

$$Z_0 = Z_s + 2Z_m + 3Z_n \text{ and } Z_1 = Z_2 = Z_s - Z_m$$

- b) Draw the zero sequence network for the following transformer connections: [9]

- i) Delta to delta
- ii) Star to star grounded
- iii) Delta to star grounded with neutral impedance.

- Q7)** a) Compare HVDC and EHVAC transmission system based on following points with due justification [8]

- i) Insulation requirement
- ii) Power transfer capability
- iii) Economics
- iv) Right of way

- b) Draw the complete single line diagram of HVDC system showing all components and elaborate any three components in detail. [9]

OR

- Q8)** a) Write short note on : [8]

- i) Bipolar HVDC link
- ii) Multi terminal HVDC link

- b) Explain Constant current control in HVDC lines. [9]



Total No. of Questions : 8]

SEAT No. :

P-7568

[Total No. of Pages : 3

[6180]-83

T.E. (Electrical)

**COMPUTER AIDED DESIGN OF ELECTRICAL
MACHINES**

(2019 Pattern) (Semester - II) (303149)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

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

OR

- Q2)** a) Explain the estimation of losses in the three phase transformer. [6]
- b) Draw and explain the generalized flow chart of computer aided design of a transformer. [6]
- c) A 6600 V, 60 Hz, single phase transformer has a core of sheet steel . The net cross sectional area is $22.6 \times 10^{-3} \text{ m}^2$. The mean length is 2.23m . There are four lap joints and each joint takes one fourth times as much reactive mmf as it is required per meter of core. Flux density is 1.1 Wb/m^2 . Find the number of turns on the 6600 V winding and the no load current. Assume the amplitude factor as 1.52 , mmf/m = 232 A /m , specific loss = 1.76 W / kg and density = $7.5 \times 10^3 \text{ Kg/m}^3$. [6]

P.T.O.

- Q3) a)** Estimate the main dimensions for 3ϕ , 50Hz, 10kW, 400V, 4 pole squirrel cage induction motor. Assume full load efficiency of 0.85, full load power factor of 0.9 and winding factor 0.96. The specific magnetic loading is 0.6 wb/m^2 and the specific electric loading = 22000A/m. Take rotor peripheral speed as 25 m/s at synchronous speed. **[10]**
- b)** Derive the output equation of a three phase induction motor with usual notation. **[7]**

OR

- Q4) a)** Discuss the various factors to be considered for selection specific magnetic loading (B_{av}) and specific electric loading (a_c). **[6]**
- b)** Explain with neat diagram the constructional features of a three phase induction motor. **[5]**
- c)** What are the various types of AC windings for three phase induction motor? Explain in brief any two. **[6]**

- Q5) a)** Derive the expression for end ring current in induction motor. **[6]**
- b)** Discuss the various factors which decide selection of suitable combination of stator slots and rotor slots in case of 3 phase induction motor. **[6]**
- c)** Discuss the design of wound rotor w.r.t. the following i) no. rotor turns ii) area of rotor conductors iii) rotor windings **[6]**

OR

- Q6) a)** A 15kw, 3ϕ , 50Hz, 400V, 4 pole, star connected squirrel cage induction motor has 60 slots, each containing 7 conductors. The rotor slots are 50. Assume full load efficiency as 0.85, full load power factor as 0.9 and rotor mmf is 80% of stator mmf. Calculate the value of bar and end ring current. Also find the area of each bar and each end ring, if current density is $5 / \text{mm}^2$. **[10]**
- b)** Discuss the various factors which affect the choice of length of air gap for a three phase induction motor, why generally the air gap should be as small as possible. **[8]**

- Q7) a)** State and explain with neat sketches the different types of leakage fluxes in an induction motor. **[5]**
- b)** A 75 KW, 3300 V, 50 Hz, 8 pole, three phase, star connected induction motor has magnetizing current which is equal to 35% of full load current. Calculate the value of stator turn per phase if the mmf required for flux density at 30° from pole axis 500 A, winding factor = 0.95, full load efficiency = 0.94, power factor at full load = 0.86 **[5]**

- c) Explain the procedure to find out MMF required for air gap, stator teeth, stator core of an induction motor. [7]

OR

- Q8)** a) Draw and explain the generalized flow chart of computer aided design of three phase induction motor. [5]
- b) Explain the effect of ducts on the calculation of magnetizing current of 3 ϕ induction motor. [5]
- c) Explain the procedure to calculate the no load current of an induction motor. [7]



Total No. of Questions : 8]

SEAT No. :

P-7569

[Total No. Of Pages : 2

[6180]-84
TE (Electrical Engineering)
CONTROL SYSTEM ENGINEERING
(2019 Pattern) (Semester - II) (303150)

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) Use of Electronic Calculator is permitted.
- 3) Assume suitable data if necessary.

Q1) a) Explain terms angle of asymptotes, angle of departure, centroid, real axis root loci **[8]**

b) Sketch root locus for given OLTF $G(s)H(s) = \frac{K}{s(s+4)(s+5)}$. Determine marginal value of K and comment on stability. **[8]**

OR

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

b) Using Routh's Hurwitz Criterion for stability analysis determine stability of following system $P(s) = s^5 + 3s^4 + 5s^3 + 4s^2 + s + 3$ From that determine how many roots are there in left half s plane, right half s plane, and on imaginary axis. **[8]**

Q3) a) Explain correlation between frequency domain and time domain **[8]**

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

$$G(s) = \frac{50}{s(s+3)(s+6)}$$

OR

P.T.O.

Q4) a) Explain Nyquist stability criterion [8]

b) Sketch the Nyquist plot, for given system and comment on stability

$$G(s) = \frac{10}{s(s+2)(s+3)} \quad [10]$$

Q5) a) Sketch bode diagram showing GM, PM for a) stable system b) unstable system c) marginally stable system [6]

b) Draw bode plot for a unity feedback system with $G(s)$ given as. Also find

GM, PM and comment on stability of system. $G(s) = \frac{10(s+10)}{s(s+2)(s+5)}$ [12]

OR

Q6) a) Explain terms gain cross over frequency, phase cross over frequency, gain margin and phase margin in Bode plot. [6]

b) Draw bode plot for a unity feedback system with $G(s)$ given as. Also find

GM, PM and comment on stability of system. $G(s) = \frac{20(s+2)}{s(s+10)}$ [12]

Q7) a) Derive transfer function of armature controlled DC servo motor. [9]

b) Using Ziegler Nicholas method design a PID controller for a system with

unity feedback and $G(s) = \frac{1}{s(s+1)(s+3)}$ [9]

OR

Q8) a) Explain Lag network, its pole zero plot and transfer function. [9]

b) Explain P, PI, PID controller. [9]



Total No. of Questions : 8]

SEAT No. :

P-7570

[Total No. of Pages : 2

[6180]-85
T.E. (Electrical)
IOT AND ITS APPLICATIONS IN ELECTRICAL
ENGINEERING
(2019 Pattern) (Semester - II) (303151A) (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) An LCD display is connected to Arduino UNO in 4-bit mode. Write a program using Arduino IDE to display the word “IoT” at the centre of 1st line and word “Arduino” at the centre of 2nd line of LCD. Assume pins of your choice to connect LCD to Arduino. **[10]**
- b) Explain with syntax and example, following control statements in Python. **[8]**
- i) If-else
 - ii) While loop
 - iii) For loop
 - iv) Nested if-else

OR

- Q2)** a) 4 LEDs are connected to digital pin No. 2, 3, 4 and 5 of Arduino UNO. Write a program to glow all the 4 LEDs ONE by ONE with a delay of 1 sec. Repeat the process continuously with a gap of 5 sec. **[10]**
- b) Explain with syntax and example, following functions from Arduino IDE. **[8]**
- i) Serial.begin()
 - ii) PinMode()
 - iii) Serial.println()
 - iv) AnalogRead()

P.T.O.

- Q3)** a) Explain in detail DHT11 sensor. Also, with a neat diagram, show interfacing of DHT11 sensor with NodeMCU. [9]
b) Draw in detail an interfacing diagram of a dc motor through L293D with nodeMCU and explain in brief the working. [8]

OR

- Q4)** a) Write a program to read data from ultrasonic sensor HC-SR04 and display it on serial monitor using Arduino IDE. Sensor is connected to D2 pin of NodeMCU. [9]
b) Describe in detail various characteristics of sensors. [8]

- Q5)** a) Write a short note on Wi-Fi communication technology. [9]
b) Describe following terms related to MQTT communication technology- [8]

- i) Publish / Subscribe
- ii) Messages
- iii) Topics
- iv) Broker

OR

- Q6)** a) Write a short note on RFID communication technology. [9]
b) Write a short note on Bluetooth communication technology. [8]

- Q7)** a) Write a simple html code to create a web page and display the heading “IoT Applications” and two buttons-LED_ON and LED_OFF. The background colour of the webpage should be purple. [10]
b) Explain in detail, any 2 IoT Cloud platforms. [8]

OR

- Q8)** a) With a suitable block diagram, explain one IoT application of Home Automation. [10]
b) What is meant by Data Visualization? Explain in short, any 4 techniques of data visualization. [8]



Total No. of Questions : 8]

SEAT No. :

P-7571

[Total No. of Pages : 2

[6180]-86
T.E. (Electrical)
ELECTRICAL MOBILITY
(2019 Pattern) (Semester - II) (303151B) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicates full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

- Q1)** a) Draw block diagram of Battery Management System and explain it. [9]
b) Explain in detail the thermal management of battery [8]

OR

- Q2)** a) Explain Constant voltage charging algorithm used in battery charging.[9]
b) List the methods of SOC estimation and explain any two in detail [8]

- Q3)** a) Draw schematic diagram of parallel HEV drive train and explain its working. [9]

- b) Write notes on : [9]
i) Energy Consumption in Braking
ii) Regenerative braking

OR

- Q4)** a) Explain in detail the Brake System of EVs and HEVs [9]
b) Explain with the help of block diagram the Control Strategies Series Hybrid Electric Drive. [9]

- Q5)** a) Explain BLDC drive with advantages and disadvantages. [9]

- b) Write notes on following charging Standards: [8]
i) CCS
ii) CHAdeMO,

OR

P.T.O.

- Q6)** a) Explain PMSM drive with advantages and disadvantages [9]
b) Write notes: [8]
i) Electric Vehicle Supply Equipment (EVSE).
ii) Bharat DC 001, Bharat AC 001
- Q7)** a) Explain in brief the concept of Vehicle to Home [9]
b) Write a note on role of aggregator for V2G [9]
- OR
- Q8)** a) Explain the concept of V2G and advantages of V2G [9]
b) Explain the concept and structure of Vehicle to Vehicle [9]



Total No. of Questions : 8]

SEAT No. :

P-7572

[Total No. of Pages : 2

[6180]-87

T.E. (Electrical)

CYBERNETICS ENGINEERING

(2019 Pattern) (Semester - III) (303151C) (Elective-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any one question from each of questions : Q.1 or Q.2, Q.3 & Q.4, Q.5 & Q.6, Q.7 & Q.8.
- 2) Figures to the right indicate full marks.

- Q1)** a) Define transfer function, poles, zero, and pole-zero plot. [6]
b) What do you mean by optimal control system? Write down the steps to solve numerical by optimal control technique. [6]
c) What is the nonlinear system? What are the different types of nonlinearities? [6]

OR

- Q2)** a) Describe the concept of an adaptive control system with a block diagram. [6]
b) Elaborate on different types of control systems. [6]
c) Write a short note on multivariable control. Explain it with a suitable example. [6]

- Q3)** a) What is mathematical modeling? Why is it required? How mathematical modeling is carried out? [6]
b) What is linearization? How the linearization of the nonlinear system is carried out? [6]
c) Derive the model of separately excited DC motor using linear ordinary differential equations [5]

OR

- Q4)** a) What are the various simulation tools used for mathematical modeling of the system and explain any two tools. [6]
b) How to get the solution of the ordinary differential equation using ODE solver? [6]
c) What is the significance of the differential equations of the physical system? [5]

P.T.O.

- Q5)** a) Explain the computer architecture. [8]
b) Explain how data communication is carried out in the industrial environment. [10]

OR

- Q6)** a) Describe various analog and digital interface. [8]
b) What are the various system components needed for embedded and industrial applications? Explain them. [10]

- Q7)** a) What is optimization? List out at least five applications of optimization. [7]
b) Write a short note on Genetic Algorithm using the example. [10]

OR

- Q8)** a) Explain the statement of the optimization problem. [7]
b) Write a short note on the particle swarm optimization method using the example. [10]



Total No. of Questions : 8]

SEAT No. :

P-7573

[Total No. of Pages : 2

[6180]-88
T.E. (Electrical)
ENERGY MANAGEMENT
(2019 Pattern) (Semester - II) (303151D) (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 indicate full marks.
- 4) Assume suitable data, if necessary.
- 5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

- Q1)** a) Discuss in detail the avenues under supply side management. [9]
b) Explain tariffs conducive to energy management. Discuss with suitable examples. [9]

OR

- Q2)** a) Explain with suitable examples role of renewable energy in energy management. [9]
b) With suitable flow chart explain implementation of demand side management for industrial consumers. [9]
- Q3)** a) What is energy audit? Explain steps in detailed 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 850 kCal/T. Fixed consumption of the plant is 3000kCal. [8]

Month	Production(MT)	Actual Energy Consumption (kCal)
1	800	660000
2	1200	720000
3	1300	750000
4	1000	700000
5	1400	850000
6	1300	810000

OR

P.T.O.

- Q4) a)** Discuss use of various instruments for energy audit. [9]
b) Discuss clustering techniques used in data analytics. What information can be obtained from it? [8]

- Q5) a)** In an industry capital investment of Rs. 2000000 for energy saving projects: Annual return is Rs.5 lakhs, life of the project is 6 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)** In an industry after carrying out energy audit it is recommended to replace 20 numbers, 15 HP motors by energy efficiency motors. Use following data to estimate payback period. Take rate of Electricity as Rs. 7/kWh and demand charges R. 425/kVA/month. [9]

Description	Old motor	Energy Efficiency Motors
Rating of machine	15 HP	15 HP
Operating hours per annum	6800	6800
Efficiency near full load	89%	93.5%
Power factor near full load	0.85 lag	0.89 lag
Capital cost	--	Rs. 125000/-(each)
Scrap value	Rs. 50000/-(each)	--

- b)** Explain following criteria [9]
 i) Benefit to cost ratio
 ii) Internal rate of return
 iii) Return on investment
- Q7) a)** Explain energy conservation measures in pumping systems . [8]
b) Discuss energy management options in T & D sectors. [9]

OR

- Q8) a)** Discuss energy saving options in fans and blowers. [8]
b) Discuss different cogeneration systems. [9]



Total No. of Questions : 8]

SEAT No. :

P7574

[6180]-89

[Total No. of Pages : 2

T.E. (Electronics)

POWER AND INDUSTRIAL ELECTRONICS

(2019 Pattern) (Semester - I) (304201) (Theory)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Compare Phase Angle Controlled rectifiers and PWM Rectifiers. **[9]**
b) Explain operation of Single Phase full converter for RL-load with the help of a neat circuit diagram and suitable waveforms. **[9]**

OR

- Q2) a)** Compare Semi and Full Converters **[9]**
b) Draw the circuit diagram, waveforms and explain operation of 3-Ø Semi converter for R load. **[9]**

- Q3) a)** With the help of a neat Circuit diagram and Waveforms explain operation of Step down chopper with R load. **[9]**
b) A type-A chopper has input dc voltage of 200V and a load of $R = 10 \text{ Ohm}$ in series with $L = 80\text{mH}$. If load current varies linearly between 12A and 16A, find the time ratio T_{on}/T_{off} for this chopper. **[8]**

OR

- Q4) a)** With the help of circuit diagram & waveforms, explain the operation of single phase full wave AC voltage controller for R load using SCRs. **[9]**
b) How are Choppers classified? Explain the operation of the Four quadrant chopper. Explain the motoring and regeneration mode in detail. **[8]**

P.T.O.

- Q5) a)** With neat circuit diagram and waveforms, explain operation of 3ϕ bridge inverter with R load for 180° conduction mode, [9]
- b)** Single-phase full-bridge inverter has a resistive load of $R=3\ \Omega$ and the d.c. input voltage $E_{dc} = 50\text{ V}$. Calculate [9]
- i) The RMS output voltage at the fundamental frequency E_1
 - ii) The output power P_o
 - iii) The average and peak currents of each thyristor, and
 - iv) The peak reverse blocking voltage of each thyristor.

OR

- Q6) a)** Explain Performance Parameters of an Inverters. [9]
- b)** With a neat circuit diagram and waveforms, explain 1 single phase full bridge inverter with RL load. [9]
- Q7) a)** What are the advantages of HVDC over HVAC transmission system? With the help of neat block schematic explain operation of HVDC transmission system. [9]
- b)** Explain the applications of Power Electronics in Traction applications. [8]

OR

- Q8) a)** Explain operation of On-line and OFF line UPS system in detail. [9]
- b)** Explain use of power electronics in Power Electronics in Induction heating application. [8]



Total No. of Questions : 8]

SEAT No. :

P7575

[Total No. of Pages : 2

[6180]-90

T.E. (Electronics Engg.)

ELECTROMAGNETIC WAVES AND PROPAGATION THEORY

(2019 Pattern) (Semester-I) (304202)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) State Maxwell's equations in point form for Time varying field. [6]

b) If $\vec{H} = [3x \cos \beta + 6y \sin \alpha] \hat{a}_z$ A/m find current density $\vec{J}$ if fields are not varying with time. [6]

c) State Maxwell's equations in point form for free space. [6]

OR

Q2) a) State Maxwell's equations in point/integral form for good conductor. [6]

b) Write Maxwell's equations for static field in point integral form. [6]

c) If $\vec{E} = 125 e^{(3x - kt) \hat{a}_y}$ V/m in free space, use Maxwell's equations to find k and $\vec{H}$. [6]

Q3) a) Derive Wave equations for free space. [8]

b) A 10GHz plane wave travelling in free space has an amplitude $E_x = 10 \frac{V}{m}$. Find velocity of propagation, wavelength, intrinsic impedance, amplitude and direction of $\vec{H}$. [10]

OR

P.T.O.

- Q4)** a) Derive Wave equations for free space. [8]
- b) Calculate attenuation constant and phase constant for uniform plane wave with frequency of 10 GHz in polyethylene for which, $\epsilon_r = 2.3$, $\mu = \mu_0$ and $\sigma = 256 \times 10^{-4} \Omega^{-1}/m$. [6]
- c) Find the velocity of a plane wave in a lossless medium having $\epsilon_r = 5$ and $\mu_r = 1$. [4]

- Q5)** a) What is transmission line. Explain types of transmission line and its applications. [10]
- b) Calculate characteristic impedance Z_0 for given parameters $R = 10.4K\Omega$, $G = 0.8 \times 10^{-6} \Omega^{-1}/Km$, $L = 0.00367H/Km$, $C = 0.0085 \mu/Km$. [6]

OR

- Q6)** a) What is characteristics impedance. Explain in detail. [4]
- b) For transmission line terminated to Z_0 , prove that $Z_o = \sqrt{Z_{oc} Z_{sc}}$. [6]
- c) Explain primary parameters associated with transmission line. [6]

- Q7)** a) What is waveguide? Explain its types and applications. [6]
- b) Write advantages of disadvantages of Waveguide. [4]
- c) Explain structure of rectangular waveguide. Explain cut-off frequency, cut-off wavelength and Guide Wavelength in waveguide. [8]

OR

- Q8)** a) Compare TE and TM modes of waveguides. [4]
- b) Explain types of cavity resonators with diagrams: Regulated, unregulated and co-axial cavity resonators. [8]
- c) An air filled circular waveguide with $a = 2.5cm$ is excited in domain mode at 12GHz. Calculate f_c , λ_g and Z_{TE} . [6]



Total No. of Questions : 8]

SEAT No. :

P7577

[Total No. of Pages : 2

[6180]-92

T.E. (Electronics Engineering)

MICROCONTROLLER AND APPLICATIONS

(2019 Pattern) (Semester-I) (304204)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume Suitable data if necessary.

- Q1)** a) Draw interfacing diagram of stepper motor with 8051 microcontroller. Write an Embedded C program to rotate stepper motor continuously in clockwise direction. **[6]**
- b) Draw interfacing diagram and write a C program for the 8051 microcontroller to transfer the letter “A” serially at 4800 baud continuously. Use 8 bit data and 1 stop bit. **[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) Draw interfacing diagram of motion detector with 8051 microcontroller. Write an Embedded C program to switch on led when motion is detected. **[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 DAC to 8051 microcontroller and write an Embedded C program to generate triangular wave form. Also draw its flowchart. **[8]**

OR

- Q3)** a) Explain memory organization of PIC 18FXXX microcontroller. **[8]**
- b) Draw and explain the block diagram of Timer 1 of PIC18FXXX microcontroller in 16 bit mode. **[8]**
- Q4)** a) Compare PIC 10, PIC 12, PIC 16, and PIC 18. **[8]**
- b) Draw and explain PIC 18FXXX microcontroller architecture. **[8]**

P.T.O.

- Q5) a)** Draw interfacing diagram of 4x4 matrix keypad with PIC 18FXXX. Draw and explain the flow chart to detect and display key pressed. **[8]**
- b) Draw interfacing diagram of LED to Port B of PIC18FXXX microcontroller. Also write an Embedded C program to alternately blink led with same delay. **[8]**

OR

- Q6) a)** Write the steps to program the PWM feature of CCP module of PIC18FXXX. **[8]**

Also find the PR2 value for the following PWM frequencies.

Assume XTAL=10 MHz. and prescaler = 1.

- i) 10 KHz
- ii) 25 KHz
- b) Interface internal ADC of PIC18FXXX microcontroller and write an Embedded C program to convert analog to digital signal. **[8]**
- Q7) a)** Design environment Monitoring System using PIC18FXXX microcontroller. **[6]**
- b) Design water level monitoring and control using PIC18FXXX microcontroller and also write algorithm for same. **[6]**
- c) Design and explain Data Acquisition System using 8051 microcontroller. **[6]**

OR

- Q8) a)** Design home protection system using PIC 18FXXX microcontroller. Also write an Embedded C program for same. **[6]**
- b) Design frequency counter using 8051 microcontroller and display the result on LCD. **[6]**
- c) What is need of Digital Multimeter. Draw the block diagram of Digital Multimeter using 8051 microcontroller. **[6]**



Total No. of Questions : 8]

SEAT No. :

P7578

[6180] - 93

[Total No. of Pages : 2

T.E. (Electronics Engineering)
INSTRUMENTATION SYSTEMS
(2019 Pattern) (Semester - I) (Elective - I) (304205)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data if necessary.

- Q1) a)** With the help of neat diagram explain working of Doppler effect ultrasonic flow meters. **[6]**
- b) Define differential type flow meter/ obstruction type flow meter. Explain any one type differential flow measurement transducer. **[6]**
- c) With the help of neat diagram explain working of Electromagnetic flow meter. State its advantages and disadvantages. **[8]**

OR

- Q2) a)** With the help of neat diagram explain working principle of capacitive probe type level sensor. **[6]**
- b) Define flow and flow rate. Explain different types of flow. Explain the bernoulli Equation. **[6]**
- c) With the help of neat diagram explain float type liquid level sensor and chain balanced float type liquid sensor. **[8]**

- Q3) a)** Explain operating principle of PIR sensor. With the help of neat diagram explain working of optoelectronics motion sensor. **[8]**
- b) Explain Capacitive accelerometer, Resistive accelerometer, piezoelectric accelerometer and piezoresistive accelerometer. **[8]**

OR

P.T.O.

- Q4) a)** With the help of neat diagram explain Rotary/ Angular incremental optical encoder. [8]
- b) With the help of neat diagram explain construction, working and characteristics of LVDT. State its advantages and disadvantages. [8]

- Q5) a)** With the help of neat construction diagram explain Hall Effect Magnetic field sensors. Explain working of PZT sensors and actuators. [8]
- b) Draw neat block diagram of smart sensor and explain functioning of each block state the advantages & disadvantages of smart sensor. [8]

OR

- Q6) a)** With the help of neat diagram explain Bulk Micromachining process and compare. Bulk micromachining process and surface micromachining process. [8]
- b) With the help of neat diagram explain the following. [8]
- i) Hall Effect Magnetic field sensors.
 - ii) PZT sensors and actuators.

- Q7) a)** Explain spool valve bidirectional control valve with suitable diagram. [6]
- b) Draw construction and explain operating principles of AC motors. [6]
- c) Explain poppet bidirectional control valve with suitable diagram. [6]

OR

- Q8) a)** Explain the following w.r.t. valve characteristics. [6]
- i) Linear flow characteristics.
 - ii) Equal percentage.
 - iii) Quick Opening.
- b) What is need of driver circuit for Relay? Explain design of relay driver circuit using transistor. [6]
- c) Draw and explain speed control of DC motor using transistor & PWM technique. [6]



Total No. of Questions : 8]

SEAT No. :

P7579

[Total No. of Pages : 2

[6180] - 94

T.E. (Electronics)

MACHINE LEARNING

(2019 Pattern) (Semester - I) (Elective - I) (304205 B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Assume Suitable data if necessary.*

- Q1) a)** Explain in brief the Bayesian network for learning and inference. **[9]**
- b) Enlist any four applications of naive bayes classifier. **[2]**
- c) What is knowledge representation using propositional logic? **[6]**

OR

- Q2) a)** Explain various steps of Knowledge engineering process **[9]**
- b) Explain the working of Unification algorithm with suitable example **[8]**
- Q3) a)** Detail the Semantic analysis phase of Natural language Processing(NLP). **[9]**
- b) Explain the different types of ambiguities in NLP **[8]**

OR

- Q4) a)** What is NLP? Explain all the phases of NLP. **[10]**
- b) What are the important elements of semantic analysis in NLP. **[7]**

P.T.O.

- Q5) a)** What is reinforcement Learning? What is meant by passive and active reinforcement learning? **[6]**
- b)** Explain common active and passive RL techniques and the scenarios in which they are applicable? **[12]**

OR

- Q6) a)** Explain the decision tree algorithm with suitable example. **[9]**
- b)** Write short note on. **[9]**
- i) Inductive learning
 - ii) Information Gain
 - iii) Gini Index

- Q7)** List the major components of fuzzy logic control, the steps in designing the FLC, the advantages and the disadvantages of FLC. **[18]**

OR

- Q8)** Explain Fuzzy logic Implementation for Induction Motor Control **[18]**



Total No. of Questions : 8]

SEAT No. :

P7580

[6180] - 95

[Total No. of Pages : 4

T.E. (Electronics Engineering) (E & TC)
Fundamentals of Java Programming
(2019 Pattern) (Semester - I) (Elective - I) (304185 C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Write a program to implement single inheritance in java. **[5]**
b) Complete the following Java code to display lower triangular matrix. **[10]**

```
public class LowerTriangular
{
public static void main (String[ ] args) {
    int rows, cols;
    //Initialize matrix a
    int a [ ][ ] = {
        {1, 2, 3},
        {8, 6, 4},
        {4, 5, 6}
    };
    //Calculates number of rows and columns present in given matrix
    rows = a. length;
    cols = a[0].length;
    if(rows != cols) {
        System.out.println("Matrix should be a square matrix");
    }
    else {
```

P.T.O.

//Performs required operation to convert given matrix into lower triangular matrix

Complete the code

```
    }  
  }  
}
```

- c) Write a program to join two strings. [3]

OR

- Q2) a)** What is difference between array and array list? When will you use array over array list. [4]

- b) Explain [6]

i) Super Class

ii) Sub Class

iii) Reusability

With reference to inheritance in Java.

- c) Explain the concept of abstract class and abstract method with suitable example. [8]

- Q3) a)** What is the difference between an Interface and an Abstract class? [8]

- b) List out the advantages of packages. [6]

- c) How to hide a class in package ? Explain. [3]

OR

- Q4) a)** Correct the following code to rectify the compile error generated if any and justify your answer. Rewrite the corrected code. [8]

```
interface NewShape {  
    void draw ();  
}  
class NewCircle1 implements NewShape{  
    public void draw() {
```

```

System.out.println ("New Circle1 drawn");
    }
}
class NewCircle2{
    public void draw()
    {
        System.out.println(New Circle2 drawn");

    }
}
public class CastInterface {
    public static void main(String[ ] args) {
        // TODO Auto-generated method stub
        NewShape obj1 = new NewCircle1 ( );
        NewShape obj2 = new NewCircle2 ( );
        obj1.draw( );
        obj2.draw( );
    }
}

```

- b) List out Java API package. [6]
- c) Which is the package by default imported in every Java program? Why? [3]

- Q5)** a) Write a java code using bufferReader class to read name from the user. [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 available thread states in a high-level. [7]
- b) What is the difference between throw and throws? What is the importance of finally block in exception handling? [5]
- c) Explain applet and differentiate between applet and application. [6]

- Q7)** a) Explain the Graphics class in Java. List out and explain any three drawing methods from Graphics class. [9]
- b) Write a Java program using Swing to display “Welcome to Java”. [8]

OR

- Q8)** a) List difference between swing and AWT in Java. [5]
- b) Write a Java program using Swing to display “Hello World”. [8]
- c) Explain the FileReader and File Writer class in Java. [4]



Total No. of Questions : 8]

SEAT No. :

P7581

[Total No. of Pages : 2

[6180]-96

T.E. (Electronics Engineering)

DATA COMMUNICATION

(2019 Pattern) (Semester - I) (Elective - I) (304205 D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) What is ARQ? Explain Go back N and selective repeat ARQ protocols.

[8]

b) Obtain the code words for the (6,3) LBC which has the generator Matrix

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

[10]

- i) Find all code words
- ii) If code word $C = 101110$ is Transmitted and received code word is $r = 001110$ obtain the correct code word

OR

Q2) a) Define the following with an example:

[8]

- i) Code rate
- ii) Hamming Distance
- iii) Hamming Weight
- iv) Code Vector

b) A rate 1/3 convolution encoder has generating vectors as $g_1 = (100)$, $g_2 = (111)$, $g_3 = (101)$.

[10]

- i) Sketch the encoder configuration.
- ii) Draw the code tree, state diagram and trellis diagram.

P.T.O.

Q3) a) Prove that, **[4]**

i) $H(x, y) = H(x / y) + H(y)$

ii) $H(x, y) = H(y / x) + H(x)$

b) Define Information, information rate, entropy and Mutual Information. **[4]**

c) Apply Huffman binary coding procedure for the following message ensemble. Also determines its efficiency. Message probabilities as per below probabilities = [0.45, 0.15, 0.1, 0.1, 0.08, 0.08, 0.04]. **[9]**

OR

Q4) a) Find the capacity of channel having Bandwidth of 1MHz and S/N ratio of 10dB. **[4]**

b) We want to digitize the human voice varying from 300Hz to 4kHz obtain Nyquist Rate and bit rate if we use 8 bits per sample. **[4]**

c) Apply shannon fano coding procedure to find the coding efficiency for the following message ensemble with Probabilities (0.4, 0.3, 0.2, 0.1). **[9]**

Q5) a) Explain the generation and reception of BPSK with the help of neat block diagram. **[6]**

b) Explain QAM modulation and demodulation in details. **[6]**

c) Draw the spectrum, Signal space, Equation and bandwidth of BFSK. **[6]**

OR

Q6) a) Explain principle and block diagram of MPSK. **[6]**

b) Explain ASK modulation and demodulation in details with Equation **[6]**

c) Explain the generation of OFDM with its Spectral analysis. **[6]**

- Q7)** a) Write a note on pure and slotted ALOHA. [6]
- b) Consider a Fast hop - SS system with binary FSK, 2 hops/symbol and a PN sequence with binary message 010010010000. The message is transmitted using following PN sequence {010, 110, 101, 100, 000, 101, 011, 001, 001, 111, 011.....} plot the output frequency for input message. [6]
- c) What are orthogonal codes and state its properties. [5]

OR

- Q8)** a) Write short note on FH-SS communication. [6]
- b) Compare FDMA, TDMA & CDMA with neat schematic. [6]
- c) With the help of mathematical expressions and block diagram explain DS-SS system. [5]



Total No. of Questions : 8]

SEAT No. :

P7582

[6180] - 97

[Total No. of Pages : 2

T.E. (Electronics Engineering)

COMPUTER NETWORKS

(2019 Pattern) (Semester - I) (304205) (Elective - I)

Time : 2 ½ 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 and Q.No.7 or 8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary.

Q1) a) What is use of framing? Explain in brief various framing techniques with example of each. **[7]**

b) Explain in brief following connecting devices **[10]**

- i) Hub
- ii) Switch
- iii) Bridge
- iv) Router
- v) Gateways

OR

Q2) a) What is the function of MAC layer? List the various multiple access techniques. Describe in brief CSMA/CA random access protocol. **[8]**

b) With the various frame formats describe in brief the HDLC protocol. **[7]**

c) What is the significance of sliding window protocol? List the various sliding window protocol. **[2]**

Q3) a) What is classful addressing technique? Explain classful IPV4 addressing technique. **[6]**

b) Explain use of ICMP. **[6]**

c) How congestion control and QoS is maintained at transport layer? **[6]**

OR

P.T.O.

- Q4)** a) With neat diagram describe in brief Transport layer-Process to process delivery using port address. [8]
b) Describe in brief Shortest Path routing algorithm. [8]
c) List the functions of Network layer. [2]

- Q5)** a) Which protocol is used for remote login? Explain in detail. [8]
b) Why do we need SMTP and POP3 protocol for electronic mail? Explain in detail. [9]

OR

- Q6)** a) What is use of FTP? How it is executed. [8]
b) Describe in brief DNS protocol. [9]

- Q7)** a) How UTP Cabling with their standard is utilized for PC to PC communication. [6]
b) What is use of Network tester? [6]
c) What are the various simulation tools are used for network administration. [6]

OR

- Q8)** a) Explain in detail use of Protocol Analyzer. [9]
b) How internet can be accessed through Dialup and DSL. [9]



Total No. of Questions : 8]

SEAT No. :

P7583

[Total No. of Pages : 2

[6180]-98
T.E. (Electronics)
FUNDAMENTALS OF HDL
(2019 Pattern) (Semester - II) (304212)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Sketch the neat diagram and explain the architectural building blocks of CPLD. **[9]**

b) Explain FPGA programming methods with neat diagram. **[8]**

OR

Q2) a) With neat Schematic explain the architectural building block of FPGA. Explain the selection Criteria of CPLD in the System? **[9]**

b) Explain with diagram SRAM Programming and Antifuse Programming Technology. **[8]**

Q3) a) Explain different Verilog Operators detail. Explain the following data types in Verilog: **[9]**

i) Net

ii) Parameters

b) Describe the structure of the Verilog Module. Find the value of following Expressions IF the two unsigned variables. **[8]**

A = 4' B1001 and B = 4' B1101

i) {A, B}

ii) (A && B)

iii) ~ ^ (A)

iv) B<<3

OR

P.T.O.

- Q4)** a) Explain the major capabilities of Verilog HDL? Explain the different levels of abstraction in Verilog HDL. [9]
- b) Describe the following: [8]
- i) Data types
 - ii) Variables & Constants declaration

- Q5)** a) Compose Verilog code for the following: [10]
- i) Full Adder
 - ii) 3 : 8 Decoder
- b) Explain Verilog Repeat and Forever statement with an example. [8]

OR

- Q6)** a) Compose Verilog code for the following. [10]
- i) 2 bit magnitude comparator.
 - ii) 4 bit ALU
- b) Explain the system Tasks and Compiler Directives in detail. [8]

- Q7)** a) Compare between Procedure and Task? Explain Procedure syntax with example. [10]
- b) Illustrate the HDL Description of an N-Bit Ripple carry Adder using Procedure and Task. [8]

OR

- Q8)** a) Compare between task and function? Explain Task syntax with example. [10]
- b) Illustrate the HDL description of a full adder using Procedure and Task. [8]



Total No. of Questions : 8]

SEAT No. :

P7584

[Total No. of Pages : 2

[6180]-99

T.E. (Electronics Engineering)

EMBEDDED PROCESSORS AND APPLICATIONS

(2019 Pattern) (Semester-II) (304213)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q.5 or Q6, Q7 or Q8,
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1) a)** What are steps in PLL programming of LPC2148 processor? Explain need of VPB divider with suitable diagram. **[6]**
- b) Interface LED's to P0.0 to P0.7 port pins of LPC2148. Write an embedded C program to blink LED's. Also write algorithm. **[6]**
- c) Explain working of soil moisture sensor. Interface soil moisture sensor with of LPC2148 processor. Write an Embedded C program using analog output A0 of soil moisture sensor. **[8]**

OR

- Q2) a)** What is the function of Pin Connect Block of LPC 2148? Explain the function of PINSEL0 and PINSEL1 registers. **[6]**
- b) Draw pin diagram of 16 x 2 LCD. Explain the functions of the pins. **[6]**
- c) Draw architecture of LPC2148 processor. Explain the functions of each block in brief. **[8]**
- Q3) a)** Interface GSM module with LPC2148. Explain any four AT commands. Write an algorithm and draw flow chart for sending the message through GSM module. **[8]**
- b) Draw architecture of UART0 of LPC 2148 and explain the functions of each block in brief. Give the difference between UART0 and UART1. **[8]**

OR

P.T.O.

- Q4)** a) Write embedded C program and draw flow chart to generate triangular and square wave using on chip DAC LPC 2148. [8]
- b) Explain ADCR (A/D Control Register), ADDR (A/D Data Register), ADGDR (A/D Global data register) and ADGSR (A/D Global start register) of ADC LPC 2148. [8]

- Q5)** a) Draw interfacing of CORTEX based controllers using CMSIS standard. Draw and explain the structure of CMSIS standard. [8]
- b) State the features and applications of ARM Cortex A, Cortex R, Cortex M Series processors. Give difference between ARM Cortex R and Cortex M Series. [8]

OR

- Q6)** a) List the features of CORTEX M3 Processor. Explain operating modes of the ARM Cortex-M3 processor. [8]
- b) Compare ARM classical series and ARM Cortex series. State advantages of ARM Cortex series for embedded system design. [8]

- Q7)** a) Draw and explain the block diagram of Embedded system with IoT. [6]
- b) Define Embedded System. Explain the characteristics of Embedded System [6]
- c) Explain case study of Smart energy meter using IoT with detailed diagram. [6]

OR

- Q8)** a) Explain Sensors and Actuators with suitable examples. Give difference between Sensors and Actuators. [6]
- b) Explain case study of Waste Management for Smart City using IoT with detailed diagram. [6]
- c) Draw architecture of Internet of Things. Explain functions of different layer. [6]



Total No. of Questions : 8]

SEAT No. :

P7585

[Total No. of Pages : 2

[6180]-100

T.E. (Electronics)

INDUSTRIAL MANAGEMENT

(2019 Pattern) (Semester - II) (304214)

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) Discuss in details - The ISO - Quality Management System Standard.[8]

b) Write a short note on Quality Management Assistance Tools. [9]

OR

Q2) a) Elaborate Six sigma Quality Management Standards. [8]

b) Illustrate types of quality - quality of design, conformance and performance, phases of quality management. [9]

Q3) a) Illustrate Social Responsibility of Business in details. [9]

b) Explain Business ethics with suitable examples. [9]

OR

Q4) a) What do you mean by Changing Concepts and Objectives of Business? [9]

b) Elaborate Social Audit in details. [9]

Q5) a) Differentiate between Private sector and Cooperative sector in details.[8]

b) Write a short note on Services sector. [9]

OR

Q6) a) Differentiate between Sole Proprietorship and Partnership firms in details. [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. :

P7586

[Total No. of Pages : 2

[6180]-101

T.E. (Electronics Engineering)

PLC & AUTOMATION

(2019 Pattern) (Semester - II) (Elective - II) (304215)

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.

- Q1)** a) List and explain data handling instructions with examples. **[6]**
- b) Describe PLC I/O modules and memory organization in detail. **[6]**
- c) A parking plot has total capacity of 100 cars. Number of empty slots are displayed on the display on the display outside the parking plot & which slots are available is to be indicated by LED's Implement this in PLC using Ladder diagram. **[6]**

OR

- Q2)** a) Write a PLC Program/Ladder diagram for continuous bottle filling plant. Each bottle having 100 ml. Capacity & a batch of 1,000 bottles to be filled. **[6]**
- b) Develop a Ladder Program for Automatic Water sprinkler for plants. **[6]**
- c) Explain Arithmetic instruction used in PLC programming. **[6]**

- Q3)** a) List the parameters need to be check while PLC installation. **[8]**
- b) Which circuit protections are used in PLC. Explain in detail. **[9]**

OR

P.T.O.

Q4) a) Extend your view on Trouble shooting of a PLC system for following sections: **[8]**

i) Processor module

ii) I/O Malfunctions

b) Which are the preventive maintenance tasks should be carried for PLC system? Explain it's advantages. **[9]**

Q5) a) What is HMI? Explain interfacing technique of PLC with HMI. **[9]**

b) Discuss advantages & disadvantages of SCADA system. **[9]**

OR

Q6) a) What is RTU & MTU? Explain its function with diagram. **[9]**

b) What is structure of control system? Explain PID control system in detail. **[9]**

Q7) a) Explain with diagram working of Field bus. **[8]**

b) Explain working principal of CAN in detail. **[9]**

OR

Q8) a) Explain with diagram working of Modbus. **[8]**

b) Explain Serial Communication with it's advantages & disadvantages. **[9]**



Total No. of Questions : 8]

SEAT No. :

P7587

[Total No. of Pages : 3

[6180]-102

T.E. (E & TC/Electronics)

ADVANCED JAVA PROGRAMMING

(2019 Pattern) (Semester - II) (Elective - II) (304195 C)

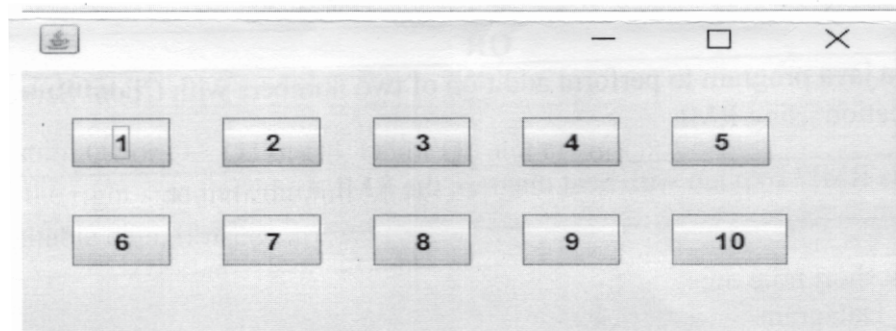
Time : 2½ Hours]

[Max. Marks : 70

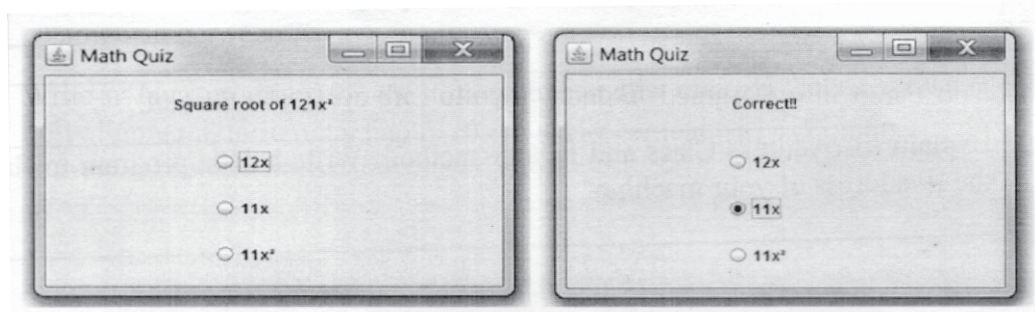
Instructions to the candidates:

- 1) Solve question Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Distinguish between ArrayList and Vector. **[4]**
- b) Write a Java program for the following output using flow layout. Consider Left alignment horizontal gap is 20 units and vertical gap is 25 units. **[7]**



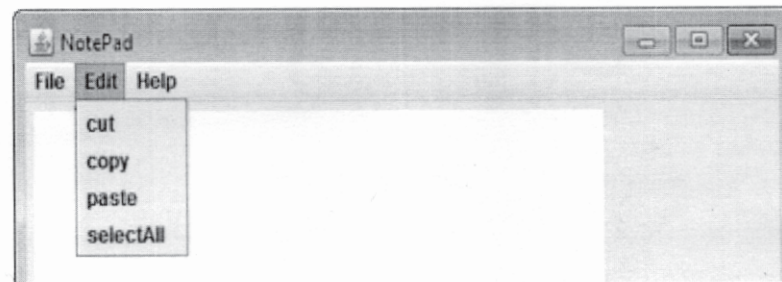
- c) Write a Java program for the following output using Radio Buttons. **[7]**



OR

P.T.O.

- Q2)** a) Write a short note on Set interface. [4]
- b) Write a program which stores the list of strings in an ArrayList and then displays the contents of the list. [5]
- c) Write a Java program for the following output using the concept of adding Menu to Window. [9]



- Q3)** a) Explain the execution of SQL commands while handling the database. [8]
- b) Write a Java Program to Retrieve the Contents of a Table using JDBC connection. [9]

Table name : Employee

Columns : emp_id, emp_name

OR

- Q4)** a) What is Prepared Statement? Write a Java Program to insert Roll Number and Student Name into Student table using Prepared Statement. [8]
- b) What is a JDBC? Explain Types of JDBC Driver. [9]

- Q5)** a) Write a short note on: [9]
- i) RMI registry
- ii) Naming and Directory services
- b) Write a simple RMI application in which the client invokes the method of the server. [9]

OR

Q6) a) Write a java program to perform addition of two numbers with Client/Server Application using RMI. **[9]**

b) What is RMI? Explain with neat diagram the RMI Architecture. **[9]**

Q7) a) Write a short note on: **[8]**

i) Datagram

ii) Java HttpURLConnection Class

b) What is socket? Explain steps used in socket programming. **[9]**

OR

Q8) a) What is servlet? Explain with neat diagram Life cycle of a Servlet. **[8]**

b) Explain InetAddress Class and factory method. Write a Java program to find the IP address of your machine. **[9]**



Total No. of Questions : 8]

SEAT No. :

P7588

[Total No. of Pages : 2

[6180]-103

T.E. (Electronics Engineering)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - II) (Elective - II) (304215)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) An analog filter has transfer function $H(s) = \frac{1}{s+1}$. Using bilinear transformation, determine transfer function of digital filter $H(z)$. Write the difference equation of the digital filter. **[6]**

b) Write comparison between Butterworth, Chebyshev, and Elliptic filters. **[12]**

OR

Q2) a) Compare IIR and FIR methods for digital filter design. **[10]**

b) List various windows used in FIR filter design. Write mathematical expression and draw the frequency response of Rectangular, hamming and Blackman window. **[8]**

Q3) a) What is a finite length problem? Describe effects of it. **[6]**

b) Obtain direct form I and II realisation of a system described by. **[12]**

$$Y(n) = 2b \cos(\omega_0) y(n-1) - b^2 y(n-2) + x(n) + 0.5x(n-1)$$

OR

Q4) a) Draw parallel realization of **[10]**

$$H(z) = (1 + 2Z^{-1} + Z^{-2}) / (1 - 0.75Z^{-1} + 0.125Z^{-2})$$

b) Compare between Butterworth polynomial and Chebyshev polynomial. **[8]**

P.T.O.

- Q5) a)** Draw a block diagram of decimator. Explain the working of a decimator with the help of waveforms. Explain the role of anti-aliasing filter. **[8]**
- b)** Draw block diagram of interpolator with interpolation factor 2 followed by decimator with factor 3. Draw waveforms for input and output waveforms assuming an arbitrary data at input. **[10]**

OR

- Q6) a)** List applications of Multirate DSP. Explain any one application in detail with appropriate block diagram and waveform. **[8]**
- b)** What do you understand by Multirate DSP? What is need for multirate DSP? Explain types of multirate DSP based on sampling rate. What are the challenges in multirate DSP? **[10]**

- Q7) a)** Draw neat block diagram and explain general architecture of DSP. **[8]**
- b)** Explain the architecture of DSP processor TMS320C54XX series. Draw a generalized block diagram. Mention the key features of the series. **[8]**

OR

- Q8) a)** What is the need for separate architecture of DSP? Elaborate the need with proper explanation. **[8]**
- b)** List various applications of DSP in biomedical engineering. Explain any one application in detail by drawing a neat block diagram and appropriate waveforms. **[8]**



Total No. of Questions : 8]

SEAT No. :

P7589

[Total No. of Pages : 3

[6180]-104

T.E. (Electronics Engineering)

FIBER OPTIC COMMUNICATION

(2019 Pattern) (Semester - II) (Elective - II) (304215D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve question Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Assume the suitable data, if necessary.

Q1) a) Classify and explain the various loss mechanisms in optical fibers. Draw and explain the attenuation curve of single mode fibers. **[8]**

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.

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 μ W 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) Compare MMSI, SMSI, MMGI fibers based on number of modes, RI profile, dimensions, and attenuation & dispersion parameters. Of these which fiber would you select for following case scenarios. **[10]**

Case 1 : Inter-lab optical setup for text file transfer.

Case 2 : Link between two states for internet access (for implementation of a high data rate, low latency intercity optical link) and why.

P.T.O.

Q3) a) Explain the following terms w.r.t. LED. **[9]**

- i) Spectral Width
- ii) Modulation Bandwidth
- iii) Quantum Efficiency
- iv) I-P characteristics

b) Compare pin diode and APD photodetectors.

A given APD has a quantum efficiency of 80% at a wavelength of 900 nm. Suppose $0.5 \mu\text{W}$ of optical power produces a multiplied photocurrent of $11\mu\text{A}$. Find multiplication factor. **[8]**

OR

Q4) a) An LED has radiative and non-radiative recombination times of 30 and 100 ns respectively. The drive current is 40 mA. Determine **[9]**

- i) The internal quantum efficiency
- ii) Bulk recombination time
- iii) Internal Power level

b) Draw structure of p-i-n photodiode and explain its operation in brief.**[8]**

Q5) a) Explain the working principle of Erbium Doped Fiber Amplifiers and Fiber Raman amplifiers. **[9]**

b) Explain the following loss mechanisms in fiber optic links: **[9]**

- alignment and joint losses
- fiber splices
- fiber connectors

OR

Q6) a) Explain the concept of Fiber Bragg Grating (FBG) and its application for Multiplexing and Demultiplexing purpose. **[9]**

b) Draw a neat labelled block diagram of a WDM system and explain the impact of parameters associated with each block on the WDM link performance. **[9]**

Q7) a) Explain link power budget with the help of power loss model for point-to-point link. **[9]**

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 -38 dBm. Given: One Connector pair loss = 0.75 dB & per splice loss = 0.1 dB. Write the link budget equation and calculate: **[8]**

i) Total link loss considering a safety margin of 6 dB.

ii) Estimate the maximum fiber distance for the fiber optic link.

OR

Q8) a) Explain the rise time budgeting analysis used in design of optical fiber communication systems. **[9]**

b) Draw a Point-to-point Link using optical fiber and explain in detail the choice of components and their impact on link design. **[8]**



Total No. of Questions : 8]

SEAT No. :

P7590

[Total No. of Pages : 2

[6180]-105

T.E. (Electronics Engineering)

E-MOBILITY

(2019 Pattern) (Semester - II) (Elective - II) (304215)

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 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) What are various types of lithium batteries? Explain construction & working of any one battery. [7]
- b) Explain role of Ultra capacitors in energy storage system. [5]
- c) Compare various energy storage systems. [5]

OR

- Q2)** a) Compare Sodium based battery & Nickel based battery. [5]
- b) Explain construction & working of Sodium based batteries. [6]
- c) Write specifications of Metal Air Battery, Zinc Chloride battery. [6]

- Q3)** a) Explain with diagram working of basic charger circuit. [6]
- b) Explain Soft-switching in power converter for inductive charging. [5]
- c) Explain with block diagram OFF board conductive charging. [6]

OR

- Q4)** a) Explain need of Charge equalization in battery charger. [6]
- b) Standard power levels of conductive chargers. [5]
- c) Explain Microprocessor based charger circuit for battery. [6]

P.T.O.

- Q5)** a) Explain Move-and-charge zone. [6]
b) Explain North American EV Plug Standards. [6]
c) Explain Fast Charging station. [6]

OR

- Q6)** a) Explain various types of EV charging connectors. [6]
b) Explain Combined Charging System (CCS). [6]
c) Explain Occasional Charging Station. [6]

- Q7)** a) Explain ROLL & RPL. [4]
b) Explain with diagram IEEE 802.11 255. [5]
c) Explain CAN Bus, I2C, LIN Bus protocol. [9]

OR

- Q8)** a) What is Ethernet? Why it is used? Give its advantages & disadvantages. [6]
b) Explain with diagram Power line carrier communication. [6]
c) Explain with diagram 6LoWPAN protocol? Give its applications. [6]



Total No. of Questions : 8]

SEAT No. :

P-7591

[Total No. of Pages : 2

[6180]-106

T.E. (E & TC)

DIGITAL COMMUNICATION

(2019 Pattern) (Semester - I) (304181)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any one Question out of Q. No. 1 or 2, Q. No. 3 or 4, Q5 or Q6 and 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) With the help of neat block diagram and waveforms describe QAM system in detail. Draw signal space diagram for 16-QAM. [8]
- b) Explain the performance of MSK with suitable block schematic and detail waveforms. [9]

OR

- Q2)** a) Draw and explain block diagram of generation and reception of M-ary FSK with waveforms. [8]
- b) Compare M-ary PSK and M-ary QAM, [9]

- Q3)** a) With neat block schematic and waveforms explain DSSS generation and detection. [9]
- b) What is PN sequence? Explain properties of PN sequence with 3-stage shift register. [8]

OR

- Q4)** a) Write a short note on : [8]
- i) CDMA ii) FHSS
- b) With the help of neat schematic describe Ranging using DSSS in detail. [9]

P.T.O.

Q5) a) Define entropy. Show that the entropy is maximum when binary message has 50% probability of occurrence. [9]

b) Prove that [9]
 $H(X, Y) = H(X/Y) + H(Y)$ and $H(X, Y) = H(Y/X) + H(X)$.

OR

Q6) a) Compare Shannon-Fano and Huffman coding techniques. [5]

b) A source puts out one of the six messages during each message interval with probabilities $1/2, 1/4, 1/8, 1/8, 1/16, 1/32$ and $1/32$. Find the entropy of the system. Also find the rate of information if there are 16 outcomes per second. [4]

c) Apply Huffman coding for the following message ensembles
 $[X] = [x_1 \ x_2 \ x_3 \ x_4 \ x_5 \ x_6 \ x_7]$ $[P] = [0.45 \ 0.15 \ 0.1 \ 0.1 \ 0.08 \ 0.08 \ 0.04]$
and find coding efficiency with $M = 2$. [9]

Q7) a) Define and Explain following terms, [10]

- i) Hamming distance
- ii) Hamming weight
- iii) Code rate
- iv) Constraint length
- v) Generator polynomial

b) The generator matrix for (7, 4) linear block code is given below. Find all code vector. Calculate syndrome for C_4 without error. [8]

$$G = \left[\begin{array}{cccc|ccc} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 & 1 \end{array} \right]$$

OR

Q8) Write a short note on (Any Three) : [18]

- a) Turbo Codes
- b) Cyclic Codes
- c) Convolution Codes
- d) LPDC Codes



[6180]-107

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 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) Use of a calculator is allowed.
- 5) Neat diagrams must be drawn wherever necessary.

- Q1)** a) For a parallel plate capacitor, area of plate $A = 120\text{cm}^2$, spacing between plates $d = 5\text{mm}$, separated by dielectric of $\epsilon_r = 12$, connected to 40V battery. Find [8]
- i) Capacitance
 - ii) E
 - iii) D
 - iv) Energy stored in Capacitor
- b) Derive boundary conditions that exist between two different magnetic materials. [10]

OR

- Q2)** a) Derive an expression for capacitance parallel plate capacitor. [8]
- b) A boundary exists at $Z = 0$ between two dielectrics $\epsilon_{r1}=2.5$ in region $Z<0$ and $\epsilon_{r2}=4$ in region $Z>0$. The field in the region ϵ_{r1} is $E=30a_x + 50a_y + 70a_z$ v/m. Find [10]
- i) Normal Component of E_1
 - ii) Tangential Component of E_1
 - iii) Angle α_1 between E_1 and normal to surface
 - iv) Normal Component of D_2
 - v) Tangential Component of D_2
 - vi) Angle α_2 between D_2 and normal to surface

P.T.O.

Q3) a) State and prove Poynting theorem. State significance of Poynting Vector. [8]

b) What do you mean by displacement current. Prove that displacement current density is given by $J_d = \partial D / \partial t$. [10]

OR

Q4) a) Given $H = H_m e^{j(\omega t + \beta z)} a_x$ A/m in free space. Find E using Maxwell equation. [8]

b) Write Maxwell equation for free space in point form and integral form for static electric field. [10]

Q5) a) Find the skin depth of frequency of 1.6MHz in aluminium whose $\sigma = 38.2$ Ms/m and $\mu_r = 1.0$. Also find propagation constant and wave velocity. [8]

b) Derive the wave equation for free space in terms of electric field intensity. [8]

OR

Q6) a) For uniform plane waves explain Depth of penetration. [8]

b) For uniform plane waves explain the term Snell's Law. [8]

Q7) a) A generator of 1V, 1KHz supplies power to 100 km long transmission line, terminated in Z_0 and having following parameters. $R = 10.4 \Omega/\text{km}$, $L = 0.00367 \text{ H/km}$, $G = 0.8 \times 10^{-6} \text{ mho/km}$ and $C = 0.00835 \times 10^{-6} \text{ F/km}$. Calculate characteristics impedance, propagation constant, reflection coefficient K. [8]

b) What is meant by dissipation less line? Derive an expression for input impedance of dissipation less line. [10]

OR

Q8) a) A transmission line cable has following primary constants $R = 11 \Omega/\text{km}$, $G = 0.8 \mu\text{mho/km}$, $L = 0.00367 \text{ H/km}$, $C = 8.35 \text{ nF/km}$ at a signal of 1kHz calculate : [10]

- Characteristic Impedance Z_0
- Attenuation Constant α Np/km
- Phase Constant β radians/km
- Wave Length λ in km
- Velocity of signal in km/sec

b) A transmission line has a characteristic impedance $69 \angle -12^\circ \Omega$ is terminated 200Ω resistor. Determine [8]

- VSWR
- Reflection coefficient



Total No. of Questions : 8]

SEAT No. :

P-7593

[Total No. of Pages : 2

[6180]-109
T.E. (E&TC)
MICROCONTROLLERS
(2019 Pattern) (Semester - I) (304184)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** Describe operation of PIC18F4550 microcontroller with block diagram. **[6]**
- b) Draw and explain program memory organization of PIC18F4550. **[6]**
- c) Explain the POR and BOD modes of reset in PIC18F4550. **[6]**

OR

- Q2) a)** Draw and explain the concept of data memory organization in PIC18F4550 **[6]**
- b) State features of PIC18F4550 Microcontroller. **[6]**
- c) Explain the flag structure (PSW) of PIC18F4550 in detail. **[6]**
- Q3) a)** Explain the timer 2 with block schematic, compare Timer 0,1 and 2. **[9]**
- b) Describe the block schematic of compare mode of operation with applications in PIC18F4550 **[8]**

OR

- Q4) a)** State features of ADC, Draw and explain block schematic of ADC in details with function of Control registers in PIC18F4550. **[9]**
- b) Write a program for 2.5 KHz and 75 % duty cycle PWM generation with $N = 4$, use $F_{osc} = 10\text{MHz}$. **[8]**

P.T.O

- Q5)** a) Draw port structure of PIC18F4550 and comment on SFRs used in Programming. [6]
- b) Draw an interfacing diagram of LED with PIC18F4550 using port D and write program to display ring counter. [6]
- c) Draw an interfacing diagram of Home protection system with LED, Key, Motion Sensor, LCD ,buzzer and relay connected to various port lines of PIC18F4550. [6]

OR

- Q6)** a) Draw an interfacing diagram of 4×4 keypad and write short program for checking key is closed or open. [6]
- b) State specifications of LCD and draw an interfacing diagram with PIC18F4550. [6]
- c) Explain step wise procedure and design methodology of PIC18F4550 test board. [6]
- Q7)** a) Explain the use of BRGH register for calculation of baud rate with UART transmitter block diagram. [9]
- b) State features of RTC, draw an interfacing diagram with PIC18F4550. [8]

OR

- Q8)** a) State features of Rs232, explain with diagram I2C mode of MSSP structure in PIC18F4550 [9]
- b) State features of EEPROM, draw an interfacing diagram with PIC18F4550. [8]



[6180]-110

T.E. (E & TC)

DIGITAL SIGNAL PROCESSING

(2019 Pattern) (Semester - I) (304185) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to right indicate full marks.
- 3) Your answers will be valued as a whole.
- 4) Use logarithmic tables slide rule, mobiler charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume suitable data, if necessary.
- 6) Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.

- Q1)** a) Explain the cyclic property of twiddle factor for 8-point DFT. [4]
b) What is FFT? Explain Bit-reversal and in place computation in FFT algorithm. Show the 3-bit bit reversed sequence. [6]
c) Compute 4-point DFT of sequence $x(n) = \{1, 2, 3, 1\}$ using DIT-FFT Radix-2 algorithms. What is computational complexity of Radix-2 FFT algorithm? [8]

OR

- Q2)** a) Compute 8-point DFT of the following sequence using radix-2 DIT-FFT algorithm. $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$. [8]
b) State the DFT symmetry property for a real sequence. [2]
c) Compute circular convolution using DFT-IDFT method for the sequences below $x(n) = \{1, 2, 1, 2\}$ & $h(n) = \{1, -1, 2, 1\}$. [8]

- Q3)** a) Draw the direct form - I and II structure 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 impulse invariant method for S-plane to Z-plane mapping. Explain its limitations. [9]

P.T.O.

OR

- Q4)** a) Explain the impulse invariance technique in detail. What is drawback of it? How Bilinear Transformation removes it? [8]
b) Draw and compare the characteristics of Butterworth filters, Chebyshev filters and elliptic filter. [8]
c) What is warping effect? [2]

- Q5)** a) Compare FIR filter with IIR filter. [7]
b) Design FIR digital filter to approximate an ideal low pass filter with passband gain of unity, cut off frequency 850Hz and sampling frequency 5000Hz. The length of impulse response should be 5. Use Hamming window. [10]

OR

- Q6)** a) Explain the Gibb's Phenomenon. [7]
b) Design a FIR filter with frequency response

$$H_d(e^{-jw}) = \begin{cases} e^{-j3w} & , -\pi/4 \leq w \leq \pi/4 \\ 0 & , \pi/4 < w \leq \pi \end{cases} \quad \text{Using Hamming window for}$$

N = 7. [10]

- Q7)** a) Speech signal is corrupted by low and high frequency noise. Explain in detail how PSP is used to remove noise with illustration. [8]
b) Explain how DSP is useful in interference cancellation in ECG. [9]

OR

- Q8)** a) Write short notes : [8]
i) Voice coders (Vocoders)
ii) Speech noise reduction
b) Explain real time application of DSP in medical field. [9]



Total No. of Questions : 8]

SEAT No. :

P-7595

[Total No. of Pages : 2

[6180]-111

T.E. (E & TC Engineering)

ELECTRONICS MEASUREMENTS

(2019 Pattern) (Semester - I) (304185) (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) Neat diagrams must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

Q1) a) Draw the block diag. of random noise generator and explain with neat waveforms. [8]

b) With the help of block diag. explain the functioning of a conventional standard signal generator. [9]

OR

Q2) a) Write a short note on frequency synthesized signal generator. [8]

b) Draw the block diag. of a function generator & explain its operations. [9]

Q3) a) Compare DSO and CRO with four features. [4]

b) Discuss in detail the measurement of frequency by Lissajous method. [7]

c) Draw the block diag. of sampling oscilloscope and explain the principle. [7]

OR

Q4) a) List out the application of DSO. [4]

b) Discuss the working of the dual beam oscilloscope. [7]

c) Explain X-Y mode operation of CRO. [7]

P.T.O.

- Q5)** a) Give construction and operation of LCD screen and compare different displays. [8]
b) Explain in detail internal and external acquisition cards. [9]

OR

- Q6)** a) Explain why recorders are essentials? With neat diag. explain X-Y plotter. [8]
b) What is data acquisition system? Describe the basic components of an digital data acquisition with proper block diag. [9]

- Q7)** a) Sketch block diag. of OTDR and state function of each block. [9]
b) Sketch block diag. of field strength meter and state function of each block. [9]

OR

- Q8)** a) Describe with diagram the operation of a logic Analyser. [9]
b) What is optical time domain Reflectometer. Explain its working in detail. [9]



Total No. of Questions : 8]

SEAT No. :

P-7596

[Total No. of Pages : 2

[6180]-113

T.E. (E & TC)

COMPUTER NETWORKS

(2019 Pattern) (Semester - I) (304185D) (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) Assume suitable data, if necessary.

- Q1)** a) Explain the various performance parameters of network layer. [7]
b) Discuss the ICMPv4 Protocol. [7]
c) Compare IPv4 vs IPv6. [4]

OR

- Q2)** a) Explain the concept of classful and classless addressing. [7]
b) Compare datagram switching and virtual circuit switching. [7]
c) Explain the network id and host id. [4]

- Q3)** a) Explain distance vector routing algorithm. [7]
b) Explain Routing Information protocol. [7]
c) Explain intra domain multicast protocol. [4]

OR

- Q4)** a) Which strategies are used while transition from IPv4 to IPv6 addressing? [7]
b) Explain the link state routing algorithm. [7]
c) Explain inter-domain multicast protocol. [4]

- Q5)** a) What is congestion control? Explain the leaky bucket algorithm with suitable diagram. [8]
b) Explain the difference between TCP and UDP. [8]

P.T.O.

OR

Q6) a) Explain TCP Connection establishment, TCP data transfer and TCP connection termination. [8]

b) Explain stream control transmission protocol. [8]

Q7) a) List the functions of application layer. Explain the DNS in detail. [9]

b) Explain telnet and FTP. [9]

OR

Q8) Write short notes : [18]

a) DHCP

b) BOOTP

c) SMTP



Total No. of Questions : 8]

SEAT No. :

P-7597

[Total No. of Pages : 2

[6180]-114

T.E. (E & TC)

CELLULAR NETWORKS

(2019 Pattern) (Semester - II) (304192)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer any one Question out of Q. No. 1 or 2, Q. No. 3 or 4, Q5 or Q6 and 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 different Channel Assignment Strategies. [6]
b) What is Handoff? Why is it necessary in Mobile Cellular System? Explain hand off scenario at cell boundary. [8]
c) What is Cell Sectoring? Explain with neat diagram. [4]

OR

- Q2)** a) Derive the approximate formula for S/I using co-channel reuse ratio Q. [6]
b) A cellular service provider decides to use a digital cellular method that can tolerate a signal to noise interference ratio 15 dB in the worst case. What is the frequency reuse factor and cluster size for maximum capacity if the path loss exponent is $n = 4$ and $n = 3$? Assume that there are six co-channels in the first tier, and all of them at the same distance from the mobile. [9]
c) Differentiate between hard handoff and soft handoff. [3]

- Q3)** a) Define and explain : [8]
i) CCR (call completion rate)
ii) Grade of Service
iii) Busy hour call Attempt.
iv) Calling rate and holding time
b) What is lost call system? Derive the first Erlang distribution for Lost call systems. [9]

P.T.O.

OR

- Q4)** a) Explain the assumptions in traffic measurement. [8]
b) A group of 5 trunks is offered 2 Erlang of traffic. Find Grade of service, probability that only one trunk is busy, probability that only one trunk is free, probability that at least one trunk is free. [9]

- Q5)** a) Explain the requirements of 5G? Also explain the open wireless architecture of 5G. [9]
b) Compare LTE and LTE A. [7]
c) List any four specifications of LTE. [2]

OR

- Q6)** a) Explain the following IEEE standards : [9]
IEEE 802.11a, IEEE 802.11g, IEEE 802.11d, IEEE 802.11e, IEEE 802.11n, IEEE 802.11r.
b) Draw and explain LTE radio protocol architecture. [9]

- Q7)** a) Explain in detail the why to evaluate the performance of a system and the procedure to performance evaluation of a system. [8]
b) Explain network coding and elaborate the use of Network Coding in wireless communication. [9]

OR

- Q8)** a) Explain mechanisms by which a system could improve link robustness in wireless communication. [8]
b) Explain the classification of scheduling algorithm and explain the types of scheduling. [9]



Total No. of Questions : 8]

SEAT No. :

P-8789

[Total No. of Pages : 3

[6180]-115A
T.E. (E & TC)
PROJECT MANAGEMENT
(2019 Pattern) (Semester - II) (304193)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) State various levels of leadership styles & explain any 2 in detail. [6]
- b) What do you mean by superimposing one organization form are another. [6]
- c) Write a note on Diversity Management. [6]

OR

- Q2)** a) List various organizational structures? Explain any one in detail. [6]
- b) List different project team members. Explain their duties. [6]
- c) Write a note on Team management. [6]

- Q3)** a) Differentiate between PERT & CPM. [6]
- b) Write a note on project cost and budget. Elaborate its significance in project with example. [6]
- c) What is AoA and AoN network. Explain with suitable example. [5]

OR

P.T.O.

Q4) a) Explain the resource allocation in project management with example. **[6]**

b) A project has the following time schedule **[6]**

Activity	Time (Weeks)	Activity	Time (Weeks)
(1 – 2)	4		
(1 – 3)	1	(5 – 7)	8
(2 – 4)	1	(6 – 8)	1
(3 – 4)	1	(7 – 8)	2
(3 – 5)	6	(8 – 9)	1
(4 – 9)	5	(8 – 10)	8
(5 – 6)	4	(9 – 10)	7

Construct network & calculate

- i) Earlier start & finish time
 - ii) Latest start & finish time
 - iii) Critical path and project duration
- c) With suitable example explain the process of constructing Gantt's chart. **[5]**

Q5) a) Explain the process of risk management. **[6]**

b) Explain the process of project financial management. **[6]**

c) Write a note on project management tool TRELLs. **[5]**

OR

Q6) a) What do you understand by "Risk Analysis". **[6]**

b) Explain in depth, with suitable example, how to control risks in Project management. **[6]**

c) Write a note on Project management tool "JIRA". **[5]**

- Q7)** a) Describe product development process. [6]
b) Identify the characteristics of successful entrepreneur. [6]
c) Write a note on [6]
i) Patent
ii) Trade secrets

OR

- Q8)** a) Explain in detail how the Product development relies on the customer needs. [6]
b) Define the factors impacting emergence of entrepreneurship. [6]
c) Write short notes on : [6]
i) Copy right
ii) Franchise



Total No. of Questions : 8]

SEAT No. :

P-7599

[Total No. of Pages : 3

[6180]-116
T.E. (E & TC)
POWER DEVICES AND 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 and 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 $R = 5\Omega$. Find: [6]
i) RMS o/p voltages at third & fifth harmonic (V_{o3} & V_{o5})
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 180° mode with gate signals & output waveforms. [12]
- 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 $R = 10\Omega$. If duty cycle is 40%, calculate : [6]
i) Average & rms o/p voltages
ii) Average & rms o/p currents
iii) Chopper efficiency

P.T.O.

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 $\theta_{JC} = 0.16^\circ\text{C/W}$, $\theta_{CS} = 0.08^\circ\text{C/W}$. for heat sink temperature of 60°C, calculate total average power loss in thyristor - sink combination. [4]
- If heat sink temperature is reduced to 50°C, find new total average power loss in thyristor - sink combination. [4]

OR

- Q6)** a) What is 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. :

P-8798

[Total No. of Pages : 2

[6180]-117

T.E. (E&TC)

DIGITAL IMAGE PROCESSING

(2019 Pattern) (Semester-II) (Elective - II) (304195)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Your answers will be valued as a whole.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) What is edge detection? Compare performance of first order & second order derivative w.r.t. image. [6]
- b) Explain Laplacian edge detector. Explain Why LoG mask is preferred over Laplacian edge detector. [6]
- c) What is Hough Transform? How it is used in edge linking. [6]

OR

- Q2)** a) Explain local and global thresholding in image segmentation. [6]
- b) Explain the image segmentation using [6]
- i) Region splitting ii) Region merging
- c) Explain the following edge detecting operators in detail. [6]
- i) Prewitt operator ii) Sobel operator

- Q3)** a) Explain the need of image compression. Hence explain image compression model. [6]
- b) Explain the concept of motion estimation with the help of any one algorithm in detail. [6]
- c) What is data redundancy? Explain the two redundancies used in image compression. [5]

OR

P.T.O.

- Q4)** a) What is lossy compression technique? Explain the DCT based compression technique. [6]
b) Draw and explain JPEG base line encoder. Comment on block size used in JPEG. [6]
c) What is fidelity Criteria? Explain the fidelity criteria used in image compression. [5]

- Q5)** a) What is image restoration? How image restoration is different from image enhancement explain with example? [6]
b) Explain any three types of noise models. [6]
c) Explain in detail how Weiner filter is used in image restoration. [6]

OR

- Q6)** a) Explain any three Geometric transforms in image restoration. [6]
b) Explain in detail constrained least square filtering. [6]
c) Explain the estimation of degradation function in frequency domain. [6]

- Q7)** a) What is pattern in images? Explain the different pattern classes in object recognition. [6]
b) What is image classification? How it is used for object recognition. [6]
c) How Deep learning using CNN is used for object recognition. [5]

OR

- Q8)** a) Explain any one algorithm of content based image retrieval. [6]
b) Explain any one algorithm of image classification in detail. [6]
c) Explain object recognition using structural methods. [5]



Total No. of Questions : 8]

SEAT No. :

P-8793

[Total No. of Pages : 2

[6180]-118A

T.E. (E&TC)

SENSORS IN AUTOMATION

(2019 Pattern) (Semester-II) (Elective - II) (304195(B))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Draw neat diagrams wherever necessary.
- 4) Assume Suitable data, if necessary.

Q1) a) Write a short note (any three) **[12]**

- i) Pressure scales
- ii) Bernoulli's theorem
- iii) Orifice
- iv) Hall effect Sensors

b) Draw and explain the principle of Fiber-Optic Sensors. **[5]**

OR

Q2) a) What is Principle of working in the view of strain gauge elements? **[6]**

b) Explain Eddy current Proximity Sensor. **[4]**

c) Draw and explain optical encoder. **[7]**

Q3) a) Explain working principle of potentiometric displacement sensors with diagram. Write its applications. **[9]**

b) Explain working principle of Gyroscope, state its applications. What is difference between working of Gyroscope and accelerometer? **[9]**

OR

Q4) a) Which are different forms of capacitive sensing element? Explain working of Capacitive push-pull displacement sensor. **[9]**

b) What are Optical encoders. Explain its working principle with diagram and write its applications. **[9]**

P.T.O.

- Q5)** a) Explain in detail about Charge-Coupled and CMOS Image Sensors. [8]
b) Write a short note on Bio Sensors Resonant mirror. [5]
c) Write a short note Gas Sensor Detector Module. [4]

OR

- Q6)** a) Explain in detail about working principle of Light Sensors and RFID Sensor with application. [8]
b) Write a short note on Camera Sensor and Colour Sensor. [5]
c) Explain MEMS and NEMS sensors. [4]

- Q7)** a) What is Data acquisition system? Explain the single and multichannel DAS with the help of block diagram. [7]
b) What are different types of sensors in IOT? [4]
c) Explain UART Interface with the help of block diagram. [5]
d) State various application of IOT. [2]

OR

- Q8)** a) Explain the single and multichannel DAS with the help of block diagram.[6]
b) Explain the IOT based healthcare system with the help of block diagram.[5]
c) Write a short note on (any one) [5]
i) YF-S201
ii) E8FC-25D (Solid state IC)
d) State application of DAS. [2]



Total No. of Questions : 8]

SEAT No. :

P-7601

[Total No. of Pages : 2

[6180]-120

T.E. (E & TC)

EMBEDDED PROCESSORS

(2019 Pattern) (Semester - II) (304195D) (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) With diagram explain LCR Register related with serial communication. How baud rate can be set? [6]
- b) List the features of on chip ADC of LPC2148. Explain the function of bits in ADC Control Register. [6]
- c) Draw and explain interfacing diagram of GSM using UART with LPC 2148. What are AT commands? [6]

OR

- Q2)** a) Draw interfacing diagram of GPS using UART with LPC 2148. How coordinates are extracted from string received by GPS module. [6]
- b) Write the SFR associated with DAC & with algorithm explain how DAC can be used to generate ramp waveforms. [6]
- c) Draw and explain interfacing of DHT11 with LPC2148. Write algorithm/flowchart to display temperature and humidity. [6]

- Q3)** a) Compare cortex processors over ARM7 for embedded system design. [6]
- b) Write a note on 'Modes of ARM CORTEX M4'. [6]
- c) Explain programmer's model of ARM CORTEX STM32F4xx. [6]

OR

P.T.O.

- Q4)** a) List the applications of ARM Cortex processors. List features of ARM Cortex processor. [6]
- b) Draw and explain the memory map of STM32F4XX. [6]
- c) Draw and explain CMSIS standard for firmware development in ARM Cortex based system. [6]

- Q5)** a) What are the features of GPIO of STM32F4XX. Write a note on different types of GPIO registers of STM32F4xx. [7]
- b) Draw an interfacing diagram and write a C program to interface and flash LED using STM32F4xx microcontroller. [5]
- c) Draw an interfacing diagram to interface LDR sensor with STM32F4xx microcontroller and write algorithm / flowchart to display the light parameter on LCD. [5]

OR

- Q6)** a) Enlist various features of Timer / Counter and describe SFR registers related with timer / counter. Write algorithm / flowchart to generate 5 ms time delay using timer. [7]
- b) Enlist the features of on chip ADC & DAC of STM32F4xx controller. [5]
- c) Draw an interfacing diagram to interface MQ3 sensor with STM32F4xx and write algorithm / flowchart to display the Gas percentage parameter. [5]

- Q7)** a) Explain the architecture and operation of CAN bus with reference to STM32F4xx microcontroller. Discuss the CAN Bus Frame. [9]
- b) Draw an interfacing diagram of STM32F4xx Interfacing with accelerometer MPU 6050. Write algorithm / flowchart to display the parameter. [8]

OR

- Q8)** a) Write detailed note on PWM. With interfacing diagram, show speed of DC Motor can be changed using PWM in STM32F407XX. [9]
- b) What are features of Ultrasonic sensor HCSR04? Explain interfacing with STM32F407XX. Write algorithm! flowchart to display distance on LCD. [8]



Total No. of Questions : 8]

SEAT No. :

P-7602

[Total No. of Pages : 2

[6180]-121

T.E. (Electronics & Telecommunication Engineering)

NETWORKS SECURITY

(2019 Pattern) (Semester - II) (304195E) (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) Use of calculator is allowed.
- 5) Assume suitable data; if necessary.

- Q1)** a) Explain the concept of Diffie-Hellman key exchange algorithm with details of steps. [4]
- b) Elaborate the steps in the various rounds of AES. [8]
- c) Discuss the block cipher modes of operation and stream cipher mode of operation. [6]

OR

- Q2)** a) What is the difference between diffusion and confusion? [4]
- b) Which basic steps are performed in one round of operation in DES? Explain in detail. [8]
- c) Explain RSA algorithm using any example. [6]

- Q3)** a) Elaborate the working of hash based Message Authentication codes (HMAC). [6]
- b) What are the important aspect that establish trust in digital signature? [6]
- c) Compare Hashing Vs Encryption. [4]

OR

P.T.O.

- Q4)** a) What are biometric authentication techniques? Explain its importance in today's digital world. [6]
b) How the Authentication Applications such as Kerberos work? Explain in detail. [6]
c) Compare MD5 with SHA. [4]

- Q5)** a) Explain in detail PGP (Pretty Good Privacy) concept and services provided by PGP. [6]
b) Write a short note on S/MIME. Which cryptographic algorithms are used in it? [6]
c) Discuss IP security Architecture. [6]

OR

- Q6)** a) What are the advantages and applications of IP security? [6]
b) Explain how confidentiality is obtained using Encapsulating, Security payload? [6]
c) Discuss the different web security considerations. [6]

- Q7)** a) What are the firewall design principles, what are the types of firewalls. [6]
b) What is Authentication header & how it provides the protection to IP header? [6]
c) Which are the key participants in SET? [6]

OR

- Q8)** a) Define virus. Specify the types of viruses. [6]
b) Write a short note on: Intrusion Detection. [6]
c) What is need of SSL? Explain all Phases of SSL handshake protocol in detail. [6]



Total No. of Questions : 8]

SEAT No. :

P7603

[6180]-122

[Total No. of Pages : 2

**T.E. (Electronics and Computer Engineering)
DATABASE MANAGEMENT SYSTEM
(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, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) Explain the various clauses for SELECT Query with example. [6]
b) Write a short note Aggregate Functions. [6]
c) Explain stored procedure and stored function. Differentiate between stored procedure and stored function. [8]

OR

- Q2)** a) Explain pattern matching operator “LIKE” [6]
b) Explain any two join operation with example. [6]
c) Define Views. Explain Create, Update and Delete Views with examples. [8]

- Q3)** a) What is serializability? Explain conflict serializability and view serializability with example. [8]
b) Explain in detail ACID properties of transactions. [8]

OR

- Q4)** a) What is a deadlock? Explain how deadlock detection and prevention is done. [8]
b) Explain the need of a concurrency control system? How is it achieved with timestamp based protocol? [8]

P.T.O.

- Q5) a)** Explain two important issues Speed Up and Scale Up in case of parallel databases. **[8]**
- b)** Define a distributed database. Explain advantages and disadvantages of distributed database. **[8]**

OR

- Q6) a)** Enlist different Parallel database architectures. Explain any two in detail. **[8]**
- b)** Describe concurrency control in distributed databases. **[8]**
- Q7) a)** Explain MapReduce operation in MongoDB with suitable example. **[6]**
- b)** Explain ACID VS BASE properties. **[6]**
- c)** List difference between RDBMS and No SQL. **[6]**

OR

- Q8) a)** Explain any three aggregation functions using MongoDB with suitable example. **[6]**
- b)** List different NO SQL data Models and explain Document Based Data Model. **[6]**
- c)** Explain CREATE, READ and UPDATE in MongoDB with examples. **[6]**



Total No. of Questions : 8]

SEAT No. :

P7604

[Total No. of Pages : 3

[6180]-123

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 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 following methods for an applet **[6]**

- i) init ()
- ii) destroy ()
- iii) Paint ()

b) Explain the following AWT/swing components **[6]**

- i) JTextField
- ii) JFrame
- iii) JSplitPane

c) Write a program to create an applet with some background color and foreground color with a message. The message string is stored in msg and is to be displayed in paint() method. **[6]**

OR

Q2) a) Explain the following. **[6]**

- i) adapter classes
- ii) inner classes

b) Write a program to pass name and salary to an applet and get the tax calculated. Make use of get Parameter() method. **[6]**

c) Write a program to create a combo box with names of some countries. The user can select any one of them from the list and the selected country name is displayed again in the frame. **[6]**

P.T.O.

- Q3)** a) What are AWT components? Explain some AWT components. [6]
b) Write a program to trap a key which is pressed on the keyboard and display its name in the TextField. (Consider F1, F2, F3 keys). [6]
c) Write a Java program to create a text area and display the mouse event when the button on the mouse is clicked. [6]

OR

- Q4)** a) Write a short note on. [6]
i) Event Classes
ii) Event Listeners
b) Write a program which first creates a frame and then closes it on clicking the close button. [6]
c) Write a Java program that allows you to fill the shapes with some colors.[6]

- Q5)** a) Write short notes on the following. [8]
i) Border Layout
ii) Grid Layout
b) Write a Java program to create a card layout and display 3 buttons, Button1, Button2 & Button3 in card Layout. [8]

OR

- Q6)** a) Write a Graphical User Interface program in Java to create a choice menu with names of some languages from where the user has to select any one item. The selected item must also be displayed in the frame. [8]
b) Explain in detail java utilities package. [8]

- Q7)** a) Explain the following in JDBC [10]
i) DSN
ii) ScrollableResultSet
iii) BLOB
iv) PreparedStatement
v) ODBC

b) Explain the following in relation to JDBC [8]

i) Class. for Name (dname) method

ii) Driver Manager.get Connection

(“jdbc:oracle:thin:@localhost:1521:xe”, “scott”, “tiger”);

OR

Q8) a) Write a JDBC program to retrieve data from the table emptab of test database. [8]

b) Explain in brief the following. [10]

i) ResultSetMetaData

ii) Reader

iii) Type 4 (JDBC driver)

iv) execute () Method

v) getProperty ()



Total No. of Questions : 8]

SEAT No. :

P7605

[6180]-124

[Total No. of Pages : 3

T.E. (Electronics and 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 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)** Explain QPSK signal generation with neat block diagram. **[6]**
- b) With the help of block diagram and waveforms, explain generation of coherent BFSK. **[6]**
- c) It is required to transmit 2.08×10^6 binary digit per second with $P_b \leq 10^{-6}$. Two possible schemes are considered. **[8]**
- i) BPSK
 - ii) 16-Ary PSK

The channel noise PSD is $S_n(\omega) = 10^{-8}$. Determine the transmission bandwidth and the signal to power required at receiver input in each case. Given : $\text{erf}(0.99999) = 3.3$

OR

- Q2) a)** Compare the performance of modulation schemes, BPSK, BFSK, QPSK, DPSK, M-ary PSK, M-ary FSK w.r.t. **[6]**
- i) Variable characteristics in o/p carrier.
 - ii) BW.
 - iii) Symbol duration
 - iv) Probability of Error.
 - v) Bit per symbols.
 - vi) Applications

P.T.O.

- b) Explain generation, Detection of BPSK system with neat block diagram. [6]
- c) Binary data is transmitted using M-ary PSK at a rate 2 Mbps over RF link having bandwidth 2MHz find signal power required at the receiver input so that bit error probability is less than 10^{-5} . [8]

Given: $M = 16$ and $M=32$ and Noise PSD $\frac{N_0}{2} = 10^{-8}$ Watt / Hz, erf (0.99995) = 3.2.

- Q3)** a) Explain different Multiple Access Techniques in detail. [8]
- b) A PN sequence is generated using feedback shift registers of length $m=4$, Find the generated output sequence if the initial contents of the shift register are 1000. If the chip rate is 10^7 chips/sec. Find the following Parameter [8]
- Design PN sequence
 - Chip Duration
 - Length of PN sequence
 - Duration of PN Sequence

OR

- Q4)** a) Draw the block diagram of DSSS BPSK transmitter and receiver system and explain various blocks. [8]
- b) Differentiate between DHSS and FHSS w.r.t. [8]
- Definition
 - Chip rate
 - Modulation techniques
 - Processing gain
 - Error probability
 - Acquisition time
 - Effect of distance
 - Applications

- Q5)** a) State & Explain [8]
- Shannon's channel coding theorem
 - Shannon's Information capacity theorem
- b) Define information rate, Entropy, Mutual information and channel capacity. [8]

OR

- Q6)** a) Compare Shannon - Fano - and Huffman coding techniques. [8]
 b) A source emits 1000 symbols per second from a range of 5 symbols, with probabilities. [8]

$\left\{ \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{16} \right\}$ find source entropy and information rate.

- Q7)** a) What is stop - and - wait ARQ? Explain. [6]
 b) Explain the need of Error detection and Error Correction. [6]
 c) Define systematic, non-systematic code and Explain properties of linear block code [6]

OR

- Q8)** a) Define the following: [6]

- i) Code rate
- ii) Word length
- iii) Hamming distance
- iv) Minimum hamming distance
- v) Block length
- vi) Constraint length

- b) For a systematic LBC, the parity check bits are [6]

$$C_1 = M_1 \oplus M_2 \oplus M_3$$

$$C_2 = M_2 \oplus M_3 \oplus M_4$$

$$C_3 = M_1 \oplus M_2 \oplus M_4$$

Find

- i) Generator matrix.
 - ii) Error detecting & correcting capabilities.
 - iii) Parity Check Matrix.
 - iv) Corrected code word for received code word [1101001].
- c) Comment whether following code is perfect code or not, with necessary justification. [6]
- i) (7, 4) LBC
 - ii) (6,3) LBC



Total No. of Questions : 8]

SEAT No. :

P7606

[Total No. of Pages : 2

[6180]-125

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) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume Suitable data if necessary.

- Q1)** a) Interface relay with 8051 microcontroller. Write an embedded C program to turn ON and OFF relay with delay. [6]
- b) Draw an interfacing diagram of stepper motor with 8051 microcontroller and write an embedded C code to rotate it in clockwise continuously. [6]
- c) Draw an interfacing diagram of DAC with 8051 microcontroller and write an embedded C code to triangular waveforms. [8]

OR

- Q2)** a) Draw an interfacing diagram of opto-isolator with 8051 microcontroller and write an embedded C code to flash lamp connected to it with delay of 10 msec. [6]
- b) Interface buzzer with 8051 microcontroller. Write an Embedded C program to turn ON and OFF buzzer. [6]
- c) Explain the interfacing of RS232 with 8051 with neat diagram. Also highlight the role of MAX232 [8]

- Q3)** a) State any 4 differences between MSP430x2x, MSP430x4x, MSP430x5x. [8]
- b) Explain with neat diagram MSP430x5xx microcontroller architecture. [8]

OR

- Q4)** a) Compare variants of the MSP430 family. [8]
- b) Explain in detail register set used in MSP430 microcontroller [8]

P.T.O.

- Q5) a)** Explain the following GPIO registers of MSP430 microcontroller. **[8]**
- i) PxIES
 - ii) PxREN
 - iii) PxOUT
 - iv) PxDIR
- b) Draw an interfacing diagram of 8 LEDs with MSP430 microcontroller and write an embedded C code to flash the LEDs with is delay. **[8]**

OR

- Q6) a)** Write a short note on 12C and UART protocol of MSP430 microcontroller. **[8]**
- b) Explain in detail PWM generation with various duty cycle in MSP430x5xx **[8]**

- Q7) a)** Design frequency counter using 8051 microcontroller and display the result on LCD. **[6]**
- b) Design a home automation system using MSP430 microcontroller. Also write an embedded C program for same. **[6]**
- c) Draw and explain block diagram of DAS using 8051 microcontroller. **[6]**

OR

- Q8) a)** Design environment monitoring system using MSP430 microcontroller. **[6]**
- b) Design soil monitoring system for agriculture using MSP430 microcontroller. **[6]**
- c) Design a water level monitoring system using 8051 microcontroller. Draw the flow chart for the same. **[6]**



Total No. of Questions : 8]

SEAT No. :

P7607

[6180] - 126

[Total No. of Pages : 2

T.E. (Electronics & Computer Engineering)

DISTRIBUTED SYSTEMS

(2019 Pattern) (Semester - I) (Elective - I) (310345 A)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data if necessary.

- Q1) a)** What are the features of P2P system? What are the advantages and disadvantages of P2P system? **[6]**
- b)** Write short notes on Napster and Peer to Peer Middleware. **[6]**
- c)** Explain the following in details. **[8]**
- i) File system access model and its sharing semantics.
 - ii) Lightweight Directory Access Protocol

OR

- Q2) a)** Briefly discuss the architecture and server operation of NFS. **[6]**
- b)** Explain file service architecture and Andrew file system with suitable sketch. **[6]**
- c)** What are Identifiers? Explain the Uniform Resource Identifiers, Uniform Resource Locator and Uniform Resource Names. **[8]**
- Q3) a)** Explain Logical time, logical clocks and vector clock. Explain the different ways of synchronizing physical clocks. **[8]**
- b)** What is a deadlock in distributed system? Explain with example. How deadlock can be recovered? **[8]**

OR

- Q4) a)** What is mutual exclusion? Explain need of mutual exclusion. Explain how mutual exclusion is handled in distributed system. **[8]**
- b)** Describe the internal and external synchronization of Physical clocks. **[8]**

P.T.O.

- Q5) a)** Explain Task Assignment Approach. Discuss Load-balancing Approach. Explain Load-sharing Approach. **[8]**
- b)** What is meant by scheduling process of a distributed system? Give the techniques and methodologies for scheduling process of a distributed system. **[8]**

OR

- Q6) a)** What is process migration? State the issues in process migration. Describe negotiation in migration process with neat sketch. **[8]**
- b)** Explain the following. **[8]**
- i) Address space transport mechanisms.
 - ii) Messages Forwarding.
 - iii) Origin site mechanism.
 - iv) Link traversal mechanism.

- Q7) a)** Explain design overview of Coda distributed file system. Which method is used for communication in Coda file system? Explain. **[6]**
- b)** What do you mean by Google file system? Explain Read and Write process in Google File System. **[6]**
- c)** What is distributed file system? State the advantages and disadvantages of Distributed File System. **[6]**

OR

- Q8) a)** What is Network File System (NFS) of distributed file system? State the advantages and disadvantages of Network File System (NFS). **[6]**
- b)** With the help of neat diagram explain structure of distributed file system. **[6]**
- c)** State the features of Google file system. State the advantages and disadvantages of Google file system. **[6]**



Total No. of Questions : 8]

SEAT No. :

P7608

[6180] - 127

[Total No. of Pages : 2

T.E. (Electronics & Computer Engineering)

BLOCKCHAIN TECHNOLOGY

(2019 Pattern) (Semester - I) (Elective - I) (310345 B)

Time : 2 ½ 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 hash in cryptography? Explain Hash function. [6]
b) What is hashing in blockchain? Write any four characteristics of hashing. [6]
c) What is secure hash algorithm. Explain application of hash algorithm. [6]

OR

- Q2)** a) What is Message Authentication Code (MAC)? Describe process of MAC for authentication. [6]
b) What is solidity programming in ethereum? Write the other programming languages used for ethereum. [6]
c) What is cryptography primitives in blockchain. Explain its importance. [6]
- Q3)** a) What is ethereum? How ethereum facilitates decentralization of applications. [6]
b) What is ethereum virtual machine? Explain its working. [6]
c) Explain Ethereum languages, consensus approach & algorithm. [6]

OR

- Q4)** a) What is ethereum wallet? Explain its types. [6]
b) What is distributed hash table? What are the features of hash distribution. [6]
c) Explain Secure Hash Algorithm Version 1 in detail. [6]

P.T.O.

- Q5)** a) Explain bitcoin transaction format in detail. [6]
b) Draw and explain Merkel tree Bitcoin building block structure. [6]
c) Draw and explain Bitcoin block structure. [6]

OR

- Q6)** a) What is Merkle Trees in blockchain technology? How it works? Explain significance of Merkle Tree. [6]
b) Describe Bitcoin Network in detail. [6]
c) What is bitcoin client? How it offers security in Bitcoin Transactions. [6]

- Q7)** a) What is the role of blockchain in cloud computing? Explain with application. [5]
b) Explain the terms Bitcoin Address, Bitcoin Transactions, Bitcoin Network [5]
c) Explain the characteristics of Bitcoin cloud. [6]

OR

- Q8)** a) Explain, how the Blockchain technology be the platform of future Internet of Things. [5]
b) Explain: Enhancement of Blockchain with machine learning tools. [6]
c) Explain benefits of implementation of Blockchain technology with Robotics Process Automation. [5]



Total No. of Questions : 8]

SEAT No. :

P7609

[6180] - 128

[Total No. of Pages : 2

T.E. (Electronics & Computer)
DIGITAL SIGNAL PROCESSING
(2019 Pattern) (Semester - I) (Elective - I) (310345 C)

Time : 2 ½ 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 in detail Impulse Invariance technique for IIR filter design. What are its drawbacks? **[10]**

b) Apply Bilinear Transformation to following function and find $H(z)$ **[8]**

$$H(s) = \frac{2}{(s+1)(s+2)} \text{ with } T = 1 \text{ sec}$$

OR

Q2) a) Explain in detail frequency sampling method of FIR filter design. **[9]**

b) Convert analog filter with system function $H(s)$ into digital IIR filter using impulse invariance method. **[9]**

$$H(s) = \frac{10}{s^2 + 7s + 10}$$

Q3) a) Obtain direct form I and II structures for the following systems. **[9]**

$$y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$$

b) What is the Finite word length effect and how it affects the FIR filter performance? **[8]**

OR

P.T.O.

Q4) a) Draw cascade and parallel realization for the system given by [9]

$$H(z) = \frac{2}{1 + 2z^{-1} - z^{-2}}$$

b) Explain Lattice-Ladder structure of IIR filter. [8]

Q5) a) What is sampling rate conversion? What is multirate DSP? Why is it required? [4]

b) Explain decimation by a factor 'D' and obtain the expression for the decimated signal at the output. [7]

c) With the help of neat waveform and diagram explain sampling rate conversion by non-integer factor. [7]

OR

Q6) a) What is the role of anti-aliasing and anti-imaging filters in a Decimator and interpolator respectively? [6]

b) Give the mathematical expressions for sampling rate conversion by non-integer factor. Can the positions of the decimator and interpolator be interchanged? Justify your answer. [8]

c) Draw block schematic for interpolation and Decimation. [4]

Q7) a) Give the architectural features of DSP Processor. [6]

b) How the DSP is useful in speech processing. Explain any application of speech processing using DSP. [6]

c) Explain how DSP is useful in Interference cancellation in ECG. [5]

OR

Q8) a) Explain the following related to Digital Signal Processor. [9]

i) Mac Unit

ii) ALU

iii) VLIW Architecture

b) Compare the features of DSP processor and microprocessor with respect to architecture. [8]



Total No. of Questions : 8]

SEAT No. :

P7610

[6180] - 129

[Total No. of Pages : 2

T.E. (Electronics & Computer Engineering)

SENSORS AND APPLICATIONS

(2019 Pattern) (Semester - I) (Elective - I) (310345 D)

Time : 2 ½ 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 whenever necessary.
- 3) Assume suitable data, if necessary.
- 4) Use of non-programmable scientific calculator is allowed.

- Q1) a)** Explain working principle of hydrostatic pressure type of level measurement technique. **[8]**
- b)** Explain with neat sketch working principal of following differential head type of flow sensors- **[9]**
- i) Orifice plate
 - ii) Venturi Tube

OR

- Q2) a)** Explain with neat diagram working principal of nuclear level gauge. **[8]**
- b)** Explain with neat sketch working principal of pitot static tube used for the measurement of airspeed aboard an aircraft. **[9]**
- Q3) a)** Draw a neat sketch of capacitive accelerometer. Explain working principle of capacitive accelerometer. **[6]**
- b)** Explain with neat sketch working principle of incremental optical encoder. **[6]**
- c)** Explain working principal of optical proximity sensors. **[6]**

OR

- Q4) a)** Explain working principal of LVDT as a displacement sensor. **[6]**
- b)** Explain weight measurement technique using load cell and strain gauges. **[6]**
- c)** Write a short note on CMOS image sensors. **[6]**

P.T.O.

- Q5) a)** Explain working principle of PZT actuators. State its applications. [8]
- b) Explain Hall effect type magnetic field sensors. State the names of materials used for Hall effect devices. [9]

OR

- Q6) a)** Explain with neat block diagram the concept of SMART sensor system. [8]
- b) Explain with neat sketch bulk micro-machined absolute pressure sensor. [9]
- Q7) a)** Draw a pneumatic circuit symbol for a poppet valve. Explain pneumatic lift system using a poppet valves and single acting cylinder. [6]
- b) Explain principle of operation of stepper motor. [6]
- c) Draw control valve characteristics and explain the terms. [6]
- i) Quick Opening
- ii) Linear and
- iii) Equal Percentage.

OR

- Q8) a)** Draw and explain the symbols of following pneumatic valves. [6]
- i) 5×2 valve
- ii) 4×2 valve
- iii) 3×2 valve
- b) Explain control of single acting cylinder using directional control valve. [6]
- c) Explain how actuators are classified. Explain any one type of actuators. [6]



Total No. of Questions : 8]

SEAT No. :

P7611

[Total No. of Pages : 2

[6180]-130

**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 and Q.7 or Q.8.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right side indicate full marks.*
- 4) Assume suitable data if necessary.*

- Q1)** a) Explain COCOMO model for project estimation with suitable example. **[8]**
b) What is project scheduling? What are the basic principles of project scheduling. **[6]**
c) What is task network in project scheduling. **[4]**

OR

- Q2)** a) Compare Lines of code (LOC) and Function Point (FP) based estimation of software. **[8]**
b) What is time line chart? Explain with suitable example. **[6]**
c) What are the categories of software Engineering resources. **[4]**

- Q3)** a) What are the software design quality attributes and quality guidelines? **[7]**
b) Explain the design concept: Functional Independence. A design should have high cohesive and low coupling. Justify. **[6]**
c) Explain guidelines of component level designing. **[4]**

OR

- Q4)** a) Why is software architecture being important? Explain Data centered Architectural style in detail. **[7]**
b) Explain in detail call and return architecture style. **[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) What are the different categories of risk? [4]

OR

- Q6)** a) What are the layers of SCM process? Explain each in detail. [8]
b) Explain Risk identification and assessment process for a software project. [6]
c) Write a short note on: Risk table. [4]

- Q7)** a) What is software testing? Explain software testing strategies for software development. [7]
b) How Top down and Bottom up integration is achieved? [6]
c) Compare Alpha and Beta Testing. [4]

OR

- Q8)** a) Explain Defect life cycle in detail. [7]
b) What is test plan, test scenario and test cases. How to write test cases for Login page. [6]
c) Differentiate between verification and validation. [4]



Total No. of Questions : 8]

SEAT No. :

P7612

[Total No. of Pages : 2

[6180]-131

T.E. (Electronics & Computer Engineering)
COMPUTER NETWORKS AND SECURITY
(2019 Pattern) (Semester-II) (3103353)

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.*

- Q1)** a) List and Explain functions of data link layer. [4]
- b) What is need of framing? What are the different technique of framing? Explain any two. [6]
- c) What are the noiseless channels? Explain simplest protocol with suitable diagram. [6]

OR

- Q2)** a) What is point to point protocol? Explain in detail [4]
- b) What are the types of media access control? Explain in detail controlled access technique. [6]
- c) Explain Hub with suitable diagram. [6]

- Q3)** a) Explain network layer services in detail. [6]
- b) Explain IPv4 address in detail [6]
- c) Explain Internet Group Message Protocol (IGMP) with suitable architecture diagram. [6]

OR

P.T.O.

- Q4)** a) What is congestion control? List the typical QOS parameters in the transport layer and explain each one. [6]
- b) Explain in detail path vector routing with suitable diagram. [6]
- c) Explain User Datagram Protocol with special features [6]

- Q5)** a) Explain feature of HTTP. [4]
- b) Explain TELNET in detail with respect to server and client communication.[6]
- c) What the different commands used in FTP? Explain File transfer Protocol in detail. [8]

OR

- Q6)** a) What is streaming of Audio / Video. Explain. [4]
- b) What is DNS? Explain Domain Name Space in detail. [6]
- c) Explain SNMP with suitable diagram. What is the role of structure management Information in SNMP explain. [8]

- Q7)** a) List the different security goals. Explain. [4]
- b) Explain secret key cryptography (cipher) with suitable diagram. [6]
- c) What is Network Monitoring? How to perform network monitoring effectively [8]

OR

- Q8)** a) Explain UTP cabling for PC to PC [4]
- b) Explain with neat diagram internet access through leased line. [6]
- c) What is Protocol Analyzer? Explain the working with neat diagram [8]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P7613

[6180]-132

T.E. (E&C.E)

EMBEDDED PROCESSOR & APPLICATIONS

(2019 Pattern) (Semester-II) (310354)

Time : 2½Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Draw neat labeled diagrams wherever necessary
- 3) Figures to the right side indicate full marks.
- 4) Assume Suitable data if necessary.

- Q1)** a) Compare ARM Cortex M3 with ARM7 TDMI [4]
b) Write down the features of UART of LPC2148, Write an embedded C program to transmit character 'E' to PC. [6]
c) Draw and explain interfacing of EEPROM using 12C communication to LPC2148. [8]

OR

- Q2)** a) Explain any 3 instructions of ARM7. [6]
b) List the features of on chip ADC of LPC2148. [8]
c) List the features of LPC2148. [4]

- Q3)** a) Explain any 4 instructions of ARM CORTEX M3. [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 M3. [5]
b) Draw detailed architecture of ARM CORTEX M3 [8]
c) Enlist the advantages of ARM Cortex-M3 [5]

- Q5)** a) Enlist various registers required to configure Serial Communication of STM32F4xx Microcontroller. Explain any two with suitable example [9]
b) Explain an algorithm to send "ENGINEER" serially via STM32F4xx controller to Desktop PC on HyperTerminal. Assume (UART, 9600 Baud Rate) [8]

OR

P.T.O.

- Q6)** a) Write a note on different types of registers of STM32F4xx. [7]
b) Draw an interfacing diagram to interface push button and LED using STM32F4xx microcontroller. [5]
c) Compare ARM Cortex M3 with ARM Cortex M4. [5]
- Q7)** a) Explain in brief Internet of Things? Draw its architecture. [8]
b) Write a note on Sensors and actuators. [6]
c) Write down the characteristics of Embedded System. [3]

OR

- Q8)** a) Draw and explain basic block diagram of Embedded System with IoT.[8]
b) Explain any one of the below with flow/block diagram. [9]
Smart Home automation

OR

Waste Management for Smart City using IoT



Total No. of Questions : 8]

SEAT No. :

P-8796

[Total No. of Pages : 2

[6180]-133

**T.E. (Electronics and Computer Engineering)
SOFTWARE MODELING AND DESIGN (Elective - II)
(2019 Pattern) (Semester - II) (310355A)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6. and Q.7 or Q.8.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Assume suitable data, if necessary.*

- Q1)** a) Explain combined fragments such as alternatives, options and loops with suitable diagram. **[8]**
- b) Draw and explain swimlane diagrams? Explain purposes and benefits swimlane. **[8]**

OR

- Q2)** a) Draw and explain sequence diagram? Explain notations used in sequence diagram. **[8]**
- b) What is activity diagram? Why use activity diagram? Explain the component of an activity diagram. **[8]**

- Q3)** a) What is object oriented design? Describe the different steps involved in the Object-oriented design process. **[9]**
- b) What is Usability Testing? What is a Usability Assessment? What is the Purpose of a Usability Test? **[9]**

OR

- Q4)** a) Draw and explain component diagram. State its advantages and disadvantages. **[9]**
- b) Explain different steps in designing business classes. Explain different types of design classes. **[9]**

P.T.O.

- Q5)** a) Explain software design principles and patterns. Differentiate software design principles and patterns. [9]
- b) What is the purpose of General Responsibility Assignment Software Patterns (GRASP) in object-oriented design? How do GRASP patterns contribute to achieving a well-organized and modular design? [9]

OR

- Q6)** a) Explain the Polymorphism pattern in GRASP. How does it influence the assignment of responsibilities through dynamic behavior? [9]
- b) Explain key objectives of software design principles. Explain any three software design principles in detail also write the advantages and disadvantages of them. [9]

- Q7)** a) What are the key components of a software architecture and how do they interact with each other? [9]
- b) Describe the principles of object-oriented design and their relevance in software architecture. [9]

OR

- Q8)** a) Explain the concept of software components and how they are used in component-based software architectures. [9]
- b) Discuss the challenges associated with achieving synchronization in concurrent software architectures. [9]



Total No. of Questions : 8]

SEAT No. :

P7614

[Total No. of Pages : 2

[6180]-134

T.E. (Electronics and Computer Engineering)
ADVANCED DATABASE MANAGEMENT SYSTEM
(2019 Pattern) (Semester - II) (Elective - II) (310355B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) What is NoSQL database? Explain two types of NoSQL databases. [6]
b) Compare Relational and NoSQL databases. [6]
c) What is JSON? Explain features and data types of JSON. [8]

OR

- Q2)** a) Explain features of MongoDB. [6]
b) Differentiate between apache Cassandra and MongoDB. [6]
c) What is XML? Why is XML important? What are the benefits of using XML? [8]

- Q3)** a) Draw and explain Data Warehouse architecture. [8]
b) What is OLAP? Explain different types of OLAP in detail. [8]

OR

- Q4)** a) Explain components of Data Warehouse. Explain star schema in detail with example. [8]
b) Write a short note on: [8]
i) Decision support system
ii) Snowflake schema

P.T.O.

- Q5)** a) What is KDD? Explain KDD seven step process in detail. [8]
- b) Explain benefits of Data Mining. Explain any two application of Data Mining in detail. [8]

OR

- Q6)** a) Draw and explain architecture of Data Mining. [8]
- b) Explain predictive and descriptive algorithms in Data Mining. [8]
- Q7)** a) Compare Spatial and Temporal databases. [6]
- b) Explain geographical information systems in detail with examples. [6]
- c) Explain Deductive database in detail with example. [6]

OR

- Q8)** a) Explain Multimedia databases in detail with examples. [6]
- b) What are active databases? Elaborate with example. [6]
- c) Explain Mobile databases in detail with examples. [6]



Total No. of Questions : 8]

SEAT No. :

P7615

[6180]-135

[Total No. of Pages : 2

T.E. (Electronics & Computer Engineering)

POWER ELECTRONICS

(2019 Pattern) (Semester - II) (Elective - II) (310355 C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain operation of single phase full converter for R load with neat circuit diagram and relevant waveforms. **[11]**

Derive expressions for average o/p voltage & rms o/p voltage?

b) A single phase half controlled bridge rectifier supplies a ripple free load current of 10 A and operates from the 110V, 60Hz mains. If the average o/p voltage is 75V, **[6]**
Calculate:

- i) Firing angle
- ii) RMS o/p voltage
- iii) RMS supply current

OR

Q2) a) Explain with circuit diagram three phase fully controlled converter with R load. Draw load current and load voltage waveforms with $\alpha=60^\circ$ and 90° . **[12]**

b) Give difference between SCR based controlled rectifiers and IGBT based controlled rectifiers. **[5]**

Q3) a) A step down chopper is operated from dc supply voltage of 230V. It has resistive load with $R = 10\Omega$. If duty cycle is 40%, calculate: **[6]**

- i) Average & rms o/p voltages
- ii) Average & rms o/p currents
- iii) Chopper efficiency

b) Explain with circuit diagram single phase full wave AC voltage controller for R-load with i/p voltage & o/p voltage & current waveforms. **[6]**

P.T.O.

- c) Explain working of step down chopper for R load and derive an expression for its average o/p voltage? [6]

OR

- Q4)** a) Draw circuit diagram of step up chopper and distinguish between step up & step down choppers. [6]
b) What are various types of choppers? Explain operation of class-C (two quadrant) chopper with circuit diagram. [8]
c) 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]

- Q5)** a) Single phase full bridge inverter is operated from 50V dc supply, it has a resistive load of $R = 5\Omega$. Find: [6]
i) rms o/p voltages at third & fifth harmonic (V_{o3} & V_{o5})
ii) Distortion factor (DF) of 3rd harmonic component
iii) Total harmonic distortion (THD)
b) Explain working of single phase full bridge inverter for R-L load with input & output waveforms. [7]
c) Distinguish between freewheeling diode with feedback diode. [4]

OR

- Q6)** a) Draw & explain control circuit for single phase inverters using PWM IC LM3524. [5]
b) Draw a three phase inverter for balanced star R load? Explain its operation of 180° mode with gate signals & output waveforms. [12]

- Q7)** a) What are various types of electric Vehicles? Explain any one with block diagram. [6]
b) What is UPS? Explain operation of Off-line UPS with block schematic. [6]
c) Explain with block diagram HVDC transmission system. [6]

OR

- Q8)** a) Explain with diagram working principle of induction heating. [6]
b) Explain with diagram architecture of EVs battery charger. [6]
c) Explain battery specifications used in EVs for traction applications. [6]



Total No. of Questions : 8]

SEAT No. :

P7616

[Total No. of Pages : 2

[6180]-136

T.E. (Electronics and Computer)

PLC AND AUTOMATION

(2019 Pattern) (Semester - II) (Elective - II) (310355D)

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

Q1) a) Explain On Delay timer and Off Delay timer. [8]

b) Draw a ladder diagram for a two - motor system having the following conditions: **[10]**

The start Push button starts Motor 1; 10 seconds later Motor 2 will start.
The stop Push button stops Motor 1; 15 seconds later Motor 2 stops.

OR

Q2) a) Explain any four arithmetic functions used in PLC programming. [8]

b) Draw a ladder diagram for following statement: **[10]**

Motor 1 (M1) starts as soon as start switch is ON; after 10 Seconds M1 goes off and Motor 2 (M2) starts. After 5 seconds M2 goes OFF and M3 starts. After 10 Seconds M3 goes off, M1 starts and the cycle is repeated. When stop switch is ON, all Motors are stop.

Q3) a) Explain test, check and assembly in connection with PLC installation.[9]

b) Explain electrical noise, leaky inputs and outputs in PLC. **[9]**

OR

P.T.O.

- Q4) a)** Explain need of program editing during commissioning. **[9]**
b) Explain need of grounding and various circuit protections used during installation. **[9]**

- Q5) a)** Explain Proportional, Derivative and integral control in detail. **[9]**
b) Explain functions of RTU and MTU in SCADA. **[8]**

OR

- Q6) a)** Explain HMI and it's interfacing with PLC. **[9]**
b) Explain block diagram of SCADA. **[8]**

- Q7) a)** Explain types of communication interfaces in detail. **[8]**
b) Write short note on: **[9]**
i) DeviceNet
ii) MODBUS
iii) CAN

OR

- Q8) a)** What are advantages of standard industrial network? **[8]**
b) Write short note on: **[9]**
i) Fieldbus
ii) EtherNet/IP Protocol
iii) ControlNet



Total No. of Questions : 8]

SEAT No. :

P-7617

[Total No. of Pages : 2

[6180]-137

T.E. (Information Technology)

THEORY OF COMPUTATION

(2019 Pattern) (Semester-I) (314441)

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) Define context free grammar. Write down CFG for the following regular expression. [6]

$(0+1)0^*(1+(01)^*)$

- b) Write a note on Chomsky hierarchy. [6]
- c) What is an ambiguous grammar? Explain with a suitable example. [6]

OR

Q2) a) What are left linear and right linear regular grammars? Explain the process of converting a Left Linear Regular Grammar to Right Linear Regular Grammar with an example. [7]

- b) Construct a CNF for the following grammar. [6]

$S \rightarrow aAbB$

$A \rightarrow aA|a$

$B \rightarrow bB|b$

- c) Check whether the given language is CFL or not $L = \{a^n b^n c^n | n \geq 0\}$ [5]

Q3) a) Construct a PDA equivalent to the following CFG. [8]

$S \rightarrow 0BB$

$B \rightarrow 0S | 1S | 0$

Test if 010^4 is in language.

- b) Compare Finite Automata and Push Down Automata. [4]
- c) Write a note on Post machine. [5]

OR

P.T.O.

- Q4)** a) Find the transition rules of PDA for accepting a language $L = \{w \in \{a,b\}^* \mid w \text{ is of } a^n b^n \text{ with } n \geq 1\}$ through both empty stack and final state and demonstrates the stack operation for the string “aaabbb”. [9]
- b) Design a Post machine for the language $L = \{a^n b^n c^n\}$. [8]

- Q5)** a) Design a Turing machine to subtract two unary numbers. [6]
- b) Explain Halting Problem of turing machine. [6]
- c) Write a note on Universal turing Machine. [6]

OR

- Q6)** a) Design a Turing machine to accept language $L = \{0^n 1^n 2^n \mid n > 0\}$. Draw transition graph and write down transition table. [9]
- b) Explain the concept of Post Correspondence Problem with an example. [5]
- c) Differentiate between Finite Automata and Turing Machine. [4]

- Q7)** a) Explain in detail Decidable problems concerning regular languages, and Decidable problems concerning context free languages. [7]
- b) Explain Traveling Salesperson Problem and Justify whether the Traveling Salesperson Problem is a class P or class NP problem. [6]
- c) What are recursive and recursively enumerable languages? [4]

OR

- Q8)** a) Explain Cook's theorem in detail. [8]
- b) Explain Satisfiability Problem and comment on NP Completeness of the SAT Problem. [9]



Total No. of Questions : 8]

SEAT No. :

P-7618

[Total No. of Pages : 2

[6180]-138

T.E. (Information Technology)

OPERATING SYSTEMS

(2019 Pattern) (Semester-I) (314442)

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) Describe in brief the different IPC mechanisms. [9]
b) What is deadlock? Explain the necessary and sufficient conditions for the occurrence of a deadlock. [9]

OR

- Q2)** a) Explain the following with example [9]
i) Mutual Exclusion ii) Synchronization
iii) Race condition.
b) What is Critical Section Problem? Explain readers-writers problem. [9]

- Q3)** a) What is page Fault? For the given reference string with 3-page frame available, determine the number of page faults for FIFO and LRU algorithms: [9]
3, 5, 3, 7, 2, 1, 5, 4, 6, 7, 4, 1, 2.
b) Explain Demand paging with the help of neat diagram. [8]

OR

- Q4)** a) Explain Buddy System with the help of neat diagram and example. [9]
b) What is segmentation? How address Translation is performed in segmentation system? [8]

P.T.O.

- Q5) a)** Describe three methods of record blocking with the help of neat diagrams. **[9]**
- b)** Explain the different functions of a file management system. **[9]**

OR

- Q6) a)** Assume a disk with 200 tracks and the disk request queue has random Requests in it as follows: 98,183,37,122,14,124,65,67. **[12]**
- Find the no of tracks traversed and average seek length if **[6]**
- i) FCFS
- ii) SSTF
- iii) SCAN is used and initially head is at track no 53.
- b)** What is spooling? Explain with suitable diagrams. **[6]**

- Q7) a)** Explain the data structures required for two PASS Assembler in detail. **[6]**
- b)** What is Macro? Explain macro call and macro expansion with suitable example. **[6]**
- c)** Discuss with example what is forward reference problem. **[5]**

OR

- Q8) a)** What is Loader? What are the basic functions of loaders? **[10]**
- b)** What is system software? Explain any four system software in brief ? **[7]**



Total No. of Questions : 8]

SEAT No. :

P-7619

[Total No. of Pages : 3

[6180]-139

T.E. (Information Technology)

MACHINE LEARNING

(2019 Pattern) (Semester - I) (314443)

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) Compare univariate and multivariate linear regression. [CO3,L2] [6]
- b) Describe the tradeoff between bias and variance using dart example. [CO3,L1] [5]
- c) Compute the R-Square error of the best fit line “ $Y = -0.94X + 43.7$ ” for below input instance space. [CO3, L3] [7]

Sr.No.	X	Y
1	3	40
2	10	35
3	11	30
4	15	32
5	22	19
6	22	26
7	23	24
8	28	22
9	28	18
10	35	6

OR

P.T.O.

- Q2) a)** Explain gradient descent technique for optimization in linear regression with example. **[CO3, L1]** **[6]**
- b)** Explain the cost function used to evaluate the performance of regression. **[CO3, L3]** **[6]**
- c)** What is least square method? Explain least square method in the context of regression. **[CO3, L1]** **[6]**

- Q3) a)** Describe Bayesian network in short for learning and inferences. **[CO4, L3]** **[8]**
- b)** Explain naïve bays algorithm? For below dataset compute the posterior probability of banana class using Bayes rule. **[CO4, L3]** **[7]**

Fruit	Yellow	Sweet	Long	Total
Orange	350	450	0	650
Banana	400	300	350	400
Other	50	100	50	150
Total	800	850	400	1200

- c)** Write any four applications of naïve Bayes classifier. **[CO4, L1]** **[2]**

OR

- Q4) a)** Explain ID-3 decision tree algorithm in detail with example. **[CO4, L2]** **[8]**
- b)** Explain the following measures of impurity with example. **[CO4, L2]** **[9]**
- i) Information Gain ii) Gini Index iii) Entropy

- Q5) a)** Explain K-Nearest Neighbor algorithm with example. **[CO5, L2]** **[7]**
- b)** Suppose we have the following dataset that has various transactions and from this dataset, we need to find the frequent item sets and generate the association rules using the Apriori algorithm. Given minimum support =2 and minimum confidence = 50%. **[CO5, L4]** **[8]**

TID	ITEM SET	TID	ITEM SET
T1	A,B	T6	B,C
T2	B,D	T7	A,C
T3	B,C	T8	A, B, C, E
T4	A, B, D	T9	A, B, C
T5	A, C		

c) Explain any one of the following terms: **[CO5, L2]** **[3]**

i) Medoid OR ii) Dendrogram

OR

Q6) a) Cluster the following eight points (with (x, y) representing locations) into three clusters: A1(2, 10), A2(2, 5), A3(8, 4), A4(5, 8), A5(7, 5), A6(6, 4), A7(1, 2), A8(4, 9) Initial cluster centers are: A1(2, 10), A4(5, 8) and A7(1, 2). The distance function between two points $a = (x_1, y_1)$ and $b = (x_2, y_2)$ is defined as $P(a, b) = |x_2 - x_1| + |y_2 - y_1|$ Use K-Means Algorithm to find the three cluster centers after the first iteration. **[CO5, L3]** **[9]**

b) Explain the Apriori algorithm in brief. Explain the following performance measure of association rule mining. **[CO5, L2]** **[6]**

1) Support 2) Confidence 3) Lift

Explain any one of the following distance metrics with example. **[CO5, L1]** **[3]**

1) Euclidean Distance 2) Manhattan Distance

3) Hamming Distance

Q7) a) Explain perceptron learning algorithm? Describe shortly about how learning parameters are updated in multi-layer perceptron. **[CO6, L3]** **[8]**

b) Explain Sigmoid, Tanh and Relu activation functions in detail. **[CO6, L2]** **[9]**

OR

Q8) a) Explain the simulation of AND gate using McCulloch Pitts Neuron? What is vanishing gradient descent problem. **[CO6, L2]** **[9]**

b) Explain what is Deep Learning and its different architectures? State the **[CO6, L2]** various applications of deep learning. **[8]**



Total No. of Questions : 8]

SEAT No. :

P-7620

[Total No. of Pages : 2

[6180]-140

T.E. (Information Technology)

HUMAN COMPUTER INTERACTION

(2019 Pattern) (Semester - I) (314444)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** User Profiles are very important from design point of view. Interface with such profiles is helpful. Justify your answer? **[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)** Explain Norman's 7 stage model with example. **[8]**
- b) How does GOMS help in improving usability? Draw GOMS for CLOSE-WINDOW. Differentiate between Goals Vs Tasks. **[9]**

- Q3) a)** Explain the following principles with example. **[9]**
- i) Learnability
 - ii) Flexibility
- b) i) Draw and explain Software design process.
- ii) Explain the importance of User Focus from HCI perspective. **[9]**

OR

- Q4) a)** What is Prototyping? Explain the low-fidelity and High-fidelity designs with example. **[9]**
- b) Consider any online food ordering system, draw Model -View- Controller (MVC) framework. Mention the necessary technology solutions available for each of MVC. **[9]**

P.T.O.

- Q5) a)** Explain DECIDE framework with necessary diagram and an example of the same. **[8]**
- b)** What are the goals of evaluation? Explain Cognitive walkthrough and heuristics evaluation technique in detail. **[9]**

OR

- Q6) a)** Explain user interface management system (UIMS) in detail along with its architecture? **[8]**
- b)** Write a short note on-i) Toolkits ii) Usability testing **[9]**

- Q7) a)** Explain **[9]**
- i)** Augmented Reality
- ii)** Virtual Reality along with real life examples of both.
- b)** Discuss in the detail the Challenges faced by designer while designing interfaces for **[9]**
- i)** smart homes
- ii)** smart devices

OR

- Q8) a)** Draw and explain Design thinking in detail for any suitable application. **[9]**
- b)** In today's world finding things on web has become very easy. Discuss how the multimodal interaction has enriched the experience. **[9]**



[6180]-141

T.E. (Information Technology)

DESIGN & ANALYSIS OF ALGORITHMS

(2019 Pattern) (Semester - I) (314445A) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

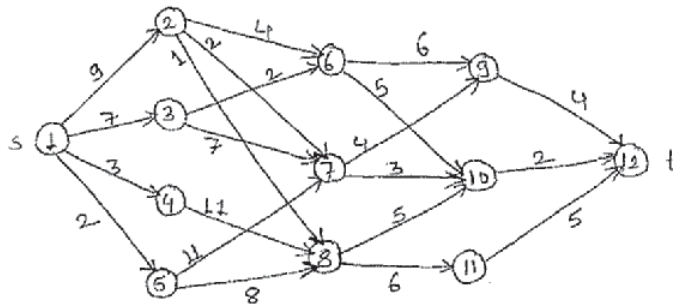
- Q1)** a) Discuss the dynamic programming approach to solving the coin change-making problem. Explain how the problem can be formulated as a dynamic programming task and provide a step-by-step explanation of the algorithm. [10]
- b) Explain the Bellman-Ford algorithm for finding the shortest paths in a weighted directed graph. Discuss the problem it solves, its applications, and its time complexity. [8]

OR

- Q2)** a) Solve the TSP problem using Dynamic Programming. [10]

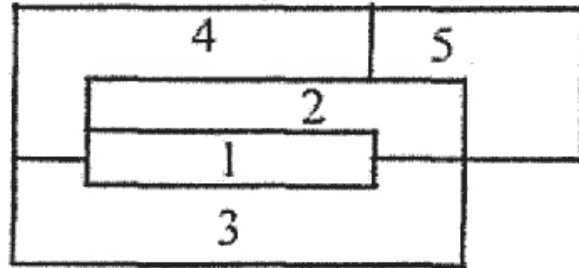
$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

- b) Find the minimum cost path from source s to sink t of the following multistage graph. [8]



P.T.O.

- Q3)** 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]



OR

- Q4)** a) Define the n-Queen problem and its objective. Explain the rules and constraints associated with placing n queens on an $n \times n$ chessboard without attacking each other. [8]
- b) Discuss how the backtracking algorithm can be applied to solve the sum of subsets problem. Explain the decision space exploration process with some examples. [9]
- Q5)** Construct the solution of following Travelling Salesperson problem using Branch and Bound. [18]

$$\begin{bmatrix}
 \infty & 20 & 30 & 10 & 11 \\
 15 & \infty & 16 & 4 & 2 \\
 3 & 5 & \infty & 2 & 4 \\
 19 & 6 & 18 & \infty & 3 \\
 16 & 4 & 7 & 16 & \infty
 \end{bmatrix}$$

OR

- Q6)** a) Write an algorithm for FIFO branch and bound. [9]
- b) Explain FIFO branch and bound method of problem solving. Explain its advantages and limitations. [9]

- Q7)** a) Prove that Satisfiability problem is NP complete. [8]
- b) Discuss the proof for the NP-completeness of the Vertex Cover problem. [9]

OR

- Q8)** a) Define the complexity classes P, NP, NP-complete, and NP-hard. Explain the relationships between these classes and their significance in computational complexity theory. [9]
- b) Prove that clique problem is NP complete. [8]



Total No. of Questions : 8]

SEAT No. :

P-7622

[Total No. of Pages : 2

[6180]-142

T.E. (Information Technology)

**ADVANCED DATABASE AND MANAGEMENT SYSTEM
(2019 Pattern) (Semester - I) (314445B) (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 features and advantages of MongoDB. [10]

b) Explain schemas in XML. [8]

OR

Q2) a) Explain Hive along with its architecture. [9]

b) Explain features and advantages of Cassandra. [9]

Q3) a) What is Decision Support System? Explain different types of Decision Support Systems. [9]

b) Draw and explain Datawarehouse Architecture. [8]

OR

Q4) a) Define the following terms : [8]

i) Roll Up

ii) Drill Down

iii) Slice

iv) Dice

b) What is Decision Support System (DSS)? Explain advantages and disadvantages of DSS. [9]

P.T.O.

- Q5)** a) Explain the descriptive modeling in detail. [9]
b) Explain any data mining tool in detail. [9]

OR

- Q6)** a) Define data mining. Explain data mining tasks with suitable example. [9]
b) Explain knowledge discovery process in detail. [9]

- Q7)** a) Write short note on : [8]
i) Geographical Information Systems
ii) Genome data management
b) What are active databases? Elaborate with example. [9]

OR

- Q8)** a) Write short notes on : [8]
i) Multimedia databases
ii) Mobile databases
b) Explain Deductive Databases. [9]



Total No. of Questions : 8]

SEAT No. :

P-7623

[Total No. of Pages : 2

[6180]-143

T.E. (Information Technology)

DESIGN THINKING

(2019 Pattern) (Semester - I) (314445C) (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) IDEATION USING SCAMPER: Explain. [8]

- b) How 2 × 2 Matrix helps in ideate phase? Which other tools support working with 2 × 2 Matrix? [9]

OR

Q2) a) Explain 6-3-5 Method for Ideation. [6]

- b) What is Analogous Inspiration? When to use Analogous Inspiration? How to use Analogous Inspiration for Ideation? [6]
- c) What is User Experience Journey? [5]

Q3) a) What are Paper prototypes? What is a WYSIWYG? For what purpose that is used? [9]

- b) Why is prototyping important? In Design Thinking how we use a prototype? [9]

OR

Q4) a) What is the difference between a wireframe and prototype? [6]

- b) What are the advantages and disadvantages of using a prototype in design thinking? [6]
- c) What is Critical Experience Prototype (CEP) & Critical Function Prototype (CFP)? [6]

P.T.O.

Q5) a) What is meant by creating a pitch with reference to reflect phase, explain. [8]

b) Discuss how the Structured Usability Testing is carried out to test prototypes. [9]

OR

Q6) a) What is A/B testing? How it is carried out in test phase? [8]

b) What is the purpose of the Evolve Phase? Explain Concept Synthesis in detail. [9]

Q7) a) Discuss How Design thinking used in redesigning the Customer Contact Center at Toyota. [9]

b) How The Good Kitchen helped Improving the nutrition of the elderly, explain in detail. [9]

OR

Q8) a) Discuss UberEATS design using design thinking tools. [9]

b) Explain IBM Design Thinking: A Framework To Help Teams Continuously Understand and Deliver. [9]



Total No. of Questions : 8]

SEAT No. :

P-7624

[Total No. of Pages : 2

[6180]-144

T.E. (Information Technology)

INTERNET OF THINGS

(2019 Pattern) (Semester - I) (314445D) (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 indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain in detail application Layer Protocols MQTT and AMQP. [8]
b) Explain Piconet and Scatternet with Bluetooth. Explain advantages and disadvantages of Bluetooth. [9]

OR

- Q2)** a) What is Zigbee? Explain in detail ZigBee protocol stack. [8]
b) Explain data aggregation and dissemination in detail. [9]

- Q3)** a) What is an IoT Device? List different IoT Devices. Explain any 2 devices. [8]
b) Explain in detail Interfaces (Serial, SPI, I2C). [9]

OR

- Q4)** a) Draw and explain interfacing of input device (LED) using Arduino Uno with program. [8]
b) Why python is important in IoT? How python plays important role in the Raspberry Pi language than C or C++? [9]

- Q5)** a) Explain Data and message security and Non repudiation and availability with respect to IoT security. [9]
b) Explain in detail Web server for IoT and role of Ubidots for Cloud in IoT. [9]

P.T.O.

OR

- Q6)** a) What is threat analysis in IoT? Explain threat analysis in detail. [9]
b) Explain Key elements of IoT Security Identity establishment and Access control. [9]

- Q7)** a) Explain in detail IoT Industry Applications - Machine Diagnosis and Prognosis, Indoor Air Quality Monitoring. [9]
b) Explain how you will design a smart water management system for agriculture using IoT. [9]

OR

- Q8)** a) What is role of IoT in health monitoring? Explain in detail any two application of health monitoring using IoT. [9]
b) Explain in detail How IoT can be used in home automation. [9]



Total No. of Questions : 8]

SEAT No. :

P-7625

[Total No. of Pages : 2

[6180]-145

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 the questions - 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 calculator is allowed*
- 5) *Assume suitable data, if necessary.*

Q1) a) Explain Adhoc Network MAC Layer with Design Issues, Design Goal & Classification. [9]

b) Classify protocols used in Sensor Network. [9]

OR

Q2) a) Explain AODV and DSR protocol in detail. [9]

b) Explain the issues in designing a Routing Protocol for Ad-hoc Wireless Networks. [9]

Q3) a) Explain the need & importance of security and types of attack. [8]

b) What are different security principles and security services? [9]

OR

Q4) a) Explain Block cipher modes in detail. [8]

b) Explain network security threats with example attacks. [9]

Q5) a) Define symmetric key encryption? Explain DES in detail. [9]

b) Elaborate Digital signatures, Digital Certificates. [9]

OR

P.T.O.

- Q6)** a) Write a note on RSA algorithm. [9]
b) What is private key? Explain Diffie-Hellman key exchange algorithm. [9]

- Q7)** a) What is cyber terrorism? How to identify and detect cyber stalking? [8]
b) Explain various cyber crimes and Computer criminals. [9]

OR

- Q8)** a) Define & explain Vulnerability, Threat, Malware & Phishing. [8]
b) Explain DoS Attack and SQL injection attack. [9]



Total No. of Questions : 8]

SEAT No. :

P-7626

[Total No. of Pages : 2

[6180]-146

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 process of reading and writing a file in HDFS with neat diagram. [8]
- b) List and explain any four Hadoop shell commands with syntax. [4]
- c) Differentiate between SQL and NoSQL databases with example. What is the need to develop big data applications using NoSQL databases? [6]

OR

- Q2)** a) What is the need of map reduce in Big Data? Explain the stages involved in map reduce task with a suitable example? [9]
- b) Explain Hadoop ecosystem in detail. [9]
- Q3)** a) What is data wrangling? Why do you need it? Explain data wrangling methods? [9]
- b) What is categorical variable? Why do you need categorical variable encoding? With an example, explain one-hot encoding. [9]

OR

- Q4)** a) Draw and explain Architecture of HIVE. [8]
- b) How missing values and categorical variables are preprocesses before building model? Explain with suitable example. [4]
- c) Explain z-score normalization. For the following dataset carry out z-score normalization (standardization), $X = 23, 29, 52, 31, 45, 19, 18, 27$. [6]

P.T.O.

- Q5)** a) What is Data Visualization? What are the major challenges in big data visualization and how to overcome these challenges? [6]
- b) Explain various techniques for visual data representation. [6]
- c) Explain the following data visualization techniques. [5]
- i) Candela
- ii) D3.js

OR

- Q6)** a) Explain data visualization with respect to 1-D, 2-D, 3-D data. [6]
- b) Explain various analytical techniques used in big data visualization. [6]
- c) Draw histogram with a suitable example and explain its usage. [5]

- Q7)** a) What is Porters valuation creation model? Explain porter's value chain analysis. [9]
- b) What is social media analytics? Explain the process of social media data analytics. [8]

OR

- Q8)** a) What is text mining? Draw and explain text mining architecture and its use. [8]
- b) Explain primary activities of Michal Porters value chain. [5]
- c) How mobile analytics is different from social media analytics? [4]



Total No. of Questions : 8]

SEAT No. :

P-7627

[Total No. of Pages : 2

[6180]-147

T.E. (IT)

WEB APPLICATION DEVELOPMENT
(2019 Pattern) (Semester - II) (314464A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 and Q8.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Use of nonprogrammable calculator is allowed.*
- 4) *Assume suitable data if necessary.*

Q1) a) Write a simple application in typescript to demonstrate the use of modules. **[9]**

b) What is pipe? Demonstrate the code for pipes in Angular. **[9]**

OR

Q2) a) Give the simple layout of the Angular application with multiple components. Explain how to create and use components in Angular?**[9]**

b) Explain the basic hooks in React JS. Explain any two hooks in brief.**[9]**

Q3) a) What is CRUDE? Explain the crude CRUDE in node.JS. **[9]**

b) What is node.JS? Explain file handling in node.js. **[8]**

OR

Q4) a) Write a code using Express.JS to illustrate the concept of roots. **[9]**

b) What is replication? Enlist the advantages of replication in database system. **[8]**

Q5) a) What is navigation? Write a code to navigate from one page to another page in jQuery mobile. **[9]**

b) What is jQuery mobile? Explain layout in jQuery Mobile design with its types. **[9]**

P.T.O.

OR

- Q6)** a) Why CSS is important in designing mobile websites? Give an example of CSS class used for mobile website design. [9]
b) List any five widgets in jQuery mobile and explain any two in brief. [9]

- Q7)** a) What is EC2 service? Explain Steps to deploy website on EC2. [9]
b) What is AWS cloud? What are the services provided by AWS? Explain any two in brief. [8]

OR

- Q8)** a) What is ELB? What are the ELB types? List advantages of ELB. [9]
b) What is VPC? What are the components of VPC? [8]



Total No. of Questions : 8]

SEAT No. :

P-7628

[Total No. of Pages : 3

[6180]-148

T.E. (Information Technology)

ARTIFICIAL INTELLIGENCE

(2019 Pattern) (Semester - II) (314454A) (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 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) What is Frame? What are the key components of Frame? Compare and Contrast Frame with Semantic Nets. [6]
- c) Write a note on Bayes Theorem and Bayesian networks. [7]

P.T.O.

Q3) a) Write a note on Probabilistic Language Models with the help of 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]

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) Implement the minimax algorithm for a two-player game with perfect information, such as Tic-Tac-Toe. Provide a step-by-step explanation of the algorithm, including how it explores the game tree, evaluates terminal states and propagates the minimax values up the tree. Finally, explain the limitations of the minimax algorithm suggest alternative algorithms that can overcome these limitations. Justify your answers with detailed explanations. [9]

b) Illustrate Hierarchical Planning with the help of 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) Describe in short 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 : 8]

SEAT No. :

P-7629

[Total No. of Pages : 2

[6180]-149

T.E. (Information Technology)

CYBER SECURITY

(2019 Pattern) (Semester - II) (314454B) (Elective - II)

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.
- 4) Assume suitable data, if necessary.

Q1) a) What is cyber forensics? What are the different types of cyber forensics? [9]

b) What do you mean by Application Forensics Readiness? Describe any 3-web application forensic tools. [9]

OR

Q2) a) What is the process of conducting a cyber forensic investigation? [9]

b) What are the differences between cyber forensics and digital forensics? [9]

Q3) a) What are the 5 phases of digital forensics? Explain. [9]

b) What are some common data sources for digital forensics investigations? [8]

OR

Q4) a) Can you give some examples of when and where digital forensics might be used? [9]

b) Why would someone seek to destroy digital evidence? What techniques can they use? [8]

P.T.O.

- Q5) a)** What are the types of social engineering? [9]
b) What are the characteristics of social engineering? [9]

OR

- Q6) a)** What is spear phishing in social engineering? [9]
b) What are the phases in social engineering life cycle? [9]

- Q7) a)** What is Cybercrime? How this crime is distinct from other types of Crime? [9]
b) Write the detailed note on the cybercrime under its IT act. [8]

OR

- Q8) a)** What is Cyber Stalking? Explain the legal remedies available against The Cyberstalking in India. [9]
b) Explain cyber terrorism and provision under the IT Act. [8]



Total No. of Questions : 8]

SEAT No. :

P-7630

[Total No. of Pages : 2

[6180]-150

T.E. (Information Technology)

CLOUD COMPUTING

(2019 Pattern) (Semester - II) (314454C) (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 marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) What are the different standards for application developers on cloud platform? [8]
- b) Differentiate between cloud and grid. [4]
- c) What are the main elements in windows Azure. Explain the significance of each. [6]

OR

- Q2)** a) How are Spot Instance, On-demand Instance, and Reserved Instance different from one another in Amazon web services. [6]
- b) Explain the architecture of Google App Engine with neat diagram.[8]
- c) Explain the significance of Open Cloud Test-bed. [4]

- Q3)** a) Enlist the different components of google file system, explain the significance of each. [9]
- b) Explain the features and advantages of DynamoDB. Differentiate between SQL and NoSQL. [9]

OR

- Q4)** a) What are the advantages of HDFS and how it is different than GFS. [9]
- b) Explain various stages in MapReduce with an Example? [9]

P.T.O.

- Q5)** a) List down the enabling technologies used in IoT. Explain any one application of using sensor networks in Internet of things. [9]
- b) Differentiate between active and passive tags used in RFID. [8]

OR

- Q6)** a) Write short note on Smart Power Grid. Explain with neat diagram. [9]
- b) What are different components of ZigBee. Explain the significance of each. [8]

- Q7)** a) What is autonomic Computing? Explain the need and various areas supported by autonomic Computing. [9]
- b) Explain the Docker architecture with neat diagram. [8]

OR

- Q8)** a) What are the advantages of Mobile Cloud computing? Explain with an application. [9]
- b) Write short note on : [8]
- i) Mobile Cloud
- ii) Home-Based Cloud Computing



Total No. of Questions : 8]

SEAT No. :

P-7631

[Total No. of Pages : 2

[6180]-151

T.E. (Information Technology)

SOFTWARE MODELING & DESIGN

(2019 Pattern) (Semester - II) (314454D) (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) Assume suitable data if required.
- 3) Figures to the right indicates full marks.

Q1) a) Analyze the scenario for an end-semester examination form registration process and draw activity diagram using the concept of fork-join, constraints and swim-lanes. [8]

b) Draw the notations of synchronous asynchronous, return, create object and destroy object messages in the context of sequence diagram. [9]

OR

Q2) a) Analyze the scenario for online purchase process from an e-commerce website and draw a sequence diagram using the concepts of object life line and message. [8]

b) In the context of a state diagram, explain concurrent states, nested states, sub-machine states and composite states with suitable examples. [9]

Q3) a) Explain steps in designing business classes. [6]

b) Justify the use of activity diagram in design of business class. [6]

c) What are the benefits of the Access Layer Class? List the access layer tasks. [6]

OR

Q4) a) What is OCL? Explain its various mechanisms and its applications.[6]

b) Describe the steps involved in the process of designing view layer.[6]

c) Draw a detailed Deployment diagram for Hotel management system scenario. [6]

P.T.O.

Q5) Explain following design patterns with suitable application design requirements : **[18]**

- a) Factory design pattern
- b) State design pattern
- c) Adapter design pattern

OR

Q6) a) List GOF patterns. Explain any three patterns in detail. **[9]**

b) Elaborate on General Responsibility Assignment Software Patterns. **[9]**

Q7) a) Explain the entities involved in documenting a software architectural pattern. **[8]**

b) What is service oriented architecture? Explain its applications. **[9]**

OR

Q8) a) List and explain multiple views of a software architecture. **[9]**

b) Write a short note on: product line software architectures. **[8]**



Total No. of Questions : 8]

SEAT No. :

P6382

[Total No. of Pages : 2

[6180]-152

T.E. (Instrumentation & Control)

EMBEDDED SYSTEMS

(2019 Pattern) (Semester-I) (306261)

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) Discuss types of branching instructions of 8051 with suitable examples.[9]
- b) What is a look-up table? Explain the software development cycle: Editor, Assembler, Compiler, and Linker. [9]

OR

- Q2)** a) For the given assembly language program, evaluate the result after instruction DA A. MOV A, #23H MOV B, #29H ADD A, B DA A. [9]
- b) What is a program counter? Discuss the following assembler directives with suitable examples: DB, EQU, CODE, and DATA. [9]

- Q3)** a) With a flowchart/steps or program. discuss how to use the Push Button connected to Port-1 of 8051 to blink an LED connected to Port-2 using a neat interface diagram. [9]
- b) With a flowchart/steps or program and interface diagram. discuss how to display 0 to 9 on a 7-segment LED display connected to 8051. [8]

OR

- Q4)** a) With a flowchart/steps or program and interface diagram, discuss how to display a string on an LCD display connected to 8051. [9]
- b) With a flowchart/steps or program and interface diagram, discuss how electromagnetic relay connected to 8051 with the suitable driver. [8]

P.T.O.

Q5) a) Develop the design of the temperature control and monitoring system using 8051 with a neat interface diagram and flowchart/steps. [9]

b) Develop the design of a line tracing robot application using 8051 with a neat interface diagram and flowchart/steps. [9]

OR

Q6) a) What signal conditioning steps are necessary to interface a thermocouple to 8051? Discuss it with a neat block or interface diagram. [9]

b) Discuss with suitable diagram and flow chart/steps, types of components involved in a typical washing machine control problem using 8051. [9]

Q7) a) What is operating system? Differentiate between RISC and CISC controllers. [9]

b) Discuss in details about PLDs. [8]

OR

Q8) a) Discuss operating system basics. Also, discuss multiprocessing and multitasking. [9]

b) Compare Arduino and Raspberry Pi boards. [8]



Total No. of Questions : 8]

SEAT No. :

P7632

[Total No. of Pages : 2

[6180]-153

T.E. (Instrumentation and Control)
INDUSTRIAL AUTOMATION-I
(2019 Pattern) (Semester-I) (Theory) (306262)

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 comparison Instructions in brief with examples. **[10]**

b) Write Note on: **[8]**

- i) MOVE
- ii) Masked MOVE
- iii) JUMP
- iv) LABEL

OR

Q2) a) Explain Math Instructions in brief with examples. **[10]**

b) Write a ladder logic program to ADD the values of analog tags TAG-1 and TAG-2 and move the value to float soft tag using the push button. Explain the scenario and assumptions. **[8]**

Q3) a) Design and explain the flow control loop using the PID with ladder logic. **[9]**

b) Enlist the various manufacturers of PLC **[2]**

c) Describe PID tuning **[6]**

OR

Q4) a) Explain the PID block **[7]**

b) Write note on analog modules **[5]**

c) Explain overview of any one of the following PLC **[5]**

- i) Allen Bradley
- ii) Siemens
- iii) Schneider

P.T.O.

- Q5)** a) Explain the need and advantages of HMI [6]
b) Write a note on VFD [6]
c) Enlist differences between SCADA and HMI [6]

OR

- Q6)** a) Describe the motion control in PLC. [10]
b) Describe Drives [8]

- Q7)** a) Explain SCADA [9]
b) Write Note on: [8]
i) RTU
ii) MTU

OR

- Q8)** a) Explain the need and benefits of SCADA system. [9]
b) Describe Alarm Management [8]



Total No. of Questions : 8]

SEAT No. :

P7633

[6180]-154

[Total No. of Pages : 3

T.E. (Instrumentation and Control)
MODERN CONTROL THEORY
(2019 Pattern) (Semester - I) (306263)

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

Q1) a) Check Controllability and Observability of system whose state space representation as below; **[10]**

$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u \text{ and } y = \begin{bmatrix} 3 & 4 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Use Kalman Test.

b) Determine stability of system defined by $\dot{x} = \begin{bmatrix} 0 & 1 \\ -1 & -1 \end{bmatrix} x$ **[8]**

Using Lyapunov direct method of stability analysis. Assume symmetric positive definite matrix Q is identity matrix.

OR

Q2) a) Check controllability and Observability of system represented in state

space form; $\dot{x} = \begin{bmatrix} 1 & 1 \\ -2 & -1 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$ and $y = \begin{bmatrix} 1 & 0 \end{bmatrix} x$

Use Gilbert Test.

[10]

b) Determine stability of system defined by $\dot{x} = \begin{bmatrix} -1 & -2 \\ 1 & -4 \end{bmatrix} x$ **[8]**

Using Lyapunov direct method of stability analysis. Assume symmetric positive definite matrix Q is identity matrix.

P.T.O.

Q3) A regulator system has the plant $\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -10 & -5 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$ [17]

and $y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$

Design a state-feedback controller which will place the closed-loop poles at.
 $s = -4, s = -4 + 2j, s = -4 - 2j$

OR

Q4) A regulator system has the plant [17]

$$\dot{x} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

Design a full order state observer, the observer - error poles are required to be located at $s = -5, s = -2 + 2\sqrt{3}j, s = -2 - 2\sqrt{3}j$

Q5) a) Sketch the basic block diagram of sampled data control system. Discuss each block in detail. [10]

b) A analog signal is given as follows;

$$x(t) = 5 \cos(40\pi t) + 10 \sin(150\pi t) + \cos(100\pi t)$$
 [7]

Calculate the Nyquist rate.

OR

Q6) a) Draw ADC and DAC block diagram, discuss ADC and DAC operation in DTCS. [10]

b) What do you mean sampling of signal; discuss sampling process in time and frequency domain. [7]

Q7) a) Solve difference equation for $y(k)$. **[10]**

$$x(k+2) - 1.3x(k+1) + 0.4x(k) = u(k)$$

Where

$$x(0) = x(1) = 0 \quad x(k) = 0; k < 0$$

$$u(k) = 1; k = 0, 1, 2, \dots$$

$$u(k) = 0; k < 0$$

b) Determine the pulse transfer function of system shown in figure below; **[8]**

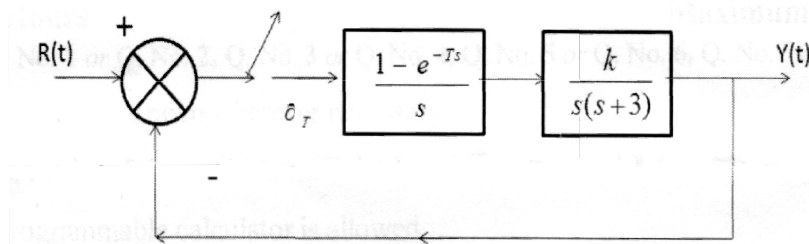


Figure. Closed Loop Control System

OR

Q8) a) Test the system stability of system using jury's stability method for system whose characteristic equation is as follows; **[10]**

$$P(z) = z^4 - 1.2z^3 + 0.07z^2 + 0.3z - 0.08 = 0$$

b) Determine Pulse Transfer function for system represented by block diagram $Y(z)/R(z)$. **[8]**

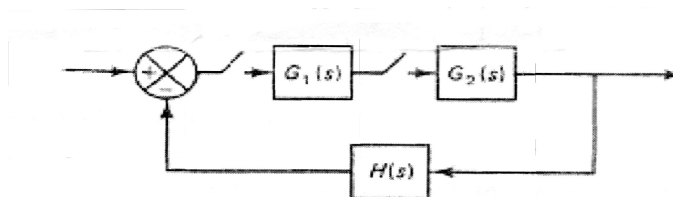


Figure. Closed Loop Control System



Total No. of Questions : 8]

SEAT No. :

P7634

[Total No. of Pages : 2

[6180]-155

T.E. (Instrumentation Engg. & Control)

OPERATING SYSTEM

(2019 Pattern) (Semester-I) (306264)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables, electronic Pocket calculator and steam table is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) a) In scheduling techniques like round robin or priority a program under execution in CPU is required to shift to allow next process to execute. For same current status of process is also required to store so that on next execution cycle process will start from same status from where it was moved to ready queue. State methodology used for shifting memory content and explain it in detail. **[8]**

b) What is demand paging? Explain it with neat diagram and example. **[9]**

OR

Q2) a) Explain External and Internal fragmentation in memory management. **[8]**

b) Explain following **[9]**

- i) Locality of reference,
- ii) Page fault,
- iii) Dirty page/Dirty bit

Q3) a) What is deadlock? How recovery from deadlock is made? **[9]**

b) Explain with suitable example how deadlocks are detected? **[8]**

OR

Q4) a) Explain Banker's algorithm with suitable example. **[9]**

b) Explain deadlock prevention methodology. **[8]**

P.T.O.

- Q5)** a) What is file allocation? Explain contiguous file allocation. [9]
b) Explain file sharing mechanism. [9]

OR

- Q6)** a) Explain directory structure in detail. [9]
b) Explain file system implementation. [9]

- Q7)** a) What is domain of protection? Explain it with suitable example. [9]
b) What are different types of attack? Explain levels of measures to provide security against these attacks. [9]

OR

- Q8)** a) Explain in brief various system and network threats. [9]
b) What is access matrix? Explain access matrix in detail. [9]



Total No. of Questions : 8]

SEAT No. :

P7635

[6180] - 156

[Total No. of Pages : 2

T.E. (Instrumentation and Control)
MECHATRONICS AND ROBOTICS
(2019 Pattern) (Semester - I) (Elective - I) (306265 A)

Time : 2 ½ 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 indicates full marks.
- 4) Assume Suitable data if necessary.

- Q1) a)** Enlist the three phases of mechatronic design Process? Explain the mechatronic design process using block diagram? **[6]**
- b)** Explain the intelligent model based monitoring system concept using block diagram? **[6]**
- c)** Explain the concept of open-architecture platform in mechatronic system? **[6]**

OR

- Q2) a)** Explain the importance and use of Serviceability, Upgradeability and Disposability as life cycle factors considered while life cycle design in mechatronic design process? **[6]**
- b)** What is real time interfacing and prototyping concept in mechatronic design methodology? **[6]**
- c)** Explain Concept evaluation, Design and functional specifications terms in mechanical design process. **[6]**

- Q3) a)** What is Polar and Cartesian configurations of robot anatomies? Draw diagrams of them? **[6]**
- b)** Draw a diagram for permanent magnet single phase BLDC motor and explain the working of it? **[6]**
- c)** Explain in brief the different guarding methods used as safety measures for Robot? (any three). **[6]**

OR

P.T.O.

- Q4) a)** List out the four main types of robots anatomies or coordinate systems? Define term “repeatability of motion”? Which robot anatomy has highest repeatability of motion? And why? [6]
- b)** Explain the working principle ultrasonic distance sensor? Draw suitable diagram to support your answer? [6]
- c)** List out the parts of dc motors? How the torque is produced in the dc motor? State the formula for torque? [6]

- Q5) a)** What is forward Kinematics? Explain with block diagram? How it is useful to know the orientation of the end effector? [6]
- b)** Define terms Pay load, Reach, and Degree of freedom? [6]
- c)** Write Python Program for pick and place work in Robotics? [5]

OR

- Q6) a)** Explain the term Inverse Kinematics? Draw a block diagram to support your answer? [6]
- b)** Explain the concept of depth first and breadth first in search techniques in problem solving using diagram? [6]
- c)** Draw and explain working of suction cups as gripper? [5]

- Q7) a)** The line following robot is to be implemented as a mini project, list out the components to be used including microcontroller? Write an algorithm and program for it? [12]
- b)** How Robotic arm is to be designed? Explain the key points? [5]

OR

- Q8) a)** The remote control car is to be designed and implemented as a small project? Which components should be procured? Develop an algorithm and program for it? [12]
- b)** Write a short note on selection of motor in robot? Consider dc gear, servo and stepper motor for comparison? [5]



Total No. of Questions : 8]

SEAT No. :

P7636

[6180] - 157

[Total No. of Pages : 2

T.E. (Instrumentation and Control)

DATA SCIENCE

(2019 Pattern) (Semester - I) (Elective - I) (306265 B)

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 various matrix operations that can be performed on arrays using Numpy. **[9]**

b) Give explanation of the various graphical data representation used in Seaborn. **[9]**

OR

Q2) a) Give an overview of scatter plot, subplot, imshow. **[9]**

b) Explain with applications the concepts of heat map and pair plot in Seaborn library. **[9]**

Q3) a) Describe the concept of data cleaning with examples. **[8]**

b) Discuss the various missing value treatments in a dataset. **[9]**

OR

Q4) a) Analyze the concept of Percentile and IQR in outlier treatment. **[9]**

b) Discuss on the usages of Boxplot and Z score of data. **[8]**

P.T.O.

- Q5) a)** Explain the concept of ‘dummies’ in categorical to numerical data cleaning with example. **[9]**
- b) Discuss various feature transformation techniques. **[9]**

OR

- Q6) a)** Explain the feature selection in categorical to numerical data analysis. **[9]**
- b) Discuss about the concept of normalization and standardization feature reshaping. **[9]**

- Q7) a)** Differentiate between Tableau public and Tableau Reader. **[8]**
- b) Explain the different data types and databases in Tableau. **[9]**

OR

- Q8) a)** Explain the ‘live’ and ‘extract’ connections between Tableau and database in detail. **[9]**
- b) Discuss the creating views analysis in Tableau **[8]**



Total No. of Questions : 8]

SEAT No. :

P7637

[6180] - 159

[Total No. of Pages : 2

T.E. (Instrumentation and Control)
BIOMEDICAL INSTRUMENTATION
(2019 Pattern) (Semester - I) (Elective - I) (306265 D)

Time : 2 ½ 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) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

Q1) a) State the Causes, Occurrence, vibration, of Heart Sounds. Draw and Discuss the working principle of Phonocardiography with neat diagram

[10]

b) Elaborate the Working of Direct Blood Pressure Measurements with the help of neat diagram.

[7]

OR

Q2) a) Define Cardiac Output. Draw and Discuss the working principle of Cardiac Output with neat diagram

[10]

b) Describe the Working Principle of any one type of Thermal Convection type Blood Flow meter with neat diagram

[7]

Q3) a) State the function of Cranial Nerves. With the help of neat diagram, explain the working of Neuron and its function.

[10]

b) Explain the working of the EEG Amplifier with neat diagram.

[8]

OR

Q4) a) Define myoelectric voltages. Explain the working principle of Electromyography (EMG) with the help of neat diagram.

[10]

b) Define Biofeedback. With the help of neat diagram, Explain the Working Mechanism of Biofeedback with the help of neat diagram.

[8]

P.T.O.

- Q5) a)** Elaborate the role of middle ear in the mechanism of hearing. Explain the working of Pure tone Audiometer with the help of neat diagram. **[10]**
- b)** With the help of neat diagram, Explain the Anatomy of Eye. **[7]**

OR

- Q6) a)** State the role of Instrumentation in the mechanism of hearing Describe the mechanism of hearing with the help of neat diagram. **[10]**
- b)** Describe the Visual Acuity (Errors in Vision) and its remedy. **[7]**

- Q7) a)** With the help of neat diagram, explain the Natural process 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 Gas Analyzer. **[8]**

OR

- Q8) a)** State the function of Oxygenator. With the help of neat diagram, Explain the working of Bubble Type Oxygenators with the help of neat diagram. **[10]**
- b)** With the help of neat diagram, Explain the working of Ventilators with the help of neat diagram. **[8]**



Total No. of Questions : 8]

SEAT No. :

P7638

[Total No. of Pages : 2

[6180]-160

T.E. (Instrumentation & Control)

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 and Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Assume suitable data if necessary.*

Q1) a) Compare Arduino board Vs Raspberry pi board. **[8]**

b) Enlist various IoT platforms and explain any three of them. **[9]**

OR

Q2) a) Define MQTT. Elaborate with relevant diagram IoT protocol MQTT. **[8]**

b) What is Third party integration in IoT platform? Write in brief the functions of IoT platform. **[9]**

Q3) a) What is identity management in IoT? Explain user centric identity management. **[8]**

b) Enlist the various types of cloud deployment models? Explain any two in detail. **[9]**

OR

Q4) a) Define the role of Cloud Computing in IoT. Enlist the types of cloud deployment models. **[8]**

b) Elaborate in detail software as a service in service models. What is data Synchronization? **[9]**

P.T.O.

- Q5) a)** In brief what is IoT reference model? What are the different IoT security requirements? **[9]**
- b)** What is an IoT gateway? Explain key features of an IoT Gateway. Define the role of Gateway in IoT. **[9]**

OR

- Q6) a)** Explain briefly the broad categories of threats? Which are the well-known active threats? **[9]**
- b)** With reference to IoT security overview, describe the network and transport layer challenges. Which are the different routing attacks? **[9]**
- Q7) a)** What are the benefits and challenges of V2X Communication? **[9]**
- b)** What are the enabling technologies in Health Care IoT and challenges in it? **[9]**

OR

- Q8) a)** Which are the different smart city frameworks? Write short note on Energy management in Smart cities. **[9]**
- b)** Draw a architecture of smart grid IoT system. What are the security aspects in smart grid system? **[9]**



Total No. of Questions : 8]

SEAT No. :

P7639

[Total No. of Pages : 2

[6180]-161

**T.E. (Instrumentation and Control)
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, 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 calculator is allowed.
- 5) Assume suitable data if necessary

Q1) a) Analyze the working of HART protocol with respect to following: **[10]**

- i) HART networks.
- ii) HART Commands.

b) Explain the master-slave communication in Modbus protocol. **[7]**

OR

Q2) a) Examine the different transmission mode in MODBUS protocol. **[10]**

b) Describe the OSI/ISO reference model in communication system. **[7]**

Q3) a) Analyze the alarm and logging configuration in DCS. **[10]**

b) Summarize the different features of HMI. **[7]**

OR

Q4) a) What is mean by alarm management? Examine the different steps for alarm management system. **[10]**

b) Analyze the role of operator in DCS based process control. **[7]**

Q5) a) Develop the Functional Block Diagram (FBD) for following logic implementation: **[10]**

- The signal state is 1 at output M3 when at least one AND logic operation is satisfied
- The signal state is 0 at output M3 when no AND logic operation is satisfied

b) Enlist the different programming language as per IEC 61131-3. Elaborate Sequential Function Chart (SFC) programming with example. **[8]**

OR

P.T.O.

Q6) a) Consider the following two fuzzy sets: **[10]**

$$A = \{ (x_1, 0.1), (x_2, 0.2), (x_3, 0.3), (x_4, 0.4) \}$$

$$B = \{ (x_1, 0.5), (x_2, 0.7), (x_3, 0.8), (x_4, 0.9) \}$$

Determine the following:

- i) $A \cup B$
 - ii) $A(x) - B(x)$
 - iii) $A(x) \cdot B(x)$
 - iv) $A(x) + B(x)$
 - v) $A \cap B$
- b) Develop the Sequential Function Chart (SFC) programming for timer instruction. **[8]**

Q7) a) Analyze the role of Internet of Things and Mobile and remote devices in industrial process control. **[10]**

- b) Examine the role of Distributed Control System for monitoring and controlling in the Field. **[8]**

OR

Q8) a) Describe the application of Distributed Control System in Petroleum-refining environment. **[10]**

- b) Elaborate the application of Industrial Internet in process control. **[8]**



Total No. of Questions : 8]

SEAT No. :

P7640

[Total No. of Pages : 2

[6180]-162

T.E. (Instrumentation & Control)
DIGITAL SIGNAL PROCESSING
(2019 Pattern) (Semester-II) (306270)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, 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) Define DTFT and state any seven properties of DTFT. [8]
b) Explain the following properties of DTFS. [6]
i) Frequency shift.
ii) Convolution in time Domain
c) For what types of signals DTFT is used? Explain the condition for existence of DTFT. [4]

OR

- Q2)** a) For a discrete time signal given below find its Fourier Series coefficients.[7]
$$x(n) = 1 + \sin\left(\frac{n\pi}{2} + \frac{\pi}{4}\right)$$

Plot the fouries series coefficients.
b) State and prove Time Reversal and convolution property of DTFT. [8]
c) Compare DTFT and DTFS. [3]

- Q3)** a) Derive the DIT-FFt algorithm for N=8 and using the resulting signal flow graph computer the 8-point DFT of an 8-point sequence
 $x(n) = \{1,1,0,0,-1,-1,0,0\}$ [10]
b) Explain Radix-2 DIF-FFT algorithm. [7]

OR

- Q4)** a) Calculate 8-point DFT of the following signal. [9]
 $x(n) = \{1,1,1,1\}$
b) Define DFT. State and prove any two properties of DFT. [8]

P.T.O.

- Q5) a)** If $H_a(s) = \frac{1}{(s+1)(s+2)}$, find the corresponding $H(z)$ using impulse invariance method for sampling frequency of 5 *samples/sec* [9]
- b) Explain Chebyshev filter approximation. [5]
- c) What is Frequency Transformation? [4]

OR

- Q6) a)** The system function of the analog filter is given as [10]

$$H_a(s) = \frac{(s+0.1)}{(s+0.1)^2 + 16}$$

Obtain the system function of the digital filter using Bilinear transformation

which is resonant at $\omega_r = \frac{\pi}{2}$

- b) Explain Butterworth IIR filter approximation. [6]
- c) Explain stability of IIR filters. [2]
- Q7) a)** How will you design linear phase FIR filter using rectangular window? [7]
- b) Using a rectangular window technique, design a low pass filter with passband gain of unity, cutoff frequency of 1000 Hz and working at a sampling frequency of 5KHz. The length of impulse response should be 7. [7]
- c) Explain advantages of Frequency Sampling method. [3]

OR

- Q8) a)** Explain advantages and disadvantages of window design method in FIR filter. [4]
- b) Write short notes on “Gibbs phenomenon.” [4]
- c) Design an FIR linear phase filter using Kaiser window to meet the following specifications. [9]

$$0.99 \leq |H(e^{j\omega})| \leq 1.01, 0 \leq \omega \leq 0.19\pi$$

$$|H(e^{j\omega})| \leq 0.01, 0.21\pi \leq \omega \leq \omega$$



Total No. of Questions : 8]

SEAT No. :

P7641

[6180]-163

[Total No. of Pages : 2

T.E. (Instrumentation & Control)

BUILDING AUTOMATION

(2019 Pattern) (Semester - II) (Elective - II) (306271 A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Discuss Constant and Variable Air Volume Systems in Air Conditioning Systems. **[10]**
- b) Describe Run Around Coil and Thermal wheel in AHU. **[8]**

OR

- Q2) a)** Draw simplified diagram of AHU and describe various measurements and justify each? **[10]**
- b) Compare AHUs based on 100% outdoor air and mixed air type. **[8]**

- Q3) a)** Distinguished Water-Cooled Chiller vs Air Cooled Chiller in HVAC System. **[10]**
- b) Describe concept of heat pump with respect to geothermal enrgy. **[7]**

OR

- Q4) a)** Enlist the parts of fire tube boiler and explain its working? What is the advantage of fire tube boiler? **[10]**
- b) Illustrate working and design of two types of heat exchangers. **[7]**

- Q5) a)** Discuss class A and class B wiring in FAS. **[8]**
- b) Explain the conventional (non-addressable) and addressable Types of Fire Alarm Systems. **[10]**

OR

P.T.O.

- Q6)** a) Describe What is SLC? [8]
b) What is the fire alarm? Why do we need NFPA 72 compliance? [10]

- Q7)** a) What is ACS? Describe its benefits. [7]
b) Explain architecture of CCTV system with components and importance. [10]

OR

- Q8)** a) What is the difference between a Video Server, an NVR and a DVR?[7]
b) Discuss block diagram of access control system. [10]



Total No. of Questions : 8]

SEAT No. :

P7642

[6180]-164

[Total No. of Pages : 2

T.E. (Instrumentation Engineering)
MECHINE LEARNING
(2019 Pattern) (Semester - II) (Elective - II) (306271 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 indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

- Q1) a)** What is bayes theorem also discuss the Naïve Bayes classifier. **[8]**
- b)** The following table gives data set about stolen vehicles. Using Naïve Bayes classifier classify the new data (Red, SUV, Domestic) **[10]**

Table

Color	Type	Origin	Stolen
Red	Sports	Domestic	Yes
Red	Sports	Domestic	No
Red	Sports	Domestic	Yes
Yellow	Sports	Domestic	No
Yellow	Sports	Imported	Yes
Yellow	SUV	Imported	No
Yellow	SUV	Imported	Yes
Yellow	SUV	Domestic	No
Red	SUV	Imported	No
Red	Sprots	Imported	Yes

OR

- Q2) a)** Explain K nearest learning algorithm with example. **[10]**
- b)** Explain the sigmoid function in brief. **[8]**

P.T.O.

Q3) a) What is Machine learning? Explain Supervised Machine Learning using example. **[9]**

b) Define Regression. How Multivariate Regression is different from Univariate regression? **[8]**

OR

Q4) a) i) Linear separable data Vs Non Linear Separable data. **[9]**
ii) Hard Margin vs Soft Margin.

b) Explain true positive, true negative, false positive, false negative and class ratio. **[8]**

Q5) a) List and explain the issues in Decision tree. **[10]**

b) Explain random forest algorithm using example. **[8]**

OR

Q6) a) Draw a neat diagram and explain the over fitting and underfitting also give the example of it. **[10]**

b) Define the following terms **[8]**

i) Gin index

ii) Entropy

iii) Chi square test

iv) Pruning

Q7) a) Give suitable example and explain K means clustering. **[9]**

b) Differentiate between supervised and unsupervised machine learning. **[8]**

OR

Q8) a) Using suitable diagram elaborate silhouette method. **[5]**

b) Write a note on (any two) **[12]**

i) Over fitting and under fitting

ii) Ensemble Learning

iii) Elbow method



Total No. of Questions : 8]

SEAT No. :

P7643

[6180]-165

[Total No. of Pages : 2

T.E. (Instrumentation & Control)

ELECTRICAL DRIVES

(2019 Pattern) (Semester - II) (Elective - II) (306271 C)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Discuss the separately excited DC motor control using chopper.

Draw a circuit diagram, waveforms with explanation for firing angles 45° and 90°. **[10]**

b) Draw and discuss four quadrant variable speed chopper fed DC drives with waveforms. **[6]**

OR

Q2) a) Discuss dc servo motor with diagram and its characteristics. Discuss in detail a method for speed control of servo motor. **[10]**

b) Draw and discuss Dual converter fed DC Drive with waveforms. **[6]**

Q3) a) Discuss stator frequency control and variable frequency operation for Induction motor in detail. **[10]**

b) Draw and discuss the synchronous motor. Explain the speed control principles for it. **[8]**

OR

Q4) a) Explain the working principle of synchronous motor. Discuss adjustable frequency operation. **[10]**

b) Analysis of different AC motor with single phase and three phase cycloconverters Operations in different modes and configurations. **[8]**

P.T.O.

Q5) a) Write the selection criterias of drives required for pump. Which motor drive will you use for centrifugal pump for low viscosity fluids such as water. **[10]**

b) Discuss the application of Motors and electric drives for Cranes and Hoist. **[8]**

Q6) a) Write the selection criterias of drives required for Cranes and Hoist. Discuss the application of Motors and electric drives for Cranes and Hoist. **[10]**

b) Discuss the detail drives application for electric traction. **[8]**

OR

Q7) a) Draw and discuss electric vehicle drive system. **[9]**

b) Discuss DC/AC converter in detail used for electrical vehicle. **[9]**

OR

Q8) a) Discuss use of induction motor in electrical vehicle? Write detail drive control for it. **[10]**

b) Draw and discuss Torque-speed capabilities of induction motor. Discuss the Application of induction Motor in Electric Vehicle. **[8]**



Total No. of Questions : 8]

SEAT No. :

P7644

[6180]-166

[Total No. of Pages : 2

T.E. (Instrumentation & Control)
ANALYTICAL INSTRUMENTATION
(2019 Pattern) (Semester - II) (Elective - 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.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) Define HPLC. Draw and explain the different types of column in HPLC. **[9]**

b) What are the types of Detectors and Recorders used in HPLC? Explain with sketch any one type of recorder in HPLC. **[9]**

OR

Q2) a) List the various detectors used in chromatography. Explain with neat sketch any one type of detector. **[9]**

b) What is chromatography? Explain the working principle of Gas chromatography. **[9]**

Q3) a) Draw and explain the Pollution Monitoring Instruments. **[9]**

b) Explain with sketch Turbidity Analyzer. List the industrial applications of turbidity analyzer. **[8]**

OR

Q4) a) Explain with neat sketch H₂S analyser system. **[9]**

b) Explain with sketch Oxygen analysers using paramagnetic principle. **[8]**

P.T.O.

- Q5) a)** Define membrane separation process. What is the operating principles of membrane separation process and list the applications of same. **[9]**
- b)** Elaborate dialysis and electro dialysis membrane separation process.**[9]**

OR

- Q6) a)** List the different types of mass analyzers. Explain with neat sketch magnetic deflection type of mass analyzers. **[9]**
- b)** List the various detectors used in Mass spectrometer and explain any one in detail. **[9]**

- Q7) a)** Draw and explain GM counter. List the applications of GM counter. **[9]**
- b)** Draw and explain Gamma Spectrometry. **[8]**

OR

- Q8) a)** Explain Scintillation counter w.r.t. following points **[9]**
- i) Principle
 - ii) Construction
 - iii) Working
- b)** Elaborate in detail various Industrial applications of radiation measurement. **[8]**



Total No. of Questions : 8]

SEAT No. :

P7645

[6180]-167

[Total No. of Pages : 3

T.E. (Automobile)

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.No.1 or Q.2, Q.3 or Q.4, Q.5 or 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 [9]

$$\frac{dy}{dx} = x + y \text{ with } x = 1, y = 0 \text{ and } h = 0.1 \text{ Comparing with}$$

$$\frac{dy}{dx} = f(x, y), y(x, 0) = y_0 \text{ we can have } f(x, y) = x + y, x_0 = 1, y_0 = 0, x_n = 1.3, \\ h = 0.1 \text{ Prepare a table of } x \text{ and } y \text{ values.}$$

- b) A steel plate of 750mm × 750 mm has its two adjacent sides maintained at 100°C while two other side are maintained at 0° C what will be the steady state temperature at interior points assuming a grid size of 250mm. [8]

OR

Q2) a) Using Runge-Kutta fourth order method find $y(0.2)$ for $\frac{dy}{dx} = x + y$ given $y(0) = 1$ and $h = 0.1$. [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]

P.T.O.

- Q3) a)** The velocities of a car running on a straight road at intervals of 2 minutes are given below: find the distance covered by the car. **[9]**

Time in Min	0	2	4	6	8	10	12
Velocity in KM/hr	0	22	30	27	18	7	0

- b) Using Trapezoidal rule, evaluate $I = \int_1^2 \int_1^2 \frac{dx dy}{(x+y)}$ taking four subintervals. **[9]**

OR

- Q4) a)** Evaluate $I = \int_1^2 \frac{2x^2}{1+x^4}$ using Simpson 3/8th Rule. **[9]**

- b) Find double integration of $f(x) = x^2 + y^2 + 5$ for $x=0$ to 2, and $y=0$ to 2 taking increment in both x and y as 0.5. Use trapezoidal rule. **[9]**

- Q5) a)** What is optimization? Give a classification of optimization problem. **[4]**

- b) Determine the maximum value of root of equation $0.51x - \sin x$ by newton method. take the initial guess as 2 and do 4 iterations. **[4]**

- c) Find the initial basic feasible solution for the Transportation Problem by Vogel's approximation 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 $2\sin x - 0.1x^2$ take 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 Simulated annealing. [9]

OR

- Q8)** a) Explain Particle swarm optimization. [9]
b) Explain Ant Colony optimization. [9]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 3

P7646

[6180]-168

T.E. (Automobile)

HEAT TRANSFER

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the significance of velocity boundary layer. **[6]**

b) Explain Local and Average heat transfer coefficient. **[6]**

c) Assuming man as a cylinder 350 mm diameter and 1.65m height with surface temperature of 28°C, find the heat he would lose while standing in a 30 km/hr wind at 12°C.

Use: $Nu = 0.027 (Re)^{0.805} (Pr)^{1/3}$

Properties of air at 20°C are $k = 0.0259 \text{ W/m}^\circ\text{C}$,

Kinematic viscosity = $15 \times 10^{-6} \text{ m}^2/\text{s}$, $Pr = 0.707$. **[5]**

OR

Q2) a) Explain the significance of following dimensionless numbers. **[6]**

i) Prandtl number

ii) Reynold Number.

iii) Nusselt Number

b) Explain Laminar & Turbulent flow with example. **[5]**

c) Lubricating oil at a temperature of 60°C enters 1 cm diameter tube with a velocity of 3 m/s. The tube surface is maintained at 40°C. Assuming that the Oil has the following average properties. Calculate the tube length required to cool the oil to 45°C. Density of oil = 865 kg/m³; $k = 0.14 \text{ W/mK}$; $C_p = 1.78 \text{ kJ/kg K}$. Assume flow to be laminar (and fully developed). $Nu = 3.657$. **[6]**

P.T.O.

- Q3) a)** Why the heat transfer coefficient for natural convection is much less than that for convection? [4]
- b) Define the Natural convection and give two practical examples of Natural convection. [4]
- c) A circular disc of diameter 25 cm is exposed to air at 293 K. If the disc is maintained at 393 K, estimate the heat transfer rate from it, when; [10]
- Disc is kept horizontal (Take characteristic length Area/Perimeter)
 - Disc is kept vertical.

For air at 70°C, $k = 0.03 \text{ W/m K}$; $Pr = 0.697$; kinematic viscosity $= 2.076 \times 10^{-6} \text{ m}^2/\text{s}$

Use the following correlations:

$Nu = 0.14 (Ra)^{0.334}$ for surface facing upward.

$Nu = 0.27 (Ra)^{0.25}$ for surface facing downward.

$Nu = 0.59 (Gr \cdot Pr)^{0.25}$ for vertical surface.

OR

- Q4) a)** Explain Forced Convection Boiling(Flow boiling) with neat sketch. [8]
- b) Estimate the heat loss from a vertical wall exposed to Nitrogen at 1 atm and 4 °C. The wall is 2 m high and 2.5 m wide and is maintained at 56 °C. The average Nusselt number over height of the wall for natural convection is given by : $Nu = 0.13 (Gr \cdot Pr)^{1/3}$ The properties for Nitrogen at a mean film temperature are given as density $= 1.142 \text{ kg/m}^3$, $k = 0.026 \text{ W/mK}$, kinematic viscosity $= 15.63 \times 10^{-6} \text{ m}^2/\text{s}$, $Pr = 0.713$. [10]

- Q5) a)** Draw labeled temperature profiles of the following types of heat exchangers. [8]
- Parallel flow heat exchanger
 - Counter flow heat exchanger
 - Condenser
 - Evaporator
- b) Write a short note on Fouling Factor. [4]

- c) A counter flow double pipe heat exchanger is used to heat water from 20°C to 80°C at a rate of 1.2 kg/s . The heating is to be accomplished by geothermal water available at 160°C at a mass flow rate of 2 kg/s . The inner tube is thin-walled and has a diameter of 1.5 cm . If the overall heat transfer coefficient of the heat exchanger is $640\text{ W/m}^2\text{K}$, determine the length of the heat exchanger required to achieve the desired heating. [5]

OR

- Q6)** a) What is LMTD for a heat exchanger? Derive an expression for LMTD of counter flow heat exchanger. [10]
b) Define Heat Exchanger & write the classification of Heat Exchangers (Any three) [7]

- Q7)** 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) Three hollow thin-walled cylinders having diameters 10 cm , 20 cm , and 30 cm are arranged coaxially. The temperatures of the innermost and outermost cylinder surfaces are 100 K and 300 K respectively. Assuming vacuum between annular spaces, find steady state temperature attained by the cylinder having diameter of 20 cm . Take emissivities of all cylinders as 0.05 . [8]

OR

- Q8)** a) Explain [6]
i) Planck's Law
ii) Wien's Displacement law
iii) Kirchhoff's Law
b) Define Irradiation with their characteristics. [4]
c) The dimensions of a room are $10\text{ m} \times 10\text{ m} \times 7\text{ m}$ height. The roof temperature is 60°C , while the walls and the floor are at 30°C . Calculate the rate of heat transfer from the roof to the walls and floor together. Emissivity of walls and floor = 0.8 Emissivity of roof is 0.6 . [8]



Total No. of Questions : 8]

SEAT No. :

P7647

[6180]-169

[Total No. of Pages : 3

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

Q1) a) Explain the different types of welds. **[6]**

- b) A machine slide weighing 3 kN is elevated by a double start acme threaded screw at the rate of 0.84 m/min. If the coefficient of friction is 0.12, calculate the power to drive the slide. The end of the screw carries a thrust collar of 32 mm inside diameter and 58 mm outside diameter. Pitch of the screw thread is 7 mm and outside diameter is 44 mm. Take coefficient of friction for collar as 0.09 and allowable shear stress as 44.125 MPa. Is it strong enough to sustain the load? **[12]**

OR

Q2) a) Derive an expression for torque required to raise the load in power screws. **[8]**

- b) A triple riveted lap joint is to be made between 6 mm plates. If the safe working stresses are tensile stress 84 MPa, shear stress 60 MPa and crushing stress 120 MPa, Design the joint. **[10]**

Q3) a) Derive Soderberg equation. **[10]**

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

OR

P.T.O.

Q4) a) A hot rolled steel rod is subjected to torsional load varying from - 110N-m to 440N-m and axial load varying from 4500N to 13500N. Assume factor of safety as 8. Take ultimate stress = 550Mpa, yield shear stress = 235Mpa, yield stress=470 Mpa, fatigue stress concentration factor=1, load factor=0.7 for axial and 1 for torsion, surface finish factor=0.89, size factor=1. Calculate the diameter of rod. **[10]**

b) Write a short note on S-N diagram. **[7]**

Q5) a) Derive an expression for formative number of teeth in helical gear. **[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 $\alpha = 20^\circ$ FDI, $\beta = 45^\circ$. $\sigma_d = 193.2\text{Mpa}$, BHN = 250 for pinion and gear. Check only tangential tooth load. **[12]**

$$Y = \pi(0.154 - 0.912 / Z_e), C = 5.55 / 5.55 + V^{0.5}.$$

OR

Q6) a) Design spur gear set to transmit 20 KW at 900rpm of pinion. The transmission ratio is 3. Take 20° FDI, $Z_1 = 18$, $\sigma_d = 193.2\text{Mpa}$, BHN=250 for pinion and $\sigma_d = 47.1\text{Mpa}$, BHN=200 for gear. Check only tangential tooth load. Form factor **[12]**

$$Y = \pi(0.154 - 0.912 / Z), C_v = 3.05 / 3.05 + V$$

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

Q7) a) Explain the purpose of Worm and worm wheel. [3]

- b) A worm gear drive is to connect two shafts to transmit 10 KW. The transmission ratio is 20:1 and worm shaft rotates at 1440 rpm. Design the gear set. Assume single start square thread. Take $\sigma_d = 207 \text{ Mpa}$, for worm and $\sigma_d = 82.4 \text{ Mpa}$, for worm wheel. Form factor [14]

$$Y = \pi(0.154 - 0.912 / Z).$$

OR

Q8) a) Explain about miter gears. [3]

- b) Two shafts are right angles to each other are connected by 20° full depth involute teeth bevel gears. The velocity ration is 3:1. The pinion transmits 37.5 KW at 750 rpm. Assume number of teeth on pinion is 20. Design the gear set. Take $\sigma_d = 233.4 \text{ Mpa}$, BHN=200 for pinion and $\sigma_d = 172.6 \text{ Mpa}$, BHN=150 for gear. form factor

$$Y = \pi(0.154 - 0.912 / Ze), C_v = 6.1 / 6.1 + V \quad [14]$$



Total No. of Questions : 8]

SEAT No. :

P7648

[Total No. of Pages : 2

[6180]-170

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 wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume Suitable data if necessary.

- Q1)** a) What is use of current regulator? Explain any one type of current regulator. [6]
- b) Compare Earth return and insulated return system. [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) Enlist the different types of battery tests. [5]
- b) What is use of Voltage regulator? [5]
- c) Explain working of type pressure gauge. [7]

OR

- Q4)** a) What is use of current regulator? [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. :

P7649

[6180] - 171

[Total No. of Pages : 2

T.E. (Automobile/Mechanical/Automation & Robotics)
ADVANCED FORMING AND JOINING PROCESSES
(2019 Pattern) (Semester - I) (Elective - I) (302045 A)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory i.e. Solve Que 1 or Que 2. Que 3 or Que 4, Que 5 or Que 6, Q 7 or Q8.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

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

OR

- Q2) a)** Explain in detail importance of effects of pre and post weld heat treatments processes? **[8]**
- b) Explain in detail concept of weldability & its assessment; explain the importance of weldability **[9]**
- Q3) a)** Explain with sketch, Cold pressure welding process with advantages and limitations. **[9]**
- b) Explain in detail with sketch, Ultrasonic welding process features and applications. **[9]**

OR

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

P.T.O.

- Q5) a)** Analyze with the sketch, working of Electrosag 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. :

P7650

[6180] - 172

[Total No. of Pages : 2

T.E. (Mechanical Engineering) (Automobile)
MACHINING SCIENCE AND TECHNOLOGY
(2019 Pattern) (Semester - I) (Elective - I) (302045 B)

Time : 2 ½ 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) Figures to the right indicate full marks.
- 5) Use of non-programmable electronic calculator is allowed.

- Q1) a)** Describe balancing of Grinding wheel with Neat Sketch. **[6]**
b) Explain the factors in the selection of grinding wheel during grinding process. **[6]**
c) Explain with figure mounting of grinding wheels. **[6]**

OR

- Q2) a)** Explain the meaning of grain, grade and structure of a grinding wheel. **[6]**
b) Explain the meaning of Grinding wheel signature: W-C-500-H-4-V-17. **[6]**
c) Explain buffing process with neat sketch used in super finishing. **[6]**
- Q3) a)** List various types of clamping devices used in jig and fixtures. Explain any one in detail. **[6]**
b) Draw and Explain V-locators used in design of jigs and fixtures. **[6]**
c) Define fixture; explain with figure milling fixtures used in milling operations. **[5]**

OR

- Q4) a)** Write a short notes on welding fixtures used in industries. **[6]**
b) Explain principles of design of jigs and fixtures used in manufacturing processes **[6]**
c) What are the advantages of using jigs and fixtures in manufacturing process. **[5]**

P.T.O.

- Q5)** a) Discuss objectives and steps involved in process planning. [6]
b) Explain with figure various steps involved in computer aided process planning. [6]
c) Explain in brief material evaluation methods used in process planning.[6]

OR

- Q6)** a) Explain in brief the drawing interpretation and selection of machine and tooling in process planning. [6]
b) Write a short notes on economics of process planning. [6]
c) Explain the sets of documents required for process planning. [6]
- Q7)** a) Explain Linear and circular interpolation in CNC programming with G codes. [6]
b) Explain CNC machine with neat sketch, state its advantages and limitations. [6]
c) Explain with examples significance of canned cycle and subroutine used in CNC machine. [5]

OR

- Q8)** a) Differentiate between the absolute and incremental positioning system in CNC machine. [6]
b) Explain with figure tool length compensation and cutter radius compensation. [6]
c) Explain the following codes - G02, G84, M02, M06 and G17. [5]



Total No. of Questions : 8]

SEAT No. :

P7651

[Total No. of Pages : 3

[6180]-173

T.E. (Automobile)

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 and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of steam table and psychometric chart is allowed.

- Q1)** a) Explain Human Comfort. [6]
b) Explain Effective temperature. [6]
c) Explain air distribution modes (any three). [6]

OR

- Q2)** a) Explain temperature control systems. [6]
b) Explain Cool-down Performance of A/c system of vehicle. [6]
c) Explain vehicle operation mode. [6]

- Q3)** a) Define following Psychrometric Properties. [7]
i) DBT
ii) DPT
iii) Specific humidity
iv) Relative humidity
b) A sample of moist air has a DBT of 43°C and WBT of 29°C. Determine the following without using psychrometric chart. [10]
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 bypass factor of cooling coil. [7]
- b) Moist air at 32°C DBT and 50% RH enters a cooling coil at 10000 cubic meter per hour. It is desired that the air leaving the coil has a DBT of 20°C and WBT of 18°C. Determine following: [10]
- i) ADP of cooling coil
 - ii) BPF of coil
 - iii) SHF of coil
 - iv) Total heat removed
 - v) Mass of water vapour removed

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

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

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

Room sensible heat gain : 84000 kJ/hr

Room latent heat gain : 21000 kJ/hr

By-pass factor of cooling coil used = 0.2

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

- i) ADP of cooling coil
- ii) Supply air temperature
- iii) Fresh air mass flow rate
- iv) Refrigeration load on cooling coil.

OR

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

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

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

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

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

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

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

SH gain from other sources = 11.60 kW,

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

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

- i) Dew point temperature of cooling coil
- ii) Condition of supply air to room,
- iii) Amount of total air required in cubic meter per hour
- iv) Capacity of plant

- Q7)** a) Explain Refrigerant retrofitting. [6]
b) Explain Leak detection methods in AC. [6]
c) Explain sight glass used in AC system of vehicle. [5]

OR

- Q8)** a) Explain Automotive AC system flushing. [6]
b) Explain Odour removal in AC. [6]
c) Explain initial vehicle inspection. [5]



Total No. of Questions : 8]

SEAT No. :

P7652

[Total No. of Pages : 2

[6180]-174

T.E. (Automobile Engineering)
AUTOMOTIVE CHASSIS AND TRANSMISSION
(2019 Pattern) (Semester-II) (316486)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) List out the major components of tyre construction & explain in detail each component. **[10]**

b) Explain in detail tyre performance parameters. **[8]**

OR

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

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

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

b) Explain in detail centrifugal clutch. **[7]**

OR

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

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

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

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

OR

P.T.O.

- Q6)** a) Draw & explain real axle with types of load acting on rear axle. [10]
b) Explain Hotchkiss Drive with neat sketch. [8]

- Q7)** a) Explain in detail about Automatic Transmission. [10]
b) Discuss the construction and working of fluid flywheel. [7]

OR

- Q8)** a) Explain Continuous Variable Transmission with advantages & disadvantages. [10]
b) Explain the construction and working of Torque convertor. [7]



Total No. of Questions : 8]

SEAT No. :

P7653

[Total No. of Pages : 4

[6180]-175

T.E. (Automobile)

DESIGN OF ENGINE COMPONENTS

(2019 Pattern) (Semester-II) (316487)

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 a neat diagram for valve gear mechanism for vertical engine. **[4]**

- b) Design an exhaust valve for a horizontal diesel engine using the following data: Cylinder bore=150 mm, length of stroke=275 mm. Engine Speed=500 rpm. Maximum gas pressure=4 MPa. seat angle=50°

Calculate:

- i) diameter of the valve port;
- ii) diameter of the valve head;
- iii) thickness of the valve head;
- iv) diameter of the valve stem; and
- v) Maximum lift of the valve. Assume allowable mean velocity of gas as 50 m/s **[13]**

OR

Q2) a) State different types of lubrication system. **[5]**

- b) Explain any types of lubrication system with neat sketch. **[12]**

Q3) a) Differentiate between Flywheel and Governor. **[4]**

P.T.O.

- 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 fluctuation 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 of a multi-cylinder engine is drawn with a scale of (1 mm = 1°) on the abscissa and (1 mm = 250 N-m) on the ordinate. The intercepted areas between the torque developed by the engine and the mean resisting torque of the machine, taken in order from one end are -350, +800, -600, +900, -550, +450 and -650 mm². The engine is running at a mean speed of 750 rpm and the coefficient of speed fluctuations is limited to 0.02. A rimmed flywheel made of grey cast iron FG 200 ($\rho = 7100 \text{ kg/m}^3$) is provided. The spokes, hub and shaft are assumed to contribute 10% of the required moment of inertia. The rim has rectangular cross-section and the ratio of width to thickness is 1.5. Determine the dimension of the rim. [14]

- b) State different types of stress in flywheel. [3]

- Q5) a)** Derive Petroff's equation. [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: [10]

- i) Coefficient of friction:
- ii) Power lost in friction:
- iii) Minimum oil film thickness;

- iv) Flow requirement in litres/Min; and
v) temperature rise.

$\left(\frac{l}{d}\right)$	ε	$\left(\frac{h_o}{c}\right)$	S	ϕ	$\left(\frac{r}{c}\right)f$	$\left(\frac{Q}{rcn,l}\right)$	$\left(\frac{Q_s}{Q}\right)$	$\left(\frac{p}{p_{max.}}\right)$
∞	0	1.0	∞	(70.92)	∞	π	0	—
	0.1	0.9	0.240	69.10	4.80	3.03	0	0.826
	0.2	0.8	0.123	67.26	2.57	2.83	0	0.814
	0.4	0.6	0.0626	61.94	1.52	2.26	0	0.764
	0.6	0.4	0.0389	54.31	1.20	1.56	0	0.667
	0.8	0.2	0.021	42.22	0.961	0.760	0	0.495
	0.9	0.1	0.0115	31.62	0.756	0.411	0	0.358
	0.97	0.03	—	—	—	—	0	—
	1.0	0	0	0	0	0	0	0
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) Derive Stribeck's equation. [6]
b) An single-row deep groove ball bearing is subjected to a radial force of 8 kN and a thrust force of 3kN. The shaft rotates at 1200 rpm. The expected life L_{10th} of the bearing is 20000 h. The minimum acceptable diameter of the shaft is 75 mm. select a suitable ball bearing for this application.[12]

X and Y factors for single-row deep groove ball bearings

$\left(\frac{F_a}{C_0}\right)$	$\left(\frac{F_a}{F_r}\right) \leq e$		$\left(\frac{F_a}{F_r}\right) > e$		e
	X	Y	X	Y	
0.025	1	0	0.56	2.0	0.22
0.040	1	0	0.56	1.8	0.24
0.070	1	0	0.56	1.6	0.27
0.130	1	0	0.56	1.4	0.31
0.250	1	0	0.56	1.2	0.37
0.500	1	0	0.56	1.0	0.44

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 ₀ (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. [6]
- 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% Determine the bore and length of the cylinder liner. [12]

OR

- Q8) Write short notes on :** [18]

- Mechanical fuel pump testing.
- Distributor dwell-angle.
- Oscilloscope engine analyzers.



Total No. of Questions : 8]

SEAT No. :

P7654

[6180]-176

[Total No. of Pages : 2

T.E. (Automobile Engineering)

**AUTOMOTIVE AERODYNAMICS AND BODY ENGINEERING
(2019 Pattern) (Semester - II) (Elective - 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.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.

Q1) a) What are the characteristics of external flow on a body? **[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) Explain the features of aerodynamic stability of a vehicle and describe the effect of wind forces resulting from non-steady side winds on a vehicle. **[9]**

Q3) a) What are the methods of improving space in cars? Discuss. **[8]**

b) What is the importance of weight to power ratio of a car? **[9]**

OR

Q4) a) Explain the compactness of driver's cabin. **[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) What is the influence of the floor height in the bus body layout? [9]

OR

- Q6)** a) How does the entrance and exit location influences the bus body layout?[8]
b) Explain the constructional details of conventional bus body. [9]
- Q7)** a) List out the points to be considered for Impact protection from steering controls. [9]
b) Explain the longitudinal load and load distribution on vehicle structure.[9]

OR

- Q8)** a) Explain the types of seat used in automobiles. [9]
b) Write down the Importance of Bumper in automobile. [9]



Total No. of Questions : 8]

SEAT No. :

P7655

[6180]-177

[Total No. of Pages : 2

T.E. (Automobile Engineering)

AUTOMOTIVE MATERIALS

(2019 Pattern) (Semester - II) (Elective - II) (316488 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 indicate full marks.

Q1) a) Explain the Reinforcement of fibres in composites. **[9]**

b) Compare Pultrusion with Compression moulding. **[8]**

OR

Q2) a) Explain the Resin transfer moulding. **[9]**

b) Describe the Spray up process. **[8]**

Q3) a) Explain the properties and composition of glass. **[9]**

b) Describe the use of nanoparticles in paints to make them self-cleaning. **[9]**

OR

Q4) a) Explain the various approaches in tempering of glass for shatter resistance. **[9]**

b) Discuss the sequences of application of paint on automotive body. **[9]**

Q5) a) Explain the Electro-or magneto-rheological engine mounts. **[9]**

b) Discuss the use of ER fluids in dampers in automobiles. **[8]**

OR

P.T.O.

- Q6)** a) Describe the use of ceramics as fuel injectors in automotive engines. **[9]**
b) Explain the powder metallurgy process for making disc brake pads. **[8]**

- Q7)** a) Explain the criteria for selection of materials for different systems in automobiles. **[9]**
b) Describe the materials developments by Honda. **[9]**

OR

- Q8)** a) Explain the developments in materials by FIAT. **[9]**
b) Discuss the Ashby charts. **[9]**



Total No. of Questions : 8]

SEAT No. :

P7656

[6180]-178

[Total No. of Pages : 3

**T.E. (Mechanical Engg) (Mechanical s/w)
NUMERICAL AND STATISTICAL METHODS
(2019 Pattern) (Semester - I) (302041)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.No.1 or Q.No. 2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.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 indicates full marks.
- 5) Assume suitable data, if necessary.

Q1) a) Find integration of $e^x \cos(x) - 2x$ in limits 0 to 1 by using 3-point Gauss Legendre formula. **[6]**

b) Evaluate **[6]**

$$\int_0^6 \frac{1}{(1+x^2)} dx$$

by using the Trapezoidal rule. Take six intervals.

c) Draw a flow chart for Simpson's 1/3rd rule to evaluate integration of any function. **[6]**

OR

Q2) a) Find integration of $\int_0^1 x e^x dx$ by using 2-point Gauss Legendre formula. **[5]**

b) Draw a flow chart for Trapezoidal rule to evaluate integration of any function. **[5]**

c) The velocity 'v' (km/hr) of a vehicle which starts from rest, is given at fixed intervals of time 't' (min) as follows: **[8]**

t (min)	2	4	6	8	10	12	14	16	18	20
V(km/hr)	10	18	25	29	32	20	11	05	02	00

Estimate approximately the distance covered in 20 minutes. Select appropriate method.

P.T.O.

- Q3) a)** Find the least square polynomial approximation of quadratic curve to the data. [9]

x	0	1	2	3	4
y	-4	-1	4	11	20

- b) The following data gives the values of y corresponding to certain values of x, Find the value of x when $y=167.59789$ by applying Lagrange's method. [9]

x	1	2	5	7
y	1	12	117	317

OR

- Q4) a)** Following is the table of square roots. Calculate the values of $\sqrt{151}$ by Newton's interpolation formula. [9]

X	150	152	154	156
$Y=\sqrt{X}$	12.247	12.329	12.410	12.490

- b) Fit a straight line to given data regarding x as the independent variable.[9]

x	1	2	3	4	5	6
y	1200	900	600	200	110	50

- Q5) a)** From the following data of marks obtained by 8 students in Numerical and Statistical Methods (NSM) and Heat and Mass Transfer (HMT) papers, compute rank coefficient of correlation. [9]

NSM	15	20	28	12	40	60	20	80
HMT	40	30	50	30	20	10	30	60

- b) Discuss the following terms. [8]

- Coefficient of variation
- Central moments
- Standard deviation
- Grouped and Ungrouped Data.

OR

- Q6) a)** Illustrate the following statistical diagrams with real life example [9]
- Scattered diagram
 - Histogram
 - Pie chart

- b) The competitors in a beauty contest are ranked by three judges in the following order. Use rank correlation coefficient to discuss which pair of judges has nearest approach to beauty. [9]

1 st judge	1	5	4	8	9	6	10	7	3	2
2 nd judge	4	8	7	6	5	9	10	3	2	1
3 rd judge	6	7	8	1	5	10	9	2	3	4

- Q7) a)** The number of breakdowns of a computer in a week is a Poisson variable with $\lambda=np=0.3$. What is the probability that the computer will operate: [8]
- With no breakdown
 - At the most four breakdown.
 - At least five breakdowns.
 - More than 5 breakdown.
 - Less than 4 breakdowns in a week.
- b) In distribution of 'NSM' marks exactly normal, 7% of students are under 35 and 89% are under 63. Find the mean and standard deviation of the distribution. [8]

$$[A_1=0.43, Z_1=1.48, A_2=0.39, Z_2=1.23]$$

OR

- Q8) a)** Let $F: R^4 \rightarrow R^3$ be the linear mapping defined by [9]

$F(x, y, z, t) = (x - y + z + t, x + 2z - t, x + y + 3z - 3t)$. Find a basis and the dimension of (a) the image of F, (b) the kernel of F.

- b) Among 64 offsprings of a certain cross between guinea pigs 34 were red, 10 were black and 20 were white. According to a genetic model, these numbers should be in the ratio 9:3:4. Are the data consistent with the model at 5% level? [8]

$$\text{Given } (\chi^2, 0.05 = 5.99)$$



Total No. of Questions : 8]

SEAT No. :

P7657

[Total No. of Pages : 3

[6180]-179

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.7 or Q.8.
- 2) Draw neat diagram wherever necessary.
- 3) Use of scientific calculator is allowed.
- 4) Assume Suitable data if necessary.
- 5) Figures to the right indicate full marks.

Q1) a) Water is flowing at the rate of 50 kg/min through a tube of inner diameter 2.5cm. The inner surface of tube is maintained at 100°C. If the temperature of water increases from 25°C to 55°C, find length of tube required.

$Nu = 0.023 Re^{0.8} Pr^{0.4}$, Properties of water : $\rho = 977.8 \text{ kg/m}^3$, $K=0.6672 \text{ W/m}^\circ\text{C}$, $\mu = 405 \times 10^{-6} \text{ Ns/m}^2$, $C_p=4.187\text{kJ/kg } ^\circ\text{C}$. **[10]**

- b) Explain **[8]**
- i) Reynolds Number
 - ii) Nusselt Number
 - iii) Grashof Number
 - iv) Stanton Number

OR

Q2) a) A hot plate $1\text{m} \times 0.5 \text{ m}$ at 130°C is kept vertically in still air at 20°C. **[10]**
Find:

- i) Heat transfer coefficient,
- ii) Initial rate of cooling the plate in °C/min.

Assume 0.5 m side is vertical and heat transfer takes place from both the sides of the plates.

Take properties of air as $C_p = 1007 \text{ J/kg } ^\circ\text{C}$, $K=0.029 \text{ W/m}^\circ\text{C}$, $\bar{v} = 19.1 \times 10^{-6} \text{ m}^2/\text{s}$, $Pr = 0.7$

Assume mass of plate = 20 kg and specific heat of plate = 400 J/kg °C
Use $Nu = 0.59 (GrPr)^{1/4}$

- b) Mention difference between film wise and drop wise condensation, Explain pool boiling and Regimes of pool boiling. **[8]**

P.T.O.

- Q3) a)** Explain the following terminology of Radiation. [12]
- i) Planck's Law
 - ii) Kirchhoff's law
 - iii) Wein's Displacement Law
 - iv) Stefan-Boltzmann law
- b) Derive an expression for the shape factor in case of radiation exchange between two surfaces. [5]

OR

- Q4) a)** Two large parallel plates are maintained at temperatures of 600 °C and 300 °C having their emissivities of 0.9 and 0.4 respectively. A radiation shield having emissivity of 0.02 is inserted in between them. Calculate [10]
- i) Heat transfer rate without shield
 - ii) Heat transfer rate with shield and Use $\sigma = 5.67 \times 10^{-8} \text{ W/m}^2\text{K}^4$
- b) Define shape factor. Explain laws of shape factor. [7]
- Q5) a)** State Fick's Law of Diffusion and Explain Mass diffusion coefficient. [6]
- b) The molecular weights of the two components A and B of a gas mixture are 24 and 28 respectively. The molecular weight of gas mixture is found to be 30. If the mass concentration of the mixture is 1.2 kgm³, determine the following. [8]
- i) Molar fractions
 - ii) Mass fractions
 - iii) Total pressure if temperature of mixture is 290K
- c) Define following Terminology. [4]
- i) Mass Diffusion velocity
 - ii) Molar Diffusion velocity
 - iii) Mass Diffusion Flux
 - iv) Molar Diffusion Flux

OR

- Q6)** a) A mixture of CO_2 and N_2 is in a container at 25°C , with each species having a partial pressure of 1 bar. Calculate the molar concentration, the mass density, the mole fraction, and the mass fraction of each species. **[8]**
- b) Draw Phase Diagram and explain different phases **[5]**
- c) Write down the Physical origins of mass transfer and enlist the applications of mass transfer **[5]**

- Q7)** a) Consider the following parallel flow heat exchanger specification: cold flow enters at 40°C , $C_c = 20000\text{W/K}$, hot flow enters at 150°C , $C_h = 10000\text{W/K}$, $A = 30\text{ m}^2$, The overall heat transfer coefficient is $500\text{ W/m}^2\text{K}$. Determine the heat transfer rate and the exit temperature. **[10]**
- b) Derive LMTD for parallel flow heat exchanger and mention assumptions considered for derivations. **[7]**

OR

- Q8)** a) 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 80°C . The overall heat transfer coefficient has a value of $95\text{ W/m}^2\text{K}$. Determine the area required. For gas $C_p = 1005\text{ J/kg K}$. **[12]**
- b) Explain TEMA standards. **[5]**



[6180]-181

T.E. (Mechanical) (Mechanical Sandwich)

MECHATRONICS

(2019 Pattern) (Semester-I) (302044)

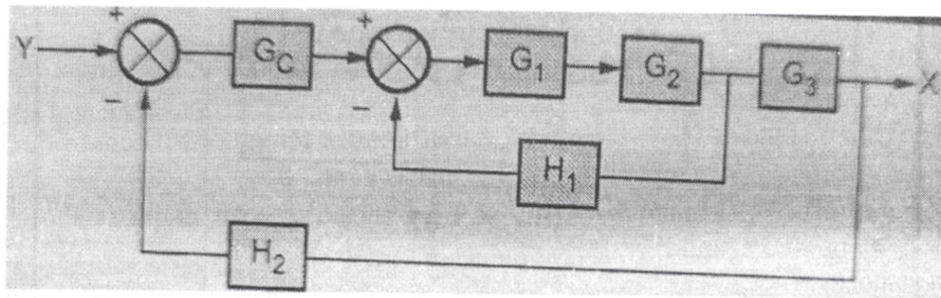
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

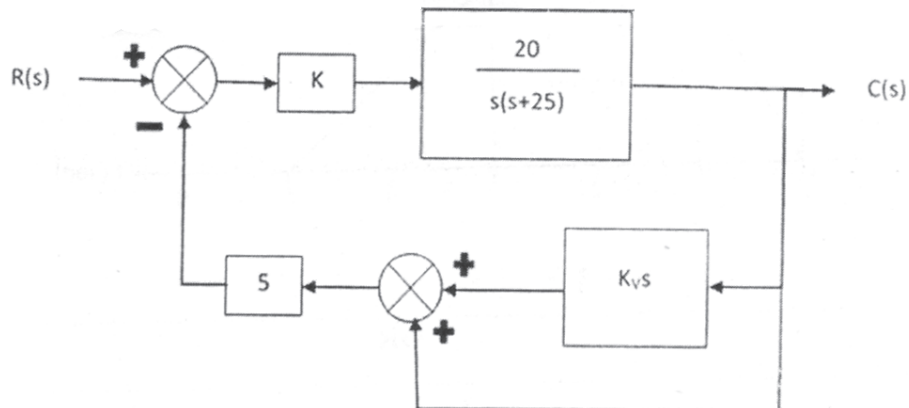
- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Use of drawing instruments, electronic pocket calculators are allowed.
- 3) Figures to the right indicate full marks.
- 4) Assume Suitable data if necessary.

- Q1)** a) Explain closed loop control system with an example. [5]
 b) Explain application of mechatronics. Engine management system [5]
 c) Reduce the block diagram and find the transfer function of the following Figure. [8]



OR

- Q2)** a) Explain concept of transfer function and state its properties. [5]
 b) Explain dish washer as an application of mechatronics system. [5]
 c) [8]

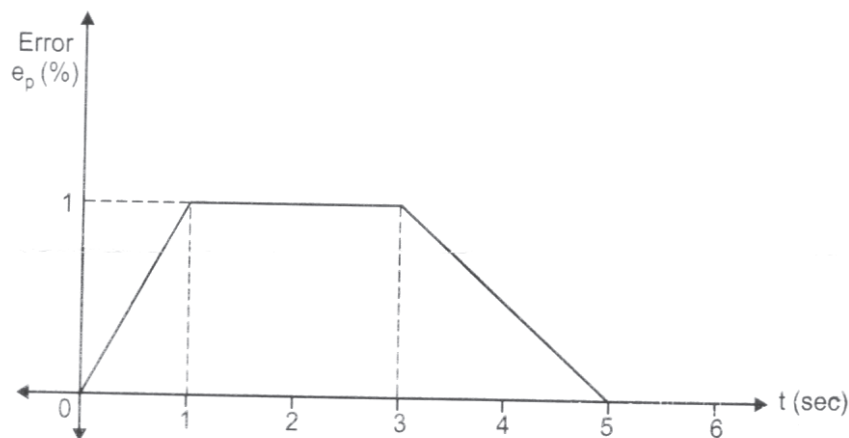


P.T.O.

- Q3)** a) Compare time response and frequency response analysis [5]
 b) Explain Bode plot and its advantages. [5]
 c) For the system with transfer function $\frac{1}{(s + 2 + 7j)(s + 2 - 7j)}$. Draw the pole and zero plot and find damping ratio, natural frequency, peak time, maximum overshoot. [7]

OR

- Q4)** a) Explain frequency response specifications such as resonant peak, resonant frequency, band width [5]
 b) Explain gain margin and phase margin [5]
 c) $\frac{C(s)}{R(s)} = \frac{0.5s + 2}{s^2 + 0.5s + 2}$ For the transfer function of second order system presented by above equation, determine [7]
 i) location of poles and zeros
 ii) damping factor
 iii) comment of stability
- Q5)** a) Explain the Proportional-Integral controller with a block diagram. [5]
 b) How Zeigler Nichols method is useful in the tuning of PID controller?[5]
 c) Draw the PD controller response for the given error graph as shown in Fig. $K_p = 5$, $K_D = 0.5 \text{ s}$, and $P_O = 20\%$. [8]



OR

- Q6)** a) Using a suitable block diagram explain the working of PID control in parallel form. [5]
- b) Explain the advantages of an integral controller over a proportional controller. [5]
- c) A derivative controller has initial, controller output $P_o = 55\%$ and derivative constant $K_D = 0.5\% - \text{sec}/\%$. What will be the controller output, when the error.
- i) Change at $1.5\% \text{ sec}$.
- ii) Is constant at 4% .
- Q7)** a) State the different areas of application of PLC. [5]
- b) Using a suitable diagram explain the working of the counter in a PLC. [5]
- c) In a certain bank, each of the three bank officers has a unique key to the vault. The bank rules require that two out of the three officers be present when the vault is opened. Draw the ladder diagram for a relay logic circuit that will unlatch the door and turn on the light when two of the three keys are inserted. [7]

OR

- Q8)** a) State the advantages of PLC over the relay system. [5]
- b) Explain the basic components of PLC. [5]
- c) Draw the ladder diagram for the following conditions: [7]
- i) When the start push button is pressed motor M1 and M2 turns ON simultaneously.
- ii) If anyone's motor out of M1 and M2 is OFF motor M3 is turned ON immediately.
- iii) When the stop push button is pressed whole systems turn OFF.



Total No. of Questions : 8]

SEAT No. :

P7660

[Total No. of Pages : 3

[6180]-184

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 Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.
- 4) Use of Non-Programmable Scientific Calculator is allowed.

Q1) a) Use ID3 algorithm to construct a decision tree for the data in the following table: **[6]**

Instance No.	X1	X2	Class label
1	T	T	1
2	T	T	1
3	T	F	0
4	F	F	1
5	F	T	0
6	F	T	0

b) How does the K Nearest Neighbour (KNN) algorithm works? **[7]**

c) Explain bagging and boosting. **[4]**

OR

Q2) a) Use Naïve Bayes algorithm to determine whether a Red SUV Domestic car is a stolen car or not using the following data: **[6]**

Example No.	Colour Type.	Origin	Whether stolen
1	Red Sports	Domestic	Yes
2	Red Sports	Domestic	No
3	Red Sports	Domestic	Yes
4	Yellow Sports	Domestic	No
5	Yellow Sports	Imported	Yes
6	Yellow SUV	Imported	No

P.T.O.

7	Yellow SUV	Imported	Yes
8	Yellow SUV	Domestic	No
9	Red SUV	Imported	No
10	Red Sports	Imported	Yes

- b) Explain working of Support Vector Machines? What are hyper parameters in SVM? [7]
- c) How Naïve Bayes is used for classification. [4]

Q3) a) What is hyper parameter tuning? Explain any two hyper parameters in the Random Forest algorithm. [9]

- b) What is a confusion matrix? Write any 2×2 confusion matrix showing, True Positive, True Negative, False Positive, False negative. [9]

Define

- i) Accuracy
- ii) Precision
- iii) Recall

OR

Q4) a) Why is data preprocessing required? Explain techniques of preprocessing data. [9]

- b) Explain following performance evaluators used for interpretation/assessment of classification model: [9]

- i) Cohen's Kappa Coefficient
- ii) F Score
- iii) ROC Curve

Q5) a) Define Markov property. Explain why Markov property is applicable in solving Reinforcement learning. [9]

- b) The transfer function of neurons on one layer of a neural network is assumed to be of sigmoid form. Evaluate the output of neurons corresponding to input $x = 0.62$. How is the nature of sigmoid function? (Justify the answer with plot) [9]

OR

- Q6)** a) What are the characteristics of deep learning? What is the difference between deep learning and machine learning? [9]
- b) Explain the working of biological neurons? Explain with a neat diagram equivalence of biological neuron and artificial neuron. [9]

- Q7)** a) Explain any one mechanical engineering application where image-based classification can be adopted. [8]
- b) What is predictive maintenance? Explain different steps in predictive maintenance. [9]

OR

- Q8)** a) Explain human and machine interaction? [8]
- b) Write a short note on use of AIML in traffic control. [9]



[6180]-185

T.E. (Mechanical Engineering)
COMPUTER AIDED ENGINEERING
(2019 Pattern) (Semester-II) (302050)

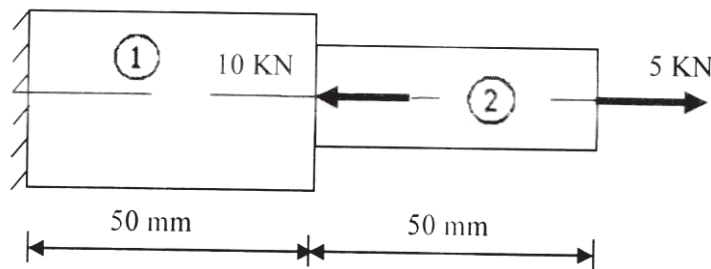
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) 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.

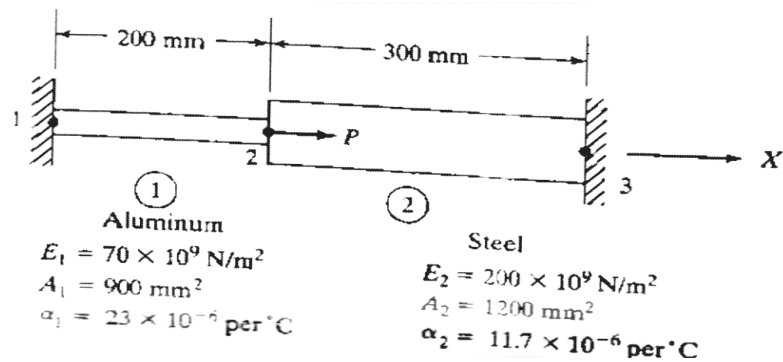
- Q1) a)** Find nodal displacement, Stresses in each element and reactions at support in stepped bimetallic bar shown in figure. The forces acting at center and the end of bar is 10kN and 5kN respectively. Use following data: $A_1=150\text{mm}^2$; $A_2=100\text{mm}^2$; $E_1=200\times 10^3 \text{ N/mm}^2$; $E_2=70\times 10^3 \text{ N/mm}^2$ [8]



- b) An axial load $P=300\times 10^3\text{N}$ is applied at 20°C to the rod as shown in figure. The temperature is then raised to 60°C . [9]
- i) Assemble the K and F matrices.

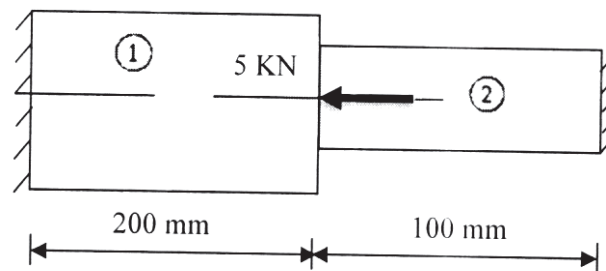
P.T.O.

- ii) Determine the nodal displacement and element stresses

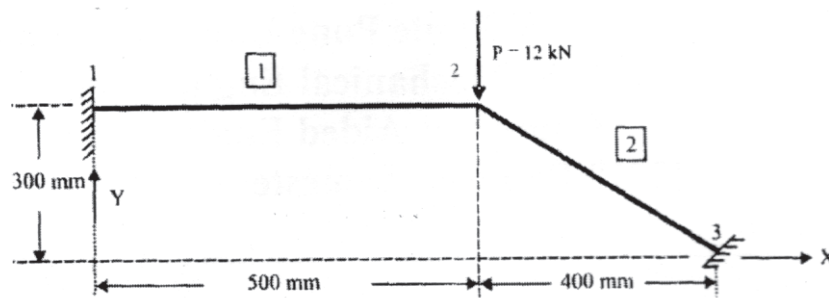


OR

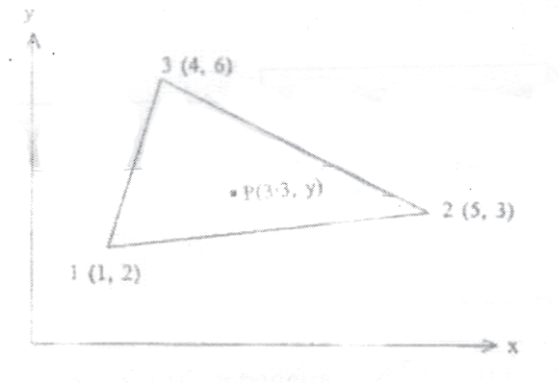
- Q2) a)** Determine the nodal displacement and element stresses for stepped bar shown in figure. Use following data: $A_1=500 \text{ mm}^2$; $A_2=250 \text{ mm}^2$; $E_1=70 \times 10^3 \text{ N/mm}^2$; $E_2=200 \times 10^3 \text{ N/mm}^2$ [8]



- b)** Determine the nodal displacements and element stresses in the truss structure shown below, assuming points 1 and 3 are fixed. Use $E=70 \text{ GPa}$ and $A=200 \text{ mm}^2$. [9]



- Q3) a)** The nodal coordinate of triangular element are shown in the figure. At the interior point 'P' the x-coordinate is 3.3. $N_1=0.3$. Determine N_2 , N_3 and the y-coordinate of point P. [6]

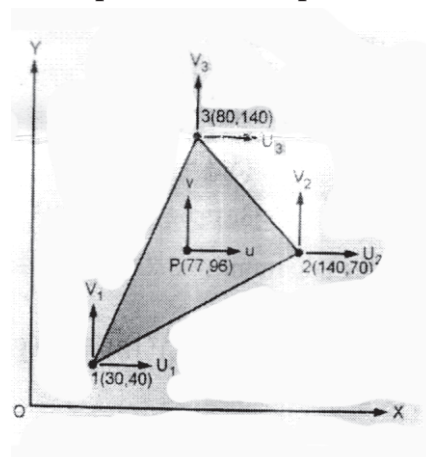


- b) What are the modifications are suggested based on the interpretation of results during post processing in CEA? [6]
- c) Explain the tricks for post processing in computer aided engineering. [5]

OR

- Q4) a)** In a triangular element, the nodes 1, 2 and 3 have Cartesian coordinates: (30,40), (14,70) and (80,140) respectively. The displacement in mm at nodes 1, 2 and 3 are (0.1,0.5), (0.6,0.5) and (0.4,0.3) respectively. The point P within the element has Cartesian coordinates (77,96). For point P, determine: [6]

- i) The natural coordinates.
 ii) The shape functions.
 iii) The displacement of point P



- b) How to verify and validate results in CAE post-processing? [6]
- c) What are the steps for interpretation of results during post processing in finite element analysis? [5]

- Q5)** a) Give comparison of Linear and Nonlinear Analysis CAE Problems with respect to its characteristics features-Load-displacement relation, stress-strain relation, scalability, Stress-strain measures, superposition, reversibility, Solution scheme, computational time and user interaction with software. [6]
- b) What are the different kinds of geometric non-linearities in CAE project? Explain with figures. [6]
- c) Write a general procedure for Non-linear static analysis project. [6]

OR

- Q6)** a) Explain difference between static analysis and dynamic analysis. [6]
- b) Explain free and forced vibration. [6]
- c) Explain modal analysis, harmonic analysis and transient analysis to study the dynamic properties of the structures. [6]

- Q7)** a) What is Computational Fluid Dynamics (CFD)? Explain the three dimension of fluid dynamics. [6]
- b) Discuss the concept of FEA for structural dynamics and acoustics used in NVH analysis. [6]
- c) Enlist the CAE software used for different application of CAE. Write at least 6 software with their applications. [6]

OR

- Q8)** a) What is durability, reliability and fatigue? Explain S-N Curve with low cycle, high cycle and infinite fatigue life. [6]
- b) Write typical application of computation fluid dynamics in various industries for the following domains: [6]
- i) Aerospace Engineering
 - ii) Automobile Engineering
 - iii) Civil Engineering
- c) Explain use of FEA to optimize plastic injection mold materials. [6]



Total No. of Questions : 8]

SEAT No. :

P7662

[Total No. of Pages : 3

[6180]-186

T.E. (Mechanical)

DESIGN OF TRANSMISSION SYSTEMS

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

Time : 3Hours]

[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) State the Advantages and limitations of Hydrodynamic Bearing? [4]
b) Derive the Stribeck's equation for basic static capacity of bearings. State the assumption made [6]
c) A ball bearing is subjected to $F_r = 3 \text{ kN}$, $N = 720 \text{ rpm}$ having expected life 10000 hrs. at 95% reliability. Calculate the dynamic load carrying capacity of the bearing at 90% of reliability. Also find System reliability for such 4 bearings. [7]

OR

- 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) Explain with neat sketch hydrodynamic bearing. State the advantages, limitations and applications of the same. [4]
c) Derive the Petroff's equation for hydrodynamic bearing. Also state its limitation? [7]

- Q3)** a) State different types of brakes and give at least one practical application of each. What are the advantages and disadvantages of band brake? [4]
b) What is the condition of self-locking in differential band brake? Why should it be avoided in speed-control brakes? Explain self-energizing block brake and self locking block 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

P.T.O.

- Q4)** a) Draw neat sketch diagram of Multi plate clutch and explain construction and working. What are the advantages, disadvantages and applications of Multi plate clutch? [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) State and Explain Basic Considerations in design of multi-speed gear box? [6]
- b) What is structural formula? Write any three structural formulae for twelve speed gear box. [6]
- c) Find the RPM values and Diameter range served by each rpm in Geometric, Harmonic and Arithmetic Progressions and compare them on the following conditions:
- Maximum Speed = 385 rpm Minimum speed = 30 rpm Number of speed steps = 12 Cutting speed 20m/min [6]

OR

- Q6)** 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) Explain the significance of geometric progression ratio. [6]
- c) Draw speed diagram and layout for a six speed gear box having the following structural formula: (1) 2 (3) 3 (1)); 2) 2 (1)3 (2). The output speeds are 160 rpm minimum and 1000 rpm maximum. The motor shaft speed is 1440 rpm. [6]

- Q7)** a) What is hybrid Vehicle? What are the advantages and disadvantages of Hybrid Vehicles? [6]
- b) Define Degree of Hybridization. Explain in details Micro Hybrid and MildHybrid. [6]
- c) Explain Power Split Device with neat sketch? [6]

OR

- Q8)** a) Explain the Sizing performance for HEV Components? Explain the optimalsizing in HEV components? [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. :

P7663

[6180]-187

[Total No. of Pages : 3

T.E. (Mechanical)

COMPOSITE MATERIALS

(2019 Pattern) (Semester - II) (Elective - II) (302052 - 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) Use of electronic pocket calculator is allowed.
- 4) Assume Suitable data if necessary.

- Q1)** a) Explain interface and wettability of metal matrix composites. [6]
- b) Explain with neat sketch the stir-casting process of fabrication of a metals matrix composite in details. [6]
- c) What is diffusion bonding? Explain the metal matrix composites produced using diffusion bonding techniques? [6]

OR

- Q2)** a) List three kinds of metal matrix composites and write typical reinforcements used in particle type metal matrix composites. [6]
- b) Explain in detail that metal matrix composites are fabricated using a powder metallurgy process. [6]
- c) Describe with neat sketch the In-situ process of fabrication of a metal matrix composite with its advantages. [6]
- Q3)** a) Find the ultimate shear strength for a glass/epoxy lamina with a 70% fiber volume fraction. Take, Shear modulus of the fiber (G_f) is 35.42 GPa, Shear modulus of matrix (G_m) is 1.308 GPa, Ultimate shear strength of matrix (τ_{12})_{ult} is 34 MPa. [6]
- b) Derive an expression for the volume and weight fraction of composites. [6]
- c) Explain the fatigue property of composite materials. [5]

OR

P.T.O.

- Q4) a)** Find the ultimate transverse tensile strength for a unidirectional glass/epoxy lamina with a 70% fiber volume fraction. Assume that the fibers are circular and arranged in a square array. Take, Young's modulus of fiber (E_f) is 85 GPa, Young's modulus of matrix (E_m) is 3.4 GPa, Ultimate strength of fiber (σ_f) ult is 1550 MPa, ultimate strength of matrix. (σ_m) ult is 72 MPa. [6]
- b) Write a short note on discontinuous fibers and woven reinforcements. [6]
- c) What do you mean by micro-mechanics and macro-mechanics of lamina? [5]
- Q5) a)** Explain recent developments in contact and noncontact strain measurement methods. [6]
- b) Differentiate between double cantilever beam, end notch flexure and interlaminar shear strength test with sketch and formula for each. [6]
- c) Explain any two non-destructive testing for polymer matrix composites. [6]

OR

- Q6) a)** Sketch the schematic representation of V-Notched beam shear test composite and describe the test with regard to ASTM D5379. [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) List the various international and national test standards developed to test mechanical properties of a lamina. [6]

- Q7)** a) State any six properties of Composites that makes it a better material than steel for building application. [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) What is multi-material technology? State any three benefits of multi-material technology in Automobiles. [5]

OR

- Q8)** a) How does the use of Composite reduce assembly time? which Composite will be preferred for manufacturing of Intake manifolds in an automobile? [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. :

P7664

[Total No. of Pages : 2

[6180]-188

T.E. (Mechanical)

SURFACE ENGINEERING

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

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer to the two sections should be written in separate answer books.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*

Q1) a) State Fick's law. Explain the importance of each term in an equation of Fick's law? **[6]**

b) What is the importance of case depth measurement? Discuss steps in ASTM E1077-01 Depth of carburization. **[6]**

c) Explain the process of Nitriding? Compare it with Carbonitriding. **[6]**

OR

Q2) a) State factors that governs depth of carburization. **[6]**

b) Compare Induction Hardening & Flame Hardening. **[6]**

c) Write short note on Laser Hardening. **[6]**

Q3) a) Explain with neat diagram Ion beam surface treatment? **[6]**

b) Explain laser surface alloying? Why need of this technology is increasing day by day? **[6]**

c) How nitrides, silicides and carbides help in corrosion resistance coating? Explain with example of steel or Stainless steel? **[5]**

OR

Q4) a) Describe sol-gel coating technology. **[6]**

b) Differentiate Electrolysis coating and Electroless coating. **[6]**

c) Classify Metallic and Non-Metallic coatings in detail. **[5]**

P.T.O.

- Q5)** a) Differentiate in metal, inorganic and organic coatings with (application, effectiveness, cost and time). [6]
- b) Explain the process of cladding. List applications of it? [6]
- c) List steps of surface preparation for organic coatings? How better surface preparation helps in getting better coating results? [6]

OR

- Q6)** a) Write short note on Cold spray coating. [6]
- b) Compare hot dipping and vapor deposition process of metal coating? [6]
- c) Define the following processes with examples [6]
- i) Noble Coatings
- ii) Sacrificial Coatings

- Q7)** a) Define Crawling; Flooding, wrinkling, Bubbling. [6]
- b) Why does embrittlement of coating occurs? State parameters that needs to be controlled to remove embrittlement. [6]
- c) Write a short note on Atomic force microscopy with a neat sketch. [5]

OR

- Q8)** a) What is Blushing, foaming? How does these defects arise, mention steps to remove these defects? [6]
- b) List the non-destructive methods of measuring film thickness. How Film thickness can be measured using eddy current and ultrasound techniques? [6]
- c) Describe briefly the measurement of porosity of surface coating. [5]



Time : 2½ Hours]

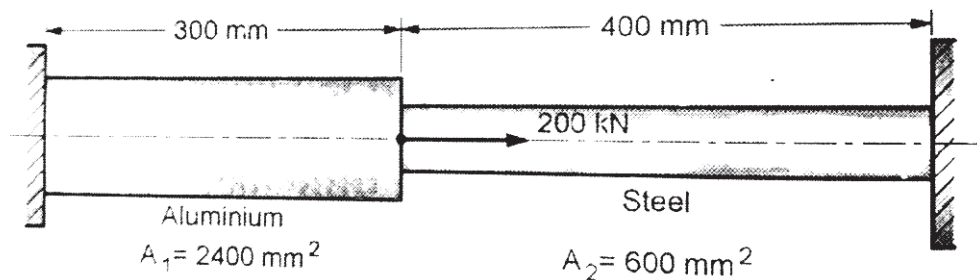
[Max. Marks : 70

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 neat figures wherever necessary.
- 4) Assume suitable data if required.
- 5) Use of non-programmable scientific calculator is allowed.

Q1) a) A stepped bimetallic bar made of aluminum ($E = 70 \times 10^3 \text{ N/mm}^2$) 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:[12]

- i) The nodal displacements,
- ii) The stresses in each element; and
- iii) The reactions at the supports.



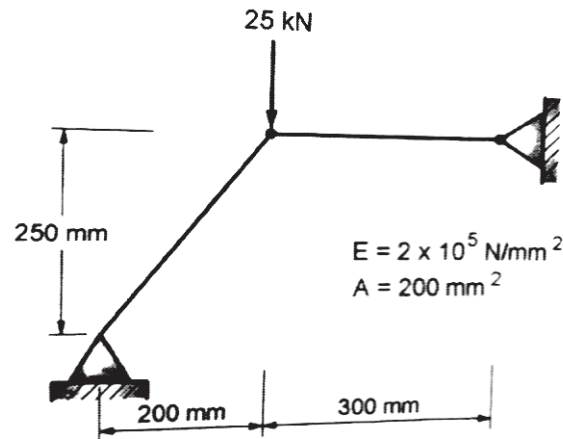
b) Write a short note on Galerkin method of weighted residuals. [5]

OR

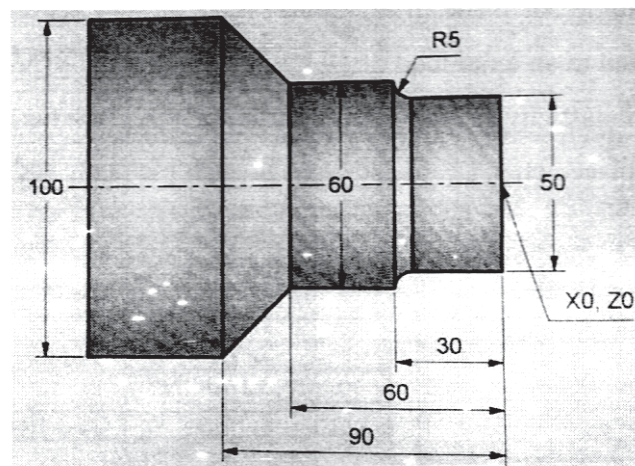
P.T.O.

Q2) A plane truss shown in the below figure is subjected to a downward vertical load at node 2. If the cross sectional area of both the elements is 30 mm^2 , using the finite element method, determine: **[17]**

- a) Nodal displacements
- b) Stress in each element
- c) Reaction force at the support



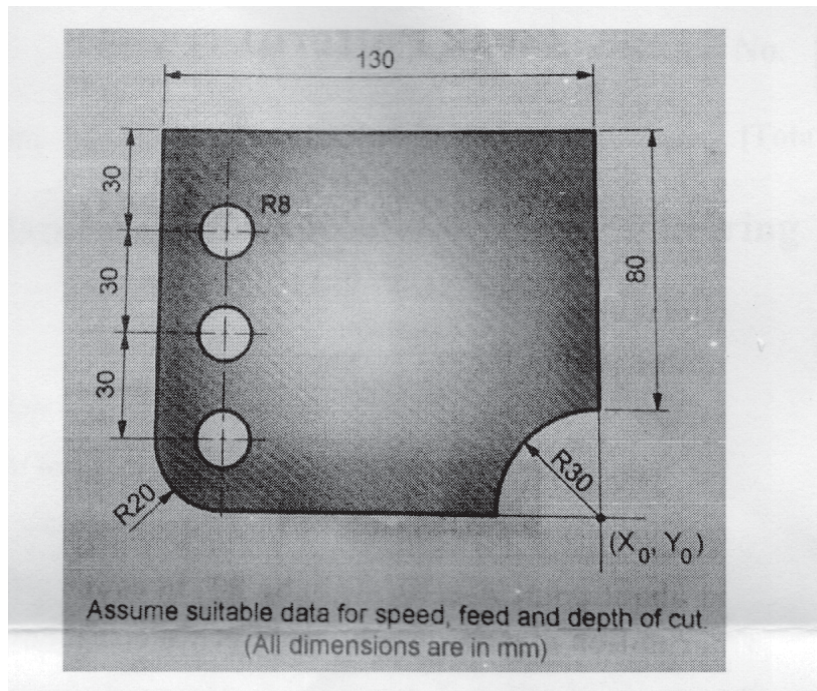
Q3) a) Write a part program using G and M code to turn mild steel job as shown in below figure. Use canned cycles for both rough turning and finishing. Take feed rate of 0.35 mm/rev and spindle speed of 400 RPM . Take raw material size as $\text{MS } \phi 100 \times 80 \text{ mm}$. **[12]**



- b) Explain Hybrid controller and straight controller CNC machines with block diagram. **[5]**

OR

- Q4) a)** Write a CNC part using G and M code for contouring a component of 10 mm thickness. Also make a drill of 16 mm diameter hole as shown in the below figure. Assume suitable data for machining parameters. [12]



- b) Explain various elements of NC machine tool system with block diagram.[5]
- Q5) a)** Classify various types of grippers. Explain any one type of gripper with neat sketch. [9]
- b) Explain Group Technology and its advantages over process layout. [9]
- OR
- Q6) a)** Explain the Flexible manufacturing systems based on type of layouts.[9]
- b) Explain with neat sketch, the vacuum gripper and enlist its advantages, disadvantages and applications. [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. :

P7666

[Total No. of Pages : 2

[6180]-190

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) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.
- 2) All questions are compulsory.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Assume suitable data if necessary and mention it clearly.

- Q1)** a) What is mechanical control? Explain with suitable example. [5]
b) Explain 3-2-1 principle of location. [6]
c) What is an auxiliary operation? How can supporting operation be distinguished from auxiliary operation? [6]

OR

- Q2)** a) Discuss the concept of standardization and interchangeability. [5]
b) What do you mean by qualifying and re-qualifying operations and how to identify them? [6]
c) What are the advantages and disadvantages of combining operations?[6]

- Q3)** a) Explain the steps involved in machine selection with a neat flow chart.[6]
b) Which are the various cutting tool materials employed during manufacturing? How do you select tool material? [6]
c) Define a Jig and Fixture. State any four functions of jigs and fixtures.[6]

OR

- Q4)** a) Explain factors affecting on machine selection. [6]
b) Suggest a cutting tools for machining of Copper, Mild Steel and Cast Iron in terms of : material, rake angle, Lip angle and suggest rage of allowable speed, feed and Depth of cut. [6]
c) List various locating and clamping devices? Explain any one locating and clamping device. [6]

P.T.O.

- Q5)** a) Write a note on 'Break-even analysis'. [5]
b) How do you estimate machining costs and labor cost? [6]
c) Describe the main costs associated with manufacturing. [6]

OR

- Q6)** a) What is variable cost and fixed costs involved in producing a product? [5]
b) Write a note on 'Economics of Process Planning'. [6]
c) What data is requirement for cost estimation? [6]

- Q7)** a) What information does the process picture provide? List some of the possible uses of process picture. [6]
b) What information is provided on operation route sheet? [6]
c) Discuss the role of CAPP in modern manufacturing. [6]

OR

- Q8)** a) Which process symbols used while making process pictures? [6]
b) Explain the steps involved in process planning. [6]
c) Explain the benefits of computer aided process planning (CAPP). [6]



Total No. of Questions : 8]

SEAT No. :

P7667

[Total No. of Pages : 2

[6180]-191

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 Q.1 or Q.2, 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 the concept of MMC and classify MMC with suitable examples. **[9]**
- b) With neat sketch explain stir casting of MMC along with advantages & disadvantages. **[9]**

OR

- Q2) a)** 'What is matrix interface? State different interface measurement techniques for composites. Explain pull out test. **[9]**
- b) Briefly explain spray process of MMC. (Construction & working). State the advantages & limitations. **[9]**
- Q3) a)** State the different metals used in metal spinning operations. Explain the process in detail along with its applications. **[9]**
- b) Briefly explain the principle and working of hydroforming process. State it's applications. **[8]**

OR

- Q4) a)** State the specifications of high speed extrusion process and explain the process in detail. **[9]**
- b) Elaborate with the applications, advantages and limitations laser beam forming process. **[8]**

P.T.O.

- Q5) a)** Differentiate between electron beam and laser beam welding. **[9]**
- b) Write a short note on Cold metal transfer process and applications. **[9]**

OR

- Q6) a)** Briefly explain the principle and working of Plasma arc welding process. State its advantages and limitations. **[10]**
- b) Write a short note on welding automation in aerospace, nuclear and transport vehicle area with examples. **[8]**

- Q7) a)** Write a short note on micro-machining. **[8]**
- b) State and explain the advantages of non-conventional machining processes over conventional machining processes. **[9]**

OR

- Q8) a)** Briefly explain the principle and working of ultrasonic machining process. State its advantages and limitations. **[9]**
- b) Explain the construction and working of Electrochemical machining process. **[8]**



[6180]-192

T.E. (Automation and Robotics)
DESIGN OF ROBOT ELEMENTS
(2019 Pattern) (Semester - I) (302521)

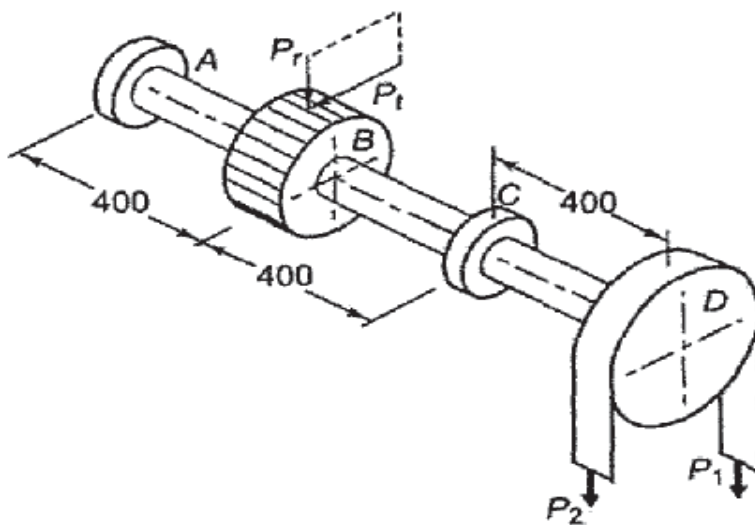
Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) 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 300 mm respectively. The pulley transmits 20 kW 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 $P_r = P_t \tan (20^\circ)$ The gear and pulley are keyed to the shaft. The material of the shaft is steel 50C4 ($S_{ut} = 700$ and $S_{yt} = 460$ N/mm²). The factors k_b and k_t of the ASME code are 1.5 each. Determine the shaft diameter using the ASME code. **[10]**

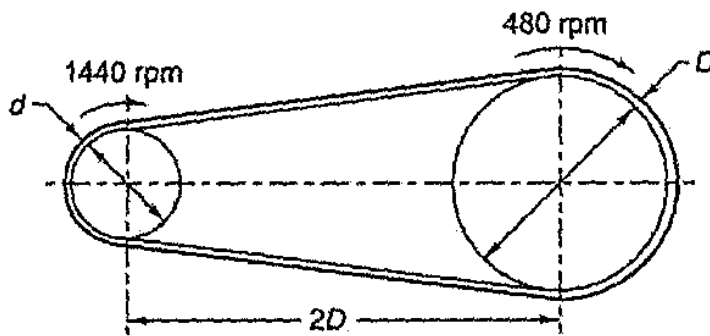


- b)** Explain design of shaft design using ASME code.

[8]**P.T.O.**

OR

- Q2) a)** The layout of a leather belt drive transmitting 15 kW of power is shown in Figure. The centre distance between the pulleys is twice the diameter of the bigger pulley. The belt should operate at a velocity of 20 m/s approximately and the stresses in the belt should not exceed 2.25 N/mm². The density of leather is 0.95 g/cc and the coefficient of friction is 0.35. The thickness of the belt is 5 mm. Calculate: (i) the diameter of pulleys; (ii) the length and width of the belt; and (iii) the belt tensions. [7]



- b) Derive equations for center distance, length of belt for open belt drive. [11]

- Q3) a)** What do you mean by payload in the design of robots. Explain payload force analysis with neat diagram and mathematical equations. [9]
- b) Explain in detail with examples and diagrams elements required for the physical support of the end effector. [8]

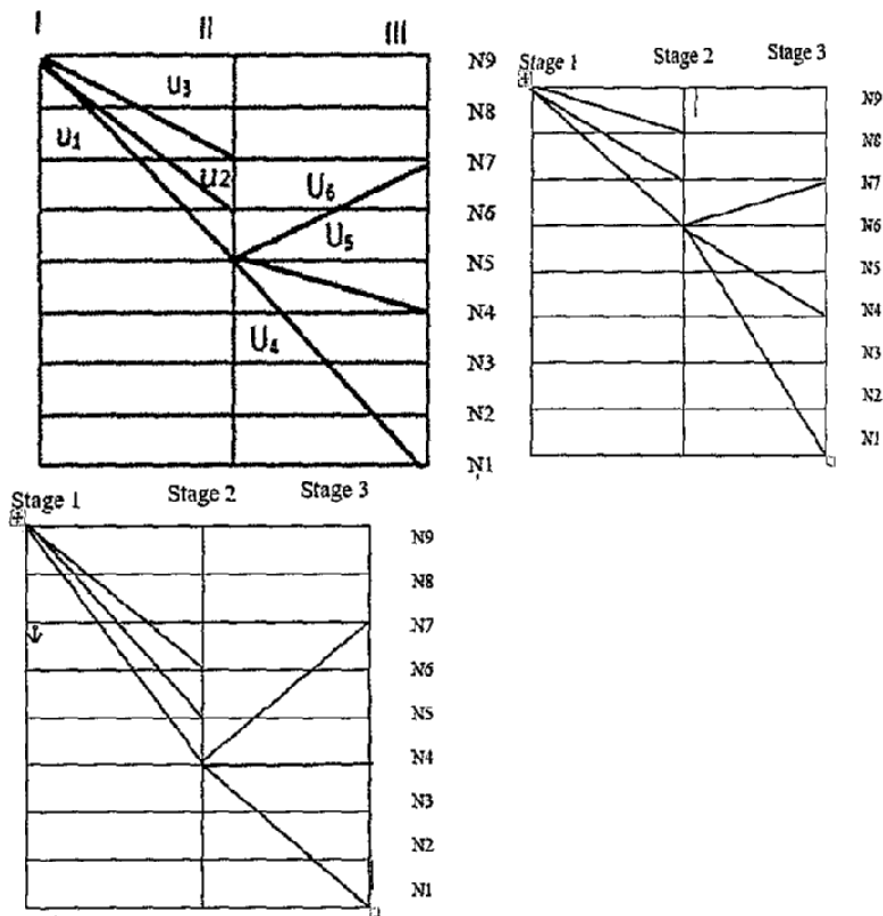
OR

- Q4) a)** Write basic design process of gripper. [9]
- b) Write a note on using tools as end effectors. [8]

- Q5)** Design a nine-speed gear box having $N_{min} = 100$ rpm 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. [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 $N_1 = 100 \text{ RPM}$ [10]



- b) Write a note on general recommendation for developing the gearing diagram. Explain with suitable example. [8]

- Q7) a)** A taper roller bearing has a dynamic load capacity of 26 kN. 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]
- b) Explain load life relationship in rolling contact bearing. [5]
- c) 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 5000 N at 720 rpm for one half cycle, and radial load of 2500 N at 1440 rpm for the remaining cycle. The expected life of the bearing is 10 000 h. Calculate the dynamic load carrying capacity of the bearing. [7]

OR

- Q8)** a) Derive Petroff's Equation for sliding contact bearing. [7]
- b) Design a full hydrodynamic journal bearing with the following specification for machine tool application: journal diameter = 75 mm, radial load = 10 kN, journal speed = 1440 rpm, minimum oil film thickness = 22.5 microns, inlet temperature 40°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]



Total No. of Questions : 8]

SEAT No. :

P-7669

[Total No. of Pages : 2

[6180]-193

T.E. (Automation and Robotics)
ROBOT KINEMATICS & 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 side indicate full marks.*
- 4) *Use of non programmable electronic calculator is permitted.*
- 5) *Assume Suitable/Standard data if necessary.*

- Q1)** a) Derive the equation for three link robot considering inverse kinematics with geometrical method. **[9]**
- b) Explain the concept of tool configuration of five axis articulated robot in details. **[9]**

OR

- Q2)** a) Explain the inverse kinematics of four axis SCARA robot. **[9]**
- b) Derive the equation for two link robot considering inverse kinematics with geometrical method. **[9]**

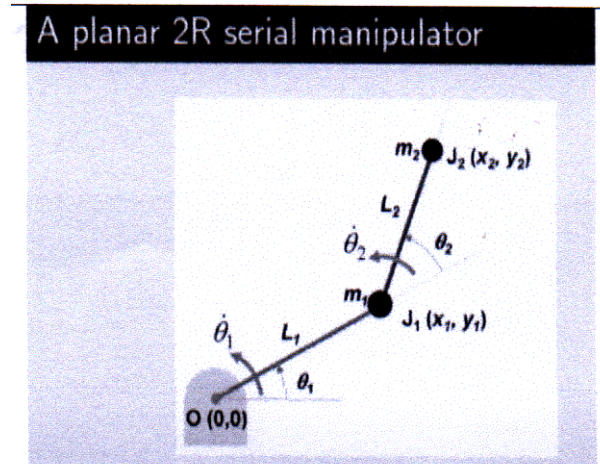
- Q3)** a) What is path generation? Differentiate between path and trajectory. **[9]**
- b) Explain the pick and place operations. **[8]**

OR

- Q4)** a) Explain the Joint Space Work Envelope. **[9]**
- b) Evaluate the concept of work envelop of four axis articulated robot. **[8]**

P.T.O.

- Q5) a)** Find the equation of motion for following configuration by using lagrangian formulation method. [9]



- b) Explain the concept of “Gravity” in manipulator dynamics. [9]

OR

- Q6) a)** Write the equations for manipulator Link inertia tensor? Explain in details. [9]

- b) Explain the dynamic model of a three axis SCARA robot. [9]

- Q7) a)** Explain the hardware architecture system in details. [9]

- b) Explain the concept of Computational Speeds. [8]

OR

- Q8) a)** What are the Hardware for Joint Controllers. Explain with block Diagrams. [9]

- b) What are the different types of sensors used in robot control systems? Explain in details. [8]



[6180]-194

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 side 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 $E = 200 \text{ GPa}$, $\gamma = 0.3$, Thickness = 1 cm

Nodal displacements are given as :

$u_1 = 1 \text{ mm}$; $u_2 = 0.5 \text{ mm}$; $u_3 = 2 \text{ mm}$; $v_1 = 1 \text{ mm}$; $v_2 = 0$; $v_3 = 1 \text{ mm}$ [15]

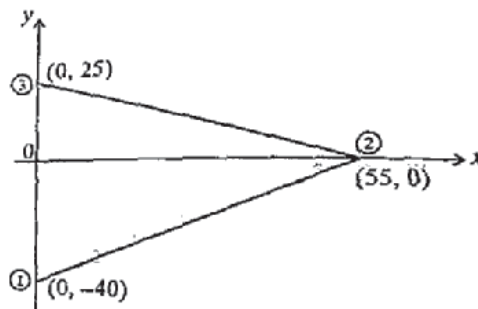


Fig. 1a

b) Explain the concept of isoparametric formulation in the CST element. [3]

OR

P.T.O.

- 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]

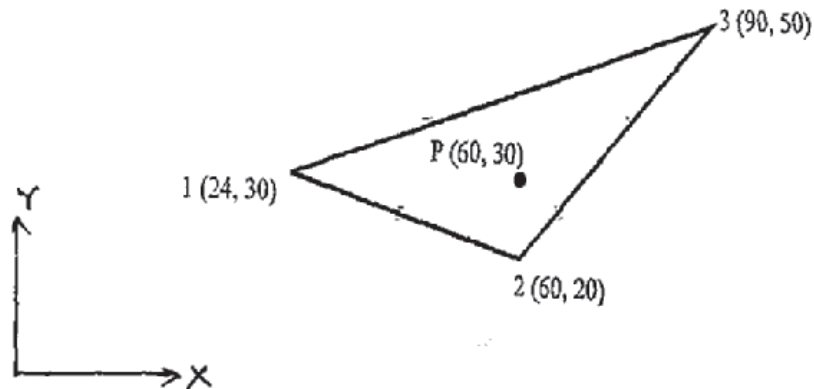


Fig. 2a

- b) Describe the key components and characteristics of a parametric model in CAE. [3]

- 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]

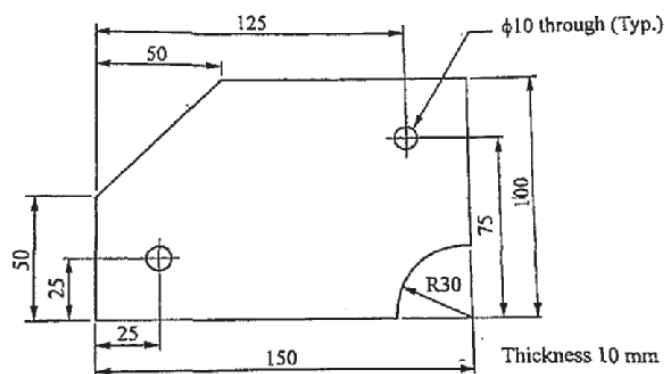


Fig. 3a

- 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]

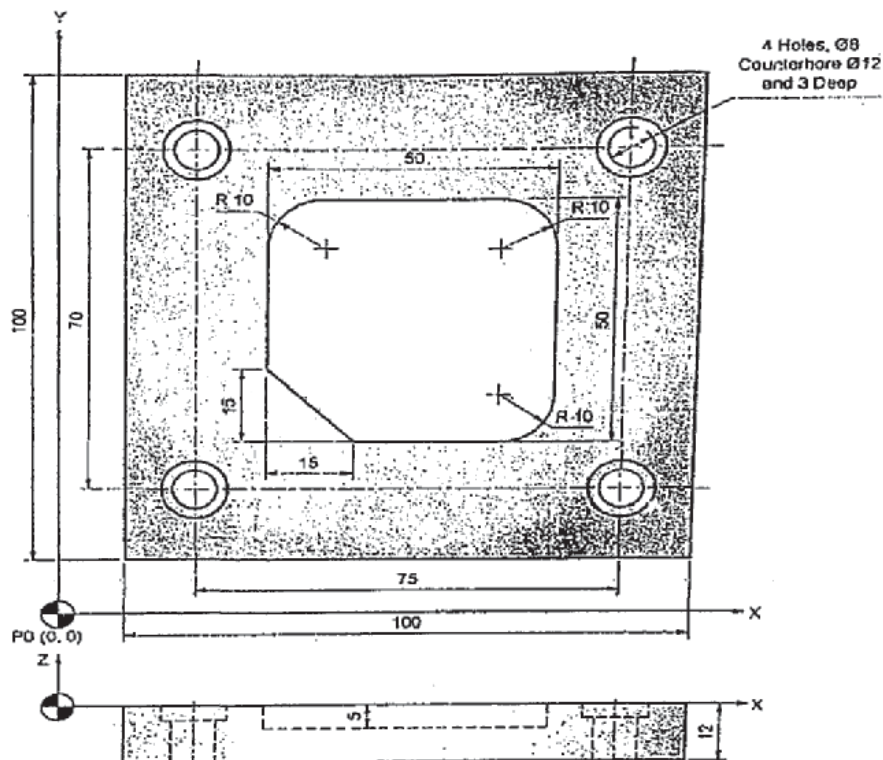


Fig. 4a

- 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 concept 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 = 200 mm

Width of workpiece = 100 mm

Depth of channel = 20 mm

The cutting speed for the milling operation is 200 meters per minute, and the feed rate is 0.1 mm 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 ₹ 240000 (40% of sales) and profit volume ratio is 30% of XY Limited, calculate its i) break even point and ii) amount of profit on sales of ₹ 900000.

ii) X limited has earned a contribution of ₹ 200000 and net profit of ₹ 150000 on sales of ₹ 800000. 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 ₹ 90000. 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]**



Total No. of Questions : 8]

SEAT No. :

P-7671

[Total No. of Pages : 2

[6180]-195

T.E. (Automation and Robotics)

SIGNAL PROCESSING AND CONDITIONING

(2019 Pattern) (Semester - I) (302524)

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) With the help of neat diagram explain working of the 4 bit SAR type ADC. [8]

b) What is amplifier? Explain with the help of neat diagram Voltage & Current Amplifier. [9]

OR

Q2) a) With the help of neat diagrams explain sampling theorem and Aliasing effect. [8]

b) Explain signal communication and the types of data transmission. [9]

Q3) a) Draw and explain Ladder Logic programming for any three logic gates. [9]

b) Explain a PLC ladder diagram for Bottle filling machine with the help of neat diagram of this system. [9]

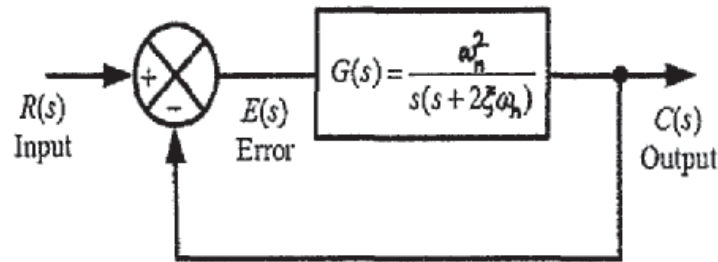
OR

Q4) a) Draw and explain Architecture of PLC. [9]

b) Write at least 9 aspects to be considered while selection of a PLC for the application. [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]

$$G(S) = \frac{S + 1}{S^2(S^2 + 5S + 6)}$$

- b)** Write a short note on Bode Plot, Gain margin and Phase margin with the help of neat diagram. [9]

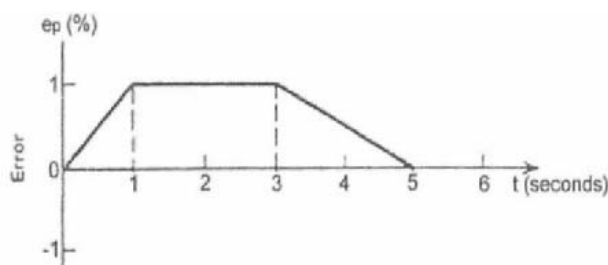
- Q7) a)** Explain Proportional (P), Integral (I) and Derivative (D) control actions. [9]

- 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 PI and PID control systems in parallel form. [9]

- b)** Following figure shows an error time graph, sketch the PID controller (parallel form) output w.r.t. time. Assume $K_p = 10$, $K_I = 2$, $K_D = 0.5$ and $P_0 = 0$ i.e. the controller output is zero when the error is zero. [9]



□□□

Total No. of Questions : 8]

SEAT No. :

P-7672

[Total No. of Pages : 3

[6180]-197

T.E. (Automation and 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, Q5 or Q6, Q7 or Q8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

Q1) a) Explain Various applications of Simulations. [5]

b) Solve the following Integer LP problem using Gomory's Cutting Plane method. [12]

$$\text{Max } Z = x_1 + x_2$$

$$\text{Subject To : } 3x_1 + 2x_2 \leq 5$$

$$x_2 \leq 2$$

$$x_1, x_2 \geq 0 \text{ and are integers.}$$

OR

Q2) 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]

$$\text{Maximize } Z = 2x_1 + 3x_2$$

$$\text{subject to constraints } 6x_1 + 5x_2 \leq 25$$

$$x_1 + 3x_2 \leq 10$$

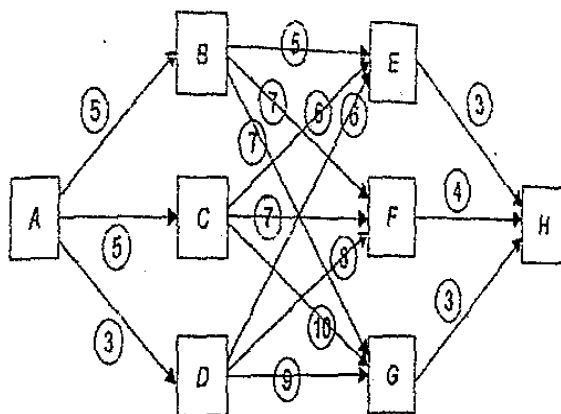
$$x_1, x_2 \geq 0 \text{ and Integers.}$$

P.T.O.

- Q3) a)** Explain the concept of Genetic Algorithm. State its applications. [8]
- b)** A company produces pharmaceutical drugs. The company has two production lines. The production rate for line 1 is 50 drug samples per hour and for line 2 it is 60 drug samples per hour. The company has entered into a contract to daily supply 1,200 drug samples daily to another company. Currently, the normal operation period 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 : [10]
- P1: Produce and deliver 1,200 drug samples 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.

OR

- Q4) a)** Write a short note on Artificial Neural Network. [8]
- 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. [6]



- c)** Give the general goal programming model. [4]

- Q5)** a) What are the different steps involved in SAW Method? [8]
b) What is the concept of analytical network process? [5]
c) Discuss the Weighted Product method. [4]

OR

- Q6)** a) Explain Analytic Hierarchy Process (AHP)? [6]
b) What do you mean by TOPSIS and PROMTHEE? [8]
c) Define the term MCDM. Also name its methods. [3]

- Q7)** a) List and elaborate the modern optimization techniques? [6]
b) State any two optimization techniques and explain its applications. [6]
c) How the Fuzzy Optimization technique is applied on any engineering system? [6]

OR

- Q8)** a) Explain the concept of Ant Colony Optimization. [6]
b) State the importance of modern optimization Techniques. [6]
c) Explain the mutation in Genetic Algorithm. [6]



Total No. of Questions : 8]

SEAT No. :

P-7673

[Total No. of Pages : 2

[6180]-198

T.E. (Automation and Robotics)

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) Explain Vision and Tracking: following the road concept with neat diagram. **[8]**

b) Draw and Explain components of a general-purpose image processing system. **[9]**

OR

Q2) a) Explain EM Algorithm in detail. **[8]**

b) Draw and Explain Stereo Imaging Model and calculate equation of disparity. **[9]**

Q3) a) Explain 3 types of low pass filters used for image smoothing in frequency domain. **[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. :

P-7674

[Total No. of Pages : 3

[6180]-199

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) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Draw neat labeled diagrams wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of non-programmable electronic calculator is permitted.
- 5) Assume 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) What is significance of the outlier? Explain outlier detection techniques with suitable examples. [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]

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0
...	...	...	...	...	...
395	15691863	Female	46	41000	1
396	15706071	Male	51	23000	1
397	15654296	Female	50	20000	1
398	15755018	Male	36	33000	0
399	15594041	Female	49	36000	1

P.T.O.

- i) Write a python code for the detection of outliers for feature 'EstimatedSalary' by Inter Quantile Range (TQR).
- ii) Write a python code for the imputation of missing values in the feature 'Age'.

- Q3)** a) Explain the assumptions in the linear regression with respect to how to check the assumption and how to handle the assumption. **[8]**
- b) Write a note on following algorithms : **[10]**
- i) Support Vector Machine (SVM)
 - ii) K-means clustering

OR

- Q4)** a) Write a note on types of logistic regression. Distinguished between linear and logistic regression. **[8]**
- b) Calculate Gini Impurity or Gini Index 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) Write a note of elements of deep learning networks with diagram. Explain any two activation functions in details used in ANN and CNN. **[7]**
- c) Explain feedforward vs backpropagation implemented in the ANN. **[5]**

OR

- Q6)** a) How to choose the suitable activation function in ANN and CNN? [5]
b) How does reinforcement learning works? [7]
c) Explain positive and negative reinforcement learning. [5]

- Q7)** a) Explain evaluation metrics in the classification problems with suitable examples, [10]
i) Confusion matrix,
ii) Accuracy,
iii) Precision,
iv) Recall,
v) F1 score,
vi) Micro-average
vii) Weighted-average
b) What do you mean by hyper-parameter tuning. Explain in detail the hyperparameter tuning for ANN. [8]

OR

- Q8)** a) Comment on terms used in Support Vector Machine (SVM). [10]
i) Support vectors,
ii) Hyperplane,
iii) Soft and hard margins,
iv) Kernel used in SVM.
b) Describe the use of machine learning techniques in the field of materials science. [8]



Total No. of Questions : 8]

SEAT No. :

P-7675

[Total No. of Pages : 2

[6180]-200

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

- Q1)** a) Explain timing and relationship of validation, verification and establishing credibility. **[10]**
- b) Explain any one technique for generating random numbers. **[7]**

OR

- Q2)** 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 $R_i = X_i/m$, $i = 1, 2, \dots$ **[9]**
- b) Define following terms : **[8]**
- | | |
|------------------|-------------------|
| i) Verification | ii) Validation |
| iii) Credibility | iv) Accreditation |

- Q3)** a) Explain inverse transform technique for exponential distribution with detailed procedure. **[9]**
- b) List out the potential issues to overcome in output data analysis. **[9]**

OR

P.T.O.

- Q4) a)** What are the different techniques for generating random variates? Explain any one of them. [8]
- b) Explain inverse transform technique for uniform and Weibull distribution with detailed procedure. [10]

- Q5) a)** Define the following terms with respect to manufacturing system : [9]
- i) Downtime
 - ii) Rework
 - iii) Reentrancy
- b) Explain vehicle system with regard to material handling system and also list its input parameters that should be considered when designing and implementing them. [8]

OR

- Q6) a)** Consider any case study related to manufacturing system and explain the random events & performance measures concerned with the taken case study. [10]
- b) What is material handling system and list out the input parameters for Automated Material Handling Systems (AMHS). [7]

- Q7) a)** Define simulation software and list out its key features. Also mention few popular simulation software used in different domains. [6]
- b) Explain the features needed in programming the discrete-event type simulation model. [6]
- c) State advantages and disadvantages of object oriented simulation approach. [6]

OR

- Q8) a)** Compare simulation software with the programming languages. [6]
- b) List out the desirable software features in detail. [6]
- c) What is general purpose software package? Explain any one example of it. [6]



Total No. of Questions : 8]

SEAT No. :

P-7676

[Total No. of Pages : 2

[6180]-201

T.E. (Automation and Robotics)

MACHINING SCIENCE AND TECHNOLOGY

(2019 Pattern) (Semester - II) (302530A) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Explain in details effect of process parameters on tool life. **[8]**
b) A tool life 40 minutes is obtained at a speed of 80 m/min and 25 minutes in 100 m/min. Determine the following: **[10]**
i) Tool life Equation.
ii) Tool life for 40 m/min of Cutting speed.
iii) Tool life for 120 m/min of Cutting speed.

OR

- Q2)** a) Define Machinability. Explain in details machinability index. **[8]**
b) A tool life 70 minutes is obtained at a speed of 15 m/min and 7 minutes in 50 m/min. Determine the following: **[10]**
i) Tool life Equation.
ii) Calculate percentage of increase of tool life when cutting speed reduced by 50%.

- Q3)** a) Write a classification of cutting force dynamometers. Explain mechanical type dynamometers. **[8]**
b) What is milling tool dynamometer, explain its construction and working with neat sketch. Write its applications. **[9]**

OR

P.T.O.

- Q4)** a) What are the reasons for measurement of cutting forces? [8]
b) Write a classification of cutting force dynamometers. Explain strain gauge type dynamometers. [9]

- Q5)** a) What are the elements of total production cost? Explain in details. [7]
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 = 500 mm 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/hr and tooling cost = \$3 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 two cutting speeds computed. [10]

OR

- Q6)** a) Derive equation for optimum cutting speed and tool life for maximum production. [7]
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/hr and the tooling cost per cutting edge = \$4. 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). [10]

- Q7)** a) What is the need of Modern Machining Techniques? [8]
b) Describe in detail Laser Beam Machining (LBM) with working principle, diagram, construction, working, and application. [10]

OR

- Q8)** a) Differentiate between conventional and non-conventional machining process. [8]
b) Describe in detail Abrasive Water Jet Machining (AWJM) with working principle, diagram, construction, working, and application. [10]



Total No. of Questions : 8]

SEAT No. :

P-7677

[Total No. of Pages : 2

[6180]-202

T.E. (Automation and Robotics)

**MAINTENANCE AND SAFETY ENGINEERING
(2019 Pattern) (Semester - II) (302530B) (Elective - II)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

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 : [8]

- i) Annual Overhauls**
- ii) Renovation**
- iii) Revamping and**
- iv) Modernization**

P.T.O.

- Q5)** a) What are the methods for Accidents preventions? [9]
b) What do you mean by Job Safety Analysis? Explain in detail. [9]

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 measures? [9]
b) Demonstrate Personal Safety and Personal Protective Equipment? [8]



Total No. of Questions : 8]

SEAT No. :

P7678

[Total No. of Pages : 2

[6180]-203

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 side indicate full marks.
- 4) Use of a Calculator is allowed.
- 5) Assume suitable data if necessary.

Q1) Explain the concept of Agarose gel electrophoresis using the following points:
[18]

- a) Working principle **CO3**
- b) Instrumentation
- c) Process and application

OR

Q2) Explain the concept of SDS-Polyacrylamide gel electrophoresis (SDS-PAGE) using the following points:
[18]

- a) Working principle **CO3**
- b) Instrumentation
- c) Process and application

Q3) a) Explain the process of sedimentation and factors affecting the rate of the process.
[10]

- b) Explain the significance of stoke's law in particle removal in sedimentation.
[7]

CO4

OR

Q4) a) Define and elaborate centrifugation and effective density. Enlist the types of baskets used in centrifuges.
[10]

- b) Draw the diagram of Pusher type Centrifuge and explain its advantages and disadvantages.
[7]

CO4

P.T.O.

Q5) Explain Beer-Lambert's law and its application. What is Spectroscopy? Write about Electromagnetic Radiation. **[18]**

CO5

OR

Q6) Write in short about following concepts of Electromagnetic radiation : (6M each) **[18]**

a) Frequency

CO5

b) Wavelength

c) Velocity

Q7) Explain the working principle of Mass Spectrometry and Describe the basic components of a Mass Spectrometer. **[17]**

CO6

OR

Q8) a) Write a note on shielding and deshielding effects involved in NMR spectroscopy. **[7]**

b) Explain the instrumentation used in NMR spectroscopy.

[10]

CO6



Total No. of Questions : 8]

SEAT No. :

P7679

[Total No. of Pages : 3

[6180]-204

T.Y. B.Tech. (Biotechnology)

MATERIAL BALANCES AND STOICHIOMETRY

(2019 Pattern) (Semester-I) (315462)

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) State and explain the forms of energy associated with the process. **[4]**

b) Calculate the heat needed to raise the temperature of 1 kmol of ammonia from 311K (38°C) to 422 (149°C) using the mean molar heat capacity.

Data : C_{pm}^0 for NH_3 between 311 K and 298 K = 35.864 KJ/Kmol.K

C_{pm}^0 for NH_3 between 422 K and 298 K = 37.7063 KJ/Kmol.K

[6]

c) Pure ethylene is heated from 303 K (30°C) to 523 K (250°C) at atmospheric pressure. Calculate the heat added per kmol ethylene using the heat capacity data given below: **[8]**

$$C_p^0 = 4.1261 + 155.0213 \times 10^{-3}T - 81.5455 \times 10^{-6}T^2 + 16.9755 \times 10^{-9}T^3$$

OR

Q2) a) Calculate the heat input to raise the temperature of 128 kg of sulphur dioxide from 373 K to 1273 K. perform the calculations in the following ways:

- i) by integrating the expression
- ii) by using C_p mean value and
- iii) by using C_p value at mean temperature. **[12]**

$$C_p \text{ of } SO_2 = 6.85 + 8.533 \times 10^{-3}T - 2.475 \times 10^{-6}T^2 \text{ cal mol}^{-1}K^{-1}$$

b) Define:

- i) Latent heat and sensible heat
- ii) Latent heat of condensation
- iii) Latent heat of Vaporization **[6]**

P.T.O.

- Q3) a)** Write a short note on :
- Limiting Reactant/Component
 - Excess Reactant
 - Percent Excess **[9]**
- b) The carbon monoxide is reacted with hydrogen to produce methanol. Calculate from the reaction. **[8]**
- The stoichiometric ratio of H_2 to CO
 - Kmol of CH_3OH produced per kmol CO reacted
 - The weight ratio of CO to H_2 if both are fed to reactor in stoichiometric proportion
 - The quantity of CO required to produce 1000 kg of CH_3OH .
- Reaction : $CO + 2H_2 \rightarrow CH_3OH$

OR

- Q4) a)** In the production of sulphur trioxide, 100 kmol of SO_2 and 100 kmol of O_2 are fed to a reactor. If the percent conversion of SO_2 is 80, calculate the composition of the product stream on mole basis. **[9]**
- b) Considering the reaction define: **[8]**
- Yield and selectivity and
 - Fractional Conversion

- Q5) a)** Calculate the heat of formation of benzoic acid crystals ($C_7H_6O_2$) at 298 K (25°C) using the following data: **[8]**

Data :

Standard heat of formation of CO_2 (g) = - 393.51 KJ/mol

Standard heat of formation of H_2O (l) = - 285.83 KJ/mol

Standard heat of combustion of benzoic acid crystals = -3226.95 KJ/mol

- b) Calculate heat of reaction at 298.15 K (25°C) of the following reaction: **[8]**



Data:

Component	ΔH_c^0 KJ/mol
C_2H_6 (g)	- 1560.69
C_2H_4 (g)	- 1411.2
H_2 (g)	- 285.83

- c) Define Hess's law of constant heat summation **[2]**

OR

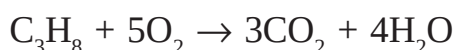
- Q6)** a) Discuss in details about effect of temperature on heat of reaction. [6]
 b) Discuss heat of solution and mixing. [6]
 c) Calculate the standard heat of reaction of the following reaction: [6]



Data:

Component	ΔH_c^0 , KJ/mol at 298.15 K (25°C)
$(\text{COOH})_2 (\text{s})$	- 244.76
HCOOH (l)	- 254.64

- Q7)** a) For a given reaction the gross heating value (GHV) of gaseous propane at 298K (25°C) is 2219.71 KJ/mol. Calculate the net heating value (NHV) of propane. [8]



- b) Crude oil is analysed to contain 87% carbon, 12.5% hydrogen and 0.5% sulphur (by weight.) Calculate the net calorific value of the crude oil at 298 K (25°C). [9]

Data :

Gross calorific value of crude oil at 298 K (25°C) is 45071 KJ/kg oil

Latent heat of water vapour at 298 K (25°C) = 2442.5 KJ/Kg

OR

- Q8)** a) The Gross heating value (GHV) of gaseous n-butane is 2877.40 KJ/mol at 298 K (25°C). Calculate its Net heating value (NHV) in KJ/mol and KJ/kg. [9]

Latent heat of water vapour at 298 K (25°C) = 2442.5 KJ/kg

- b) The gross calorific value of liquid acetone at 298K (25°C) is 1791.21KJ/mol. Find its Net Calorific Value using latent heat of water at 298 k (25°C).

[8]



Total No. of Questions : 8]

SEAT No. :

P7680

[Total No. of Pages : 2

[6180]-205

T.E. (Bio Technology)

GENETIC ENGINEERING

(2019 Pattern) (Semester - I) (315463)

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

- Q1) a)** WHAT IS selection and what are the different methods of selecting of recombinants? **[9]**
- b) How are genomic libraries created give a detailed account of? Give its significance. **[9]**

OR

- Q2) a)** What are Genomic libraries? How are they prepared and what is their significance? **[9]**
- b) What is the role of PCR in cloning? What are the important ingredients of PCR and which are the important steps? **[9]**
- Q3) a)** What is competency in bacteria and why is it important? Are bacteria naturally competent if yes give examples? How can we make bacteria competent? **[9]**
- b) Describe a typical cloning vector with diagram. What is broad host range in plasmid? **[8]**

OR

- Q4) a)** Saccharomyces cerevisiae as a cloning host, touch iupon its vector design, promoter elements and significance and drawbacks. **[9]**
- b) Describe cloning in gram positive bacteria namely *Bacillus subtilis*? Why should we clone gram positive bacteria? **[8]**

P.T.O.

- Q5) a)** Write notes on: **[9]**
- i) Electroporation
 - ii) Transfection
- b) What is Transformation? How is Transfection different? **[9]**

OR

- Q6) a)** Microinjection technique has paved a new way in the genetic engineering of human cells-Discuss. What are the steps and the instruments required in microinjection? **[9]**
- b) Write a note on particle bombardment technique for plant cell transformation. **[9]**

Q7) Write in brief about

- a) Factor VIII **[5]**
- b) Humulin **[5]**
- c) Transgenic plants **[7]**

OR

- Q8) a)** What is Bt cotton? How is it produced and what are the steps in its production? **[10]**
- b) Write a note on Gene Therapy. **[7]**



Total No. of Questions : 8]

SEAT No. :

P7681

[Total No. of Pages : 2

[6180]-206

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 are antigens? Explain the types of antigens and factors affecting antigenicity. **[6]**

b) Explain about generation of antibody diversity **[6]**

c) Write detail note on hapten and adjuvants. **[6]**

OR

Q2) a) What is antibody? Explain about Structure and function of antibody. **[6]**

b) Write about Organization and expression of Ig genes **[6]**

c) Describe the process of activation of B-cells. **[6]**

Q3) a) What are MHC? Explain the mechanism of presenting antigens by MHC. **[9]**

b) Write about Graft rejection, Graft-versus-Host and ethics. **[8]**

OR

Q4) a) Write note on Cytokines and Complement system. **[9]**

b) Explain about Cell mediated immunity and T-cell receptors. **[8]**

P.T.O.

- Q5) a)** What is hypersensitivity? Explain about type I to IV hypersensitivity. **[8]**
b) Write note on Anaphylaxis and immediate hypersensitivity. **[10]**

OR

- Q6) a)** Write note on allergy test and organ specific autoimmunity. **[10]**
b) Write about immunodeficiency and autoimmune diseases. **[8]**

- Q7) a)** What is ELISA? Discuss the various types of ELISA. **[8]**
b) Describe the process of Precipitation-Gel Diffusion test and agglutination test, **[9]**

OR

- Q8) a)** Discuss about DNA vaccines and recombinant DNA vaccines **[8]**
b) Write about RIA and RID. **[9]**



Total No. of Questions : 8]

SEAT No. :

P7682

[6180] - 207

[Total No. of Pages : 2

T.E. (Biotechnology Engineering)

ENZYME TECHNOLOGY

(2019 Pattern) (Semester - I) (Elective - I) (315465 A)

Time : 2 ½ 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.

**Course
out come
(CO)
[18]CO3**

Q1) Answer the following.

- a) Define the following TERMS with suitable example.
 - i) Cofactors
 - ii) Prosthetic Groups
 - iii) Co-substrates
- b) Explain the role of Biotin in enzyme catalyzed reaction

OR

Q2) Answer the following.

[18] CO3

- a) Differentiate between 1. NAD⁺ coenzyme and flavin coenzymes
- b) Write down the reactions involved in conversion of pyruvate into acetyl Co A.

Q3) Answer the following.

[17] CO4

- a) Competitive inhibition can be overcome- justify.
- b) What is the significance of enzyme inhibition study?

OR

Q4) Answer the following.

[17] CO4

- a) Differentiate between reversible and irreversible type of inhibition.
- b) Plot a line weaver Burk plot for noncompetitive inhibition and note on Km and Vmax.

P.T.O.

Q5) Answer the following. [18]CO5

- a) Immobilized enzyme systems offer cost advantages to users -justify.
- b) What is the prerequisite of the matrix whenever it has to apply for covalent immobilization? What are the advantages of covalent immobilization?

OR

Q6) Answer the following. [18]CO5

- a) Differentiate between Adsorption and Encapsulation method of enzyme immobilization.
- b) How the enzyme is immobilized by encapsulation? Which matrices are used for the same method of immobilization?

Q7) Answer the following. [17]CO6

- a) Immobilized enzymes are more stable-Justify.
- b) Why immobilized enzymes are broadly applied in the food sector?

OR

Q8) Answer the following. [17]CO6

- a) What are the applications of immobilized enzyme?
- b) Explain with an example immobilized enzyme-based biosensor for any analyte detection.



Total No. of Questions : 8]

SEAT No. :

P7683

[6180] - 209

[Total No. of Pages : 2

T.E. (Biotechnology)

AGRICULTURAL BIOTECHNOLOGY

(2019 Pattern) (Semester - I) (Elective - I) (315465 C)

Time : 2 ½ 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 Q8.
- 2) Figures to the right indicate full marks.

Q1) a) Give an outline of plant tissue culture techniques, methods and its applications in biological studies. **[9]**

b) What is callus tissue? Describe the protocol and discuss the significance of callus culture. **[9]**

OR

Q2) a) What is embryo culture? How could this technique be utilized for the improvement of crops? **[9]**

b) Write short note on In vitro mutagenesis with its applications. **[9]**

Q3) a) Give different types of molecular markers with its applications. **[9]**

b) Briefly describe principle and applications of comparative genomics. **[8]**

OR

Q4) a) Give general features of RFLP markers and its applications in crop improvement. **[9]**

b) Briefly describe principle and applications of functional genomics. **[8]**

P.T.O.

- Q5) a)** Write short note on PGR. **[8]**
b) What are biofertilizers? Give methods of production and applications of microbial fertilizers used in agriculture. **[10]**

OR

- Q6) a)** Explain the importance of symbiotic nitrogen fixing microorganisms in biofertilizers with examples. **[10]**
b) Write short note on algal biofertilizers. **[8]**

- Q7) a)** Briefly describe the role of the Genetic Engineering Appraisal Committee (GEAC). **[8]**
b) Write general principles of risk assessment. **[9]**

OR

- Q8) a)** What are (LMO) Living modified organisms? **[8]**
b) Explain the key points of Environment Protection Act (EPA) 1986. **[9]**



Total No. of Questions : 8]

SEAT No. :

P7684

[Total No. of Pages : 2

[6180]-210

T.E. (Biotechnology Engg.)

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 and Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

- Q1)** a) What is fermentation? Describe the fermentative production of ethanol. **[6]**
b) Write in detail about fermentative production of Citric acid with recovery process. **[6]**
c) Describe the detail process of Streptomycin production. **[6]**

OR

- Q2)** a) Explain how the starting culture of yeast is activated? Illustrate the detail process of bakers yeast production. **[6]**
b) Discuss the Microbial production of vitamins B2, B12. **[6]**
c) Describe the recovery process of penicillin with neat sketch. **[6]**

OR

- Q3)** a) Write note on microbial transformation with neat labeled diagram. **[9]**
b) Write in detail about Single Cell Protein (SCP) production. **[8]**
- Q4)** a) Considering the enzyme protease, describe its detail production, recovery process and applications. **[9]**
b) What are enzymes? Enlist the different sources of enzymes and discuss their applications in various sectors. **[8]**

P.T.O.

- Q5) a)** Describe the design involved in Continuous stirred tank reactor (CSTR) with its characteristics. **[8]**
- b)** Write note on Mixed flow reactor, Plug flow reactor with neat labeled diagram. **[10]**

OR

- Q6) a)** What are important bioreactors components? Describe them in detail with neat sketch. **[10]**
- b)** Explain the design and working of Fluidized bed reactor with neat sketch. **[8]**

- Q7) 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 Fermentation and product recovery costs in detail. **[9]**

OR

- Q8) a)** Discuss how fermentation efficiency can be enhanced with respect to product recovery and yield. **[8]**
- b)** Discuss the concept of Good Manufacturing Practices (GMP) in detail. **[9]**



Total No. of Questions : 8]

SEAT No. :

P7685

[Total No. of Pages : 2

[6180]-211

T.E. (Biotechnology)

MASS TRANSFER

(2019 Pattern) (Semester-II) (315472)

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) Calculate the yield of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ crystals when 1000 kg saturated solution of MgSO_4 at 353 K is cooled to 303K assuming 10% of the water is lost by evaporation during cooling. **[10]**

Solubility of MgSO_4 at 353K = 64.2 kg/100 kg water

Solubility of MgSO_4 at 303 K = 40.8 kg/100 kg Water

At. Wt. Mg=24, S=32, H=1 and O=16

b) Give classification of various types of crystallizers and write a short note on Swenson-Walker crystallizer. **[8]**

OR

Q2) a) Explain with a neat diagram Mier's supersaturation theory for crystallization. **[9]**

b) Explain with a neat diagram how crystal formation varies based on the rate of cooling? **[9]**

Q3) a) Derive Rayleigh equation in terms of relative volatility. **[8]**

b) What is Molecular distillation? Where it can be applied? **[9]**

OR

P.T.O.

- Q4) a)** Define terms: [8]
- i) Equilibrium
 - ii) Bubble point
 - iii) Dew point
 - iv) Saturation
- b) What are HETP, HTU and NTU? When concept of HETP is used? [9]

- Q5) a)** A simple batch still is used to distill 1000 kg of a mixture containing 60 mass % ethyl alcohol and 40 mass% of water. After distillation the bottom product contains 5 mass % of alcohol. Determine the composition of the overhead product, its mass and mass of the bottom product. Equilibrium data is with respect to weight percentage values. Data is given as, [12]

x	5	10	20	30	40	50	60
y	36	51.6	65.5	71	74	76.7	78.9

- b) Draw a neat sketch and write a short note on Sieve plate/tray. [6]
- OR
- Q6) a)** Write material balance over distillation column and derive an expression of operating line in stripping section. [10]
- b) What is feed plate and feed line and how thermal conditions of the feed are varied based on q-value? [8]

- Q7) a)** What is absorption and stripping? Explain it with some industrial applications. [9]
- b) Explain in detail concept $L_{\min}$ for absorption column. [8]

OR

- Q8) a)** Explain concept of HETP by correlating it with distillation column. [8]
- b) What are different methods of absorption? Explain it with neat diagrams and concentration profiles. [9]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P7686

[6180]-212

T.E. (Biotechnology)

BIOSEPARATION ENGINEERING

(2019 Pattern) (Semester-II) (315473)

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

Q1) Compare and contrast between chemical and physical adsorption. Explain the Concepts in detail with the help of suitable case example. **[18]**

OR

CO3

Q2) Explain each of the following concept in detail: (09M Each) **[18]**

- a) Applications of Adsorption in Biotechnology
- b) Temperature swing Adsorption (TSA)

CO3

Q3) Describe working principle and instrumentation of Gas chromatography system with the help of following points. **[17]**

- a) Injector device
- b) Columns
- c) Temperature control device
- d) Detectors
- e) Recorders & integrators.

CO4

OR

P.T.O.

Q4) Describe working principle and instrumentation of High performance liquid chromatography system with the help of following points. **[17]**

- a) Solvent reservoir
- b) Delivery system
- c) Injector
- d) Column.
- e) Detectors.
- f) Recorder.

CO4

Q5) a) Which membranes are used for reverse osmosis? Explain the technique of RO in Details with the help of suitable diagrams. **[9]**

CO5

- b) Which membranes are used for pervaporation? Explain the technique in details with the help of suitable diagrams. **[9]**

CO5

OR

Q6) a) What is dialysis? What is the general principle of Dialysis? Discuss the application of dialysis. **[9]**

- b) How electrodialysis is different from dialysis? Describe the process of electro dialysis in detail. **[9]**

CO5

Q7) a) what is isoelectric point? How isoelectric precipitation is performed? Explain with one example. **[10]**

- b) Write a short note on reactive extraction? how it is modified from liquid-liquid extraction? **[7]**

CO6

OR

Q8) a) Write a short note on molecular sieves with few examples. **[7]**

- b) What is supercritical extraction? Explain the phenomenon with suitable examples. How is it different from liquid-liquid extraction? **[10]**

CO6



Total No. of Questions : 8]

SEAT No. :

P7687

[6180]-214

[Total No. of Pages : 2

T.E.

BIOTECHNOLOGY

Food Biotechnology

(2019 Pattern) (Semester - II) (315474 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.*

Q1) a) Thermal food processing methods give its significance and describe in detail any one. **[9]**

b) What is pasteurization? How is it carried out? Any design considerations we need to keep in mind? **[9]**

OR

Q2) a) What is Thermal death kinetics? Discuss in detail. **[9]**

b) Describe in detail HTST pasteurization? How is the pasteurization carried out using a plate heat exchanger show with a neat labelled diagram. **[9]**

Q3) a) How are microbes used in oil production? **[8]**

b) What are the different applications of algae? **[9]**

OR

Q4) a) Solid state fermentation has improved the food processing process. Discuss. **[9]**

b) How is fermentation been utilized in the food industry? Explain in brief with examples. **[8]**

Q5) a) How are the enzymes important in the cereal and beverage industry? **[9]**

b) What are the applications of pectinases in the food processing industry? **[9]**

OR

P.T.O.

- Q6)** a) Are the vegetables and fruits subjected to processing? If yes which are the enzymes used in the processing? [9]
- b) Which enzymes are used in the meat processing industry? Give examples and its significance. [9]

Q7) Write short notes on with neat diagram, advantages and process description.

- a) Anerobic treatement of food waste [8]
- b) Trickling filters [9]

OR

- Q8)** a) Write note on Rotating Biological Contactors with a neat labelled diagram. Give their advantages and disadvantages. [8]
- b) What are Lagoons and how can they be used for the treatment of water. Draw a neat labelled diagram to explain. [9]



Total No. of Questions : 8]

SEAT No. :

P-7688

[Total No. of Pages : 3

[6180]-216

T.E. (Printing Engineering)

PRINT STATISTICS

(2019 Pattern) (Semester - I) (308281)

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) Black 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) a) 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	.0261	.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]

- Target 22 mm, Tolerance ± 2 mm, process mean 23 mm, LCL 20 mm, UCL 26 mm.
- Target 530, process μ 532, standard deviation 8, LSL 505, USL 560
- Design specification 5.5, $s = 1.5$, μ 6, specification width 8

Q7) Calculate the Process Capability Index for Delta E on a Flexo Press. **[18]**

USL : 3.5 and LSL : 0.5, $d_2 = 2.326$

Sample No.	Shift 1	Shift 2	Shift 3
1	1.1	2.4	3.5
2	1.3	2.6	3.6
3	0.8	2.2	3.7
4	1.6	3.9	3.4
5	1.9	2.5	2.6

OR

Q8) Explain in detail the Six Sigma Methodology. **[18]**

Total No. of Questions : 8]

SEAT No. :

P-7689

[Total No. of Pages : 2

[6180]-217

T.E. (Printing Engineering)

OFFSET PRINTING TECHNIQUES

Technology

(2019 Pattern) (Semester - I) (308282)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) Explain Inking Systems with rollers configuration. **[18]**

OR

Q2) Describe various types of rollers used in offset dampening and inking units **[18]**

Q3) Explain the following related to roll to web processing : **[17]**

- a) Reel width and reel diameter
- b) Roll core handling
- c) Festoon rollers
- d) Dancer roller function

OR

Q4) Explain why : **[17]**

- a) Packing required under plate and blanket
- b) Compressible blankets are better than incompressible blankets
- c) IPA is used in Fountain solutions
- d) Tower press is used in newspaper presses

P.T.O.

Q5) Describe combination type of dryer. Why different substrates require different dryer temperature. **[18]**

OR

Q6) Explain : **[18]**

- a) Ink agitators
- b) Web break sensors
- c) Web steering devices
- d) Pyrometers

Q7) Explain following troubles : **[17]**

- a) Web sagging
- b) Blistering in dryer
- c) Tone value increase
- d) Ink chalking

OR

Q8) Explain chopper folding mechanism and its use in commercial printing. Assume necessary sizes. **[17]**



Total No. of Questions : 8]

SEAT No. :

P-7690

[Total No. of Pages : 3

[6180]-218
T.E. (Printing)
COLOR SCIENCE AND MEASUREMENT
(2019 Pattern) (Semester-I) (308283)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Attempt Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No. 7 or Q.No. 8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) Explain the L^*a^*b color system. [6]
b) Define saturation and explain out of 2 same samples, which attribute will have show higher degree of difference. [6]
c) Describe the CIE 1931 Yxy System. [5]

OR

- Q2)** a) Describe the Munsell Color model system. [6]
b) Explain which attributes can be derived from tri-stimulus values and how? [5]
c) Explain with neat diagram LCH. [6]

- Q3)** a) State different parts of a Spectrophotometer. Distinguish between a colorimeter and spectrophotometer. [12]
b) Justify effect of light source on the color of an object. [6]

OR

- Q4)** a) Draw a neat diagram of spectrum of the sample which the spectrophotometer considers during computing CIE metrics. [6]
b) Density is not a CIE-type color metric and therefore densitometry is only indirectly used in color management, Justify. [12]

P.T.O.

- Q5) a)** Delta E is the measured change of color from one color sample to another Explain it using Delta Eab equation. **[6]**
- b) State disadvantages of evaluating color visually. **[6]**
- c) State importance of instrument to measure color difference. **[5]**

OR

- Q6) a)** Solve following using delta Eab equation between Sample 1 & 2 And Sample 3 & 4 **[6]**

Sample 1

$L_1^* 56.2$

$a_1^* -32.5$

$b_1^* 4.9$

&

Sample 2

$L_2^* 56.0$

$a_2^* -45.7$

$b_2^* 57$

Sample 3

$L_3^* 60.3$

$a_3^* 33.0$

$b_3^* 64.3$

&

Sample 4

$L_4^* 41.0$

$a_4^* 33.2$

$b_4^* 25.5$

- b) Draw a neat diagram of L^*C^*h that shows a color difference in hue and chroma. **[5]**
- c) Compare any 2 color difference equations. State their differences. **[6]**

- Q7) a)** Compare difference between a colorant and dye. Give any 3 applications of each. **[12]**
- b)** What is particle size of a pigment or dye. Why particle size is important. **[6]**

OR

- Q8) a)** Explain the term Colour IndexTM Generic Name (CIGN) Give any 3 examples, how pigments are described using this term. **[6]**
- b)** What is metamerism. Explain it's significance in color management. **[12]**



Total No. of Questions : 8]

SEAT No. :

P-7691

[Total No. of Pages : 2

[6180]-219

T.E. (Printing Engineering)

INK TECHNOLOGY

(2019 Pattern) (Semester - I) (308284)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Write short note on Behaviour of Inks on machines. [6]
b) Write short note on Viscometer. [6]
c) Write short note on Rheology. [6]

OR

- Q2)** a) Draw a stress and strain curve diagram and explain printing ink on the diagram. [6]
b) Differentiate between a Shear thinning and shear thickening liquids. [6]
c) Factors which affects the rheological behaviour of printing inks. [6]

- Q3)** a) Explain in brief Ink drying. [5]
b) Explain in brief the methods of ink drying. [6]
c) Compare Micro wave and radio frequency drying. [6]

OR

- Q4)** a) Write short note on Electron beam curing. [5]
b) Describe the evaporation drying. [6]
c) Compare IR and Microwave curing. [6]

P.T.O.

- Q5)** a) List down the printing substrates and their ink requirements in terms of adhesion and gloss and drying methods. [6]
- b) Explain in brief the ink ingredients for ink manufacturing for various printing process inks. [6]
- c) Compare mixing and milling process of ink manufacturing. [6]

OR

- Q6)** a) Write short note on pigment dispersion. [6]
- b) Explain in brief the printing process and their ink ingredients and ink formulation. [6]
- c) What is the purpose of Breakdown of the Pigment Particles. [6]

- Q7)** a) What is the purpose of checking the ink adhesion? Explain the ink adhesion test. [5]
- b) What is the purpose of checking the solid content of the ink? Explain the solid content measurement process. [6]
- c) What is the purpose to measuring the viscosity of ink? What are the different methods of checking the viscosity of ink. [6]

OR

- Q8)** a) Explain in brief the purpose to check the gloss of ink. [5]
- b) Explain in brief health hazards, safety and environmental effect of ink ingredients on human health. [6]
- c) Explain in brief the ink proofing. [6]



Total No. of Questions : 8]

SEAT No. :

P-7692

[Total No. of Pages : 2

[6180]-220

T.E. (Printing)

CYBER SECURITY

(2019 Pattern) (Semester-I) (308286A) (Elective-I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Attempt Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No. 7 or Q.No. 8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) What is an IP Address (Mention its types)? How is it assigned? How is different from MAC Address? **[12]**
- b) What are the different types of booting methods? Explain any 2 in detail. **[6]**

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 password cracking? Explain how bruteforce and dictionary attacks work. **[9]**
- b) What are the various phases of hacking? Name a few tools used for each of these phases. **[8]**

OR

- Q4)** a) Explain in detail how an android device can be hacked. **[8]**
- b) How can you detect if your device has been hacked? What are the security measures through which you can stay safe from android hacking? **[9]**

P.T.O.

- 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)** Define and discuss various IT Act clauses related to cyber crimes. **[12]**
- b)** Explain the liability aspect of the Internet Service Provider as per the Information Technology Act 2000. **[5]**



Total No. of Questions : 8]

SEAT No. :

P-7693

[Total No. of Pages : 2

[6180]-221

T.E. (Printing Engineering)

WOOD GLASS AND METAL BASED PACKAGING

(2019 Pattern) (Semester-I) (308286B) (Elective-I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Solve Q.1 or 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 allowed.*

Q1) a) Explain manufacturing of glass. **[9]**

b) Give brief introduction of glass Packaging. **[9]**

OR

Q2) a) Write down about modern trends in glass packaging. **[9]**

b) Explain standards of glass packaging. **[9]**

Q3) a) Explain about USP glass types and testing procedures. **[9]**

b) Write down the concept of gauging. **[8]**

OR

Q4) a) What is requirement of testing in glass packaging. **[8]**

b) Explain 2 physical test of glass packaging. **[9]**

Q5) a) Explain manufacturing of aluminium foil. **[9]**

b) Write down properties of aluminium foil. **[9]**

OR

P.T.O.

- Q6)** a) Explain Tin Plate Characteristics. [9]
b) Explain Manufacturing of Black Plate. [9]

- Q7)** a) Explain about Drums. [8]
b) Explain about closures. [9]

OR

- Q8)** a) Write down types of drums. [8]
b) Explain Manufacturing of Drums. [9]



Total No. of Questions : 8]

SEAT No. :

P-7695

[Total No. of Pages : 2

[6180]-223

T.E. (Printing Engineering)

FLEXO PRINTING TECHNIQUES

(2019 Pattern) (Semester - II) (308289)

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

- Q1)** a) Discuss Standardization of Conventional Flexo Plate. [9]
b) Define Back-exposure and its purpose and effect. [4]
c) Explain washout solution and different type of solutions. [4]

OR

- Q2)** a) Prepare a conventional photopolymer plate for flexo press systematically. [9]
b) Define Main-exposure and its purpose and effect. [4]
c) Explain different aspect of Environmental in flexo industry. [4]

- Q3)** a) Explain different type of image used in pre-press. [6]
b) Discuss different type of dot: Flat top dot and Round top dot. [6]
c) Discuss Raster image process digital workflow. [6]

OR

- Q4)** a) Discuss different characteristics of digital plates. [6]
b) Define CTP imaging technique: Ablation technique. [6]
c) Explain digital workflow. [6]

P.T.O.

- Q5)** a) Explain wide web press with diagram. [9]
b) Explain platform narrow web press and its advantages. [4]
c) Explain Central impression narrow web press with diagram. [4]

OR

- Q6)** a) Discuss different type of tapes and its impact on print quality. [9]
b) Define in-line narrow web press with diagram. [4]
c) Explain hot air dryer. [4]

- Q7)** a) Define fountain roller and its specification. [6]
b) Explain different ink metering system used in flexography. [6]
c) Explain different method of anilox engraving. [6]

OR

- Q8)** a) Define anilox cells and its type. [6]
b) Explain different method of Anilox cleaning. [6]
c) Explain doctor blade in detail with diagram. [6]



Total No. of Questions : 8]

SEAT No. :

P-7696

[Total No. of Pages : 2

[6180]-224

T.E. (Printing)

COLOR MANAGEMENT

(2019 Pattern) (Semester-II) (308290)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Attempt Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Write a short note on the following CRT, LCD and LED technologies. **[10]**
b) Explain what is brightness setting in monitor. **[7]**

OR

- Q2)** a) Brightness setting primarily affects the shadows. Explain with help of graph. **[6]**
b) Explain what are RGB primaries in case of monitors. Draw neat diagram. **[11]**

- Q3)** a) Printer profiling consists of the three Cs. Explain them with their significance. **[12]**
b) What does calibration process include in inkjet printing. **[5]**

OR

- Q4)** a) Describe any 2 printer test charts in terms of patches, measurement and profiling. **[12]**
b) Compare visual and random charts used in printer charts. **[5]**

- Q5)** a) Differentiate between hard proof and soft proof. **[6]**
b) Compare proofing methods in color management. **[12]**

OR

P.T.O.

- Q6)** a) Differentiate between assign a profile and convert a profile. [6]
b) Explain need of DeviceLink profile. State advantages and disadvantages of DeviceLink profile. [12]

- Q7)** a) State the effect of surrounding lighting conditions on visual evaluation of color. [6]
b) Why do we need a viewing standard. Explain the importance of ISO 3664: 2009. [12]

OR

- Q8)** a) Describe the concept of evaluation of color visually. State the viewing conditions required. What problems can be seen if not used ideal viewing condition. [12]
b) Explain grey balance. [6]



Total No. of Questions : 8]

SEAT No. :

P-7697

[Total No. of Pages : 3

[6180]-225

T.E. (Printing Engineering)

DESIGN OF EXPERIMENTS

(2019 Pattern) (Semester - II) (308291)

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) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Use of an electronic pocket calculator is allowed.

Q1) Test the hypothesis by the Chi-square method for an acceptable printed sample and gender. Consider P Table $\alpha_{0.05} = 5.99$. **[18]**

Observed Values			
Gender	Left Image	Center Image	Right Image
Male	5	8	10
Female	5	8	10

OR

Q2) Test the hypothesis by the T-test method for the following two sets of values : **[18]**

Set 1: 6, 9, 7, 8, 9, 10, 11, 10 and

Set 2: 4, 3, 3, 2, 5, 5, 6, 6? (t-Table $\alpha_{0.05} = 1.7613$)

Q3) Prepare ANOVA for density from side-to-side of a Black printed sheet. $\alpha = 0.05$ **[17]**

Density		
Left	Center	Right
1.6	1.6	1.58
1.65	1.67	1.65
1.64	1.66	1.55
1.65	1.67	1.63
1.67	1.68	16.3

P.T.O.

OR

- Q4)** Prepare a 2-Way ANOVA Table and identify whether Sales Managers Kore, Pore and Sakore with or without Training have an impact on Unit Sales. ($\alpha = 0.05$) [17]

Training			Not Training		
Manager Kore	Manager Pore	Manager Sakore	Manager Kore	Manager Pore	Manager Sakore
12	10	11	8	8	8
12	10	11	8	8	7
11	11	13	6	7	8
10	11	12	8	7	8
12	10	12	7	6	8

- Q5)** Kakade, Wakade and Sakade listed flexo print quality factors. Prepare full factorial design and fractional factorial design from the following factors. [18]

Factors	Low	High
Plate Line Screen (LPI)	100	120
Press Speed (m/min.)	250	300
Anilox Cell Angle (°)	30	60
Anilox Screen (LPI)	600	700
Dot Compensation (%)	30	40
Ink Viscosity (sec.)	22	24

OR

- Q6)** Akolkar, Divekar and Manjrekar identified the following factors affecting printability. Generate a full factorial and fractional factorial design for the following factors. [18]

Factors	Low	High
Impression Pressure (kg/cm ²)	1	2
Viscosity (sec.)	15	19
Speed (m/min.)	150	300
Doctor Blade Pressure (kg/cm ²)	1	1.5
Doctor Blade Angle (°)	45	60
Impression Hardness (Shore A)	60	70

Q7) Calculate the Process Capability and Process Performance for Dot Gain on an Offset Press. Data is collected on an hourly basis. USL : 20 and LSL : 12, $d_2 = 1.128$ [17]

Sample No.	8.00	9.00	10.00	11.00	12.00	1.00
1	20	16	18	14	18	17
2	15	22	12	16	11	16

OR

Q8) Explain in detail Bar Chart, Pareto, Run Chart and Multi Vari Chart. [17]



Total No. of Questions : 8]

SEAT No. :

P-7698

[Total No. of Pages : 2

[6180]-226
T.E. (Printing)
MAINTENANCE MANAGEMENT OF PRINTING
MACHINES
(2019 Pattern) (Semester - II) (308293A) (Elective - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Attempt Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No. 7 or Q.No. 8*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

- Q1)** a) Write a Brief Note on Preventive Maintenance with Suitable Example. **[6]**
b) What are the Elements of Breakdown Maintenance? **[6]**
c) Important Steps for Establishing a PM Program. **[5]**

OR

- Q2)** a) Why Preventive Maintenance is Important for any Printing Press? **[6]**
b) What are the Elements of Corrective Maintenance? **[6]**
c) Write a brief note on Lubricants. **[5]**

- Q3)** a) What is Condition Based Monitoring. **[6]**
b) Explain in detail about thermographic analysis for offset press. **[6]**
c) Why is predictive maintenance important? **[6]**

OR

- Q4)** a) What Techniques are used in condition based monitoring? **[6]**
b) Describe in detail the predictive maintenance with respect to Air Compressor used for gravure printing press. **[6]**
c) List & Explain various Instruments used for Different Condition Monitoring. **[6]**

P.T.O.

- Q5)** a) What is OEE, Explain with Availability. [6]
 b) Why Need for Effectiveness Maintenance Important. [6]
 c) What are the Key Performance Indicators for the feeder of web offset press. [5]

OR

- Q6)** a) What are the Safety Measures taken during Gravure Maintenance. [6]
 b) What is significance of 5s in Maintenance Management. [6]
 c) What is MTTR and MTBF? [5]

- Q7)** a) Describe the Replacement or Repair Decision Making Policy with respect to LCC Model Technique. [6]
 b) What is 5S? Explain with suitable example from maintenance management. [6]
 c) Conclude Replacement or Repair Decision by Calculating Average Maintenance Cost for a Single-Color Offset Machine & Write a Statement Considering Below Mentioned Data for Calculation. [6]

Year	1	2	3	4	5	6	7	8
Maintenance Cost	1000/-	1200/-	1400/-	1800/-	2300/-	2800/-	3400/-	4000/-
Resale Value	3000/-	1500/-	750/-	375/-	200/-	200/-	200/-	200/-

OR

- Q8)** a) What is TPM? Explain with respect to Single color Offset Press. [6]
 b) What are the Pillars of TPM? Explain with suitable example. [6]
 c) Why is it important keep spares. And explain critical spares. [6]



Total No. of Questions : 8]

SEAT No. :

P-7699

[Total No. of Pages : 2

[6180]-227

T.E. (Printing Engineering)

**BASIC COMMUNICATION SYSTEMS AND
ELECTRONIC INSTRUMENTATION**

(2019 Pattern) (Semester - II) (308293B) (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) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Explain the RFID communication in detail along with applications. **[18]**

OR

Q2) Explain the Wi-Fi Communication system with modulation techniques, losses involved in it. **[18]**

Q3) Describe static and Dynamic characteristics of measurement system. **[17]**

OR

Q4) a) Explain the selection criteria for the sensors and transducers. **[9]**

b) State types of measurements. **[8]**

Q5) Mention the applications of displacement sensor used in printing industry. **[18]**

OR

P.T.O.

- Q6)** a) Explain the working principle of LVDT. [9]
- b) Describe the errors and elimination methods of errors while performing any measurements. [9]

Q7) Describe the working and types of temperature sensors (any 2). [17]

OR

Q8) Describe in detail any pressure sensor used in printing industry. [17]



Total No. of Questions : 8]

SEAT No. :

P-7700

[Total No. of Pages : 2

[6180]-228

T.E. (Printing)

ELECTRONICS PUBLISHING

(2019 Pattern) (Semester-II) (308293C) (Elective-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Attempt Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.*
- 2) Figures to the right indicate full marks.*
- 3) Assume suitable data, if necessary.*
- 4) Neat diagrams must be drawn wherever necessary.*

Q1) Explain 10 types of Computing with examples.

[18]

OR

Q2) What is Web Technologies Development, Explain Web 1.0, 2.0, 3.0, and its features.

[18]

Q3) What is DBMS and its need. Explain with the example of Library Management system.

[17]

OR

Q4) Explain in details and with diagram levels of Database and its purpose and functionality.

[17]

Q5) Explain Web Graphics Guidelines and Various file formats.

[18]

OR

P.T.O.

Q6) What is Image optimization and its importance? Also discuss various methods used for image optimization. **[18]**

Q7) What is interaction Design? Explain 7C's of Effective Communication. **[17]**

OR

Q8) Create a questionnaire of 10 questions for Usability testing for newly launched mobile application of CIELAB Color Measurement. **[17]**



Total No. of Questions : 8]

SEAT No. :

P7701

[6180]-229

[Total No. of Pages : 2

T.E. (Production)

ENGINEERING METROLOGY & INSTRUMENTATION
(2019 Pattern) (Semester - I) (311081 A)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Neat diagrams must be drawn whenever necessary.*
- 2) *Use of electronic pocket calculator is allowed.*
- 3) *Assume suitable data, if necessary.*

Q1) a) List the Quality dimensions. Explain any four. **[8]**

- b) A manufacturer uses injection moulding machine to produce a plastic insulation barrier. He inspects 110 barriers daily, picked up randomly from the production, and determines the number of rejects by visual inspection the results of daily inspection of 110 barriers for 10 days are given below. **[10]**

Day	1	2	3	4	5	6	7	8	9	10
No. of rejects	5	11	10	12	13	6	8	10	12	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 double sampling inspection. **[8]**

- b) A subgroup of 5 items is taken from the manufactured items. After 22 subgroups the values of $\bar{x}$ and R were found to be $\Sigma \bar{x} = 265$ and $\Sigma R = 6.5$. The specification limits for the part are 20.4 ± 0.34 . 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) What is Q.F.D.? Explain house of quality. [9]
b) What are Quality Assurance tools and techniques? Explain Histogram. [9]

OR

- Q4)** a) Explain in detail the objectives of Quality Circles. [9]
b) Write short note on Kaizen and six sigma. [9]

- Q5)** a) Explain with neat sketch generalized measuring system? [7]
b) Explain in detail the following features of measuring instrument. [10]
i) Hysteresis.
ii) Sensitivity.

OR

- Q6)** a) What are the types of Active and Passive transducers? [10]
b) Differentiate between active and passive sensors with example. [7]

- Q7)** a) Explain with neat sketch any one instrument used for Torque Measurement. [8]
b) Define Force. Explain in detail Direct and Indirect methods of force measurement. [9]

OR

- Q8)** a) Explain with neat sketch Electrical Resistance Thermometers (Any two). [8]
b) What are the different types of dynamometers? Explain with neat sketch Prony Brake type dynamometer in Torque measurement. [9]



Total No. of Questions : 8]

SEAT No. :

P7702

[Total No. of Pages : 3

[6180]-230

T.E. (Production)

MATERIAL FORMING TECHNOLOGY

(2019 Pattern) (Semester-I) (311082 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) Use of electronic pocket calculator is allowed.
- 5) Assume Suitable data, if necessary.

Q1) a) What are the defects in wire drawing? Describe the causes and remedies for these flaws. **[8]**

b) Explain stepped cone and multistage wire drawing machine with their relative merits and demerits. **[9]**

OR

Q2) a) Derive the equation of drawing stress for wire drawing **[9]**

b) Explain stepped cone and multistage wire drawing machine with neat sketch. **[8]**

Q3) a) For cold rolling; Show that **[8]**

$$R.L. = \sigma_o \times W_m \times \sqrt{R\Delta h}$$

Mention the assumption made

b) Write short note on (any two) **[10]**

- i) Four high rolling mill
- ii) Sendzimir Cluster Rolling Mill
- iii) Planetary Rolling Mill

OR

P.T.O.

- Q4) a)** A steel strip of size, thickness 100mm $\times$ width 140 mm $\times$ length 1000 mm is rolled in rolls of diameter 600 mm with reduction of 20%. The coefficient of friction is 0.35 The roll rotate at speed 160 rpm. [12]

Determine:

- i) Arc contact length
 - ii) Angle of bite
 - iii) Neutral section thickness
 - iv) Neutral angle
 - v) Forward slip and Backward slip
- b) State true or false with justification. [6]
- i) Friction is essential during rolling process.
 - ii) Rolling load can be decreased by increasing roll diameter

- Q5) a)** Explain various differences between forward and backward extrusion with ram travel vs extrusion pressure diagram. [9]

- b) Explain various extrusion defects with their causes and remedies. [8]

OR

- Q6) a)** Explain how seamless tubes are produced by extrusion process. [9]

- b) An Aluminum billet of 50mm diameter and 1m long is extruded to the final shape shown in Fig1. Calculate: [8]

- i) Extrusion Ratio
- ii) CCD
- iii) Shear (Shape) Factor
- iv) Work done

The flow stress of Aluminum is 60N/mm^2 and coefficient of friction between billet and container is 0.2.

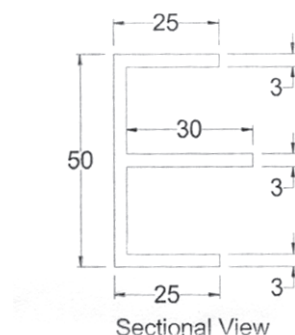


Fig 1 : Extruded Aluminum Section

- Q7)** a) Explain with sketch Magnetic Pulse Forming. [6]
b) Explain Confined explosive forming. [6]
c) Write short note on Stretch Forming. [6]

OR

- Q8)** a) Compare high velocity forming with conventional forming. [6]
b) Discuss various methods of flow forming. [6]
c) Discuss tribological aspects in micro-forming. [6]



Total No. of Questions : 8]

SEAT No. :

P7703

[6180]-231

[Total No. of Pages : 2

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) 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 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) What is the meaning of tool life? Discuss various factors affecting the tool life. **[9]**

b) Discuss formation of primary and secondary shear zone in metal cutting with suitable sketches **[9]**

OR

Q2) a) Explain various direct tool failure criterias in metal cutting with suitable sketches. **[9]**

b) The useful tool life of a HSS tool machining mild steel at 20 m/min is 4 hours. Calculate the tool life when the tool operates at 25 m/min. $n = 125$. **[9]**

Q3) a) Describe in brief wear mechanism due to fatigue, electrochemical effect, oxidation effect, and chemical decomposition. **[9]**

b) Explain effect of tool geometry on tool life. **[8]**

OR

Q4) a) Describe formation of crater wear and flank wear with suitable sketches. **[9]**

b) For a metal machining, the following information is available: **[8]**

Tool change time, = 8 min. Tool re-grind time, = 5 min.

Machine running cost, = Rs. 9 per hour, Tool depreciation per re-grind, = 50 paise, $n = 0.25$, $C = 150$. Calculate the optimum cutting speed.

P.T.O.

- Q5) a)** Explain design procedure of single point cutting tool for rectangular shank with suitable sketches. [9]
- b)** Describe ANSI specification system for insert tool holder. [9]

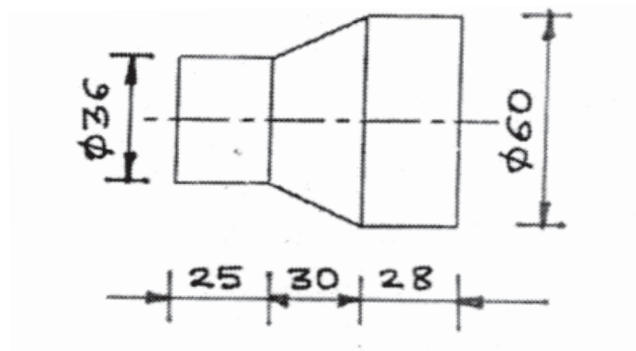
OR

- Q6) a)** Discuss 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 35 m/min on a lathe equipped with a 10 KW motor. Safe stress for tool material is 290 MPa and efficiency of machine tool is 85%. [9]

- Q7) a)** Explain with suitable example the procedure to be followed in designing a flat form tool by graphical method. [9]
- b)** State various guidelines to be used in design of broach. [8]

OR

- Q8) a)** Design a reamer for a through hole diameter 56 H7 in a workpiece of alloy steel. The diameter of the pre-machined hole is 55.60 mm. [8]
- b)** Design a circular form tool for a given job by graphical method when, rake angle = 22° and relief angle = 11° , $a = 10$ mm, $b = 10$ mm. Raw material - Mild steel. [9]



✍ ✍ ✍

Total No. of Questions : 8]

SEAT No. :

P7704

[Total No. of Pages : 3

[6180]-232

T.E. (Production Engineering)

KINEMATICS AND DESIGN OF MACHINES

(2019 Pattern) (Semester-I) (311084(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.
- 5) Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam table is allowed.

Q1) a) Give detail classification of cams and explain any two with suitable sketch. **[8]**

b) Following data relate to a cam profile, in which the follower moves with Simple Harmonic Motion during the out stroke and return stroke. **[10]**

The minimum cam radius = 45 mm.

The diameter of a roller = 18 mm

Lift of roller follower = 40 mm

Offset of follower axis = 10 mm towards right

Angle of ascent = 110°

Angle of dwell between ascent and descent = 50°

Angle of descent = 120°

Angle of remaining dwell = 80°

Cam speed = 200 rpm. Draw cam profile.

OR

Q2) a) Explain the turning moment diagram for four stroke I. C. Engine. **[8]**

b) A riveting machine is driven by a constant torque 3 kW motor. The moving parts including the flywheel are equivalent to 150 kg at 0.6 m radius. One riveting operation takes 1 second and absorbed 10000 Nm of energy. The speed of the flywheel is 300 rpm before riveting. Find the speed immediately after riveting. How many rivets can be closed per minute?**[10]**

P.T.O.

Q3) a) Explain the significance of fatigue stress concentration factor and notch sensitivity. [7]

b) A transmission shaft made of steel having corrected endurance limit 204 N/mm^2 and tensile yield strength 380 N/mm^2 is subjected to a fluctuating torque which varies from 800 Nm clockwise to 200 Nm anticlockwise. Factor of safety is 2. Assuming that there is no stress concentration, determine diameter of shaft for infinite life. Use distortion energy theory of failure. [10]

OR

Q4) a) Explain modified Goodman diagram for fluctuating torsional shear stresses. [7]

b) A cantilever beam of circular cross section, made of cold drawn steel having ultimate tensile strength of 550 N/mm^2 , is fixed at one end and subjected to a completely reversed force of 15 kN at free ends. The force is perpendicular to beam axis. The distance between free and fixed end of beam is 200 mm . The theoretical stress concentration factor and notch sensitivity are 1.35 and 0.85 respectively. The surface finish factor and reliability factor are 0.80 and 0.897 respectively. If the factor of safety is 2, determine diameter of beam for infinite life. [10]

Q5) a) Give comparison between normal distribution and standard distribution curves. [7]

b) A shaft and hole assembly of nominal diameter 30 mm have the following dimension [10]

$$\text{Shaft diameter} = 30_{-0.15}^{-0.1} \text{ mm}$$

$$\text{Hole diameter} = 30_{+0.0}^{+0.1} \text{ mm}$$

Assuming shaft and hole diameters are normally distributed, determine the percentage of assemblies having clearance less than 0.14 mm .

The areas below standard normal distribution curve from zero to z are as follows.

Z	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
Areas	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554	0.4641	0.4713

OR

- Q6) a)** What is standard variable? Explain the concept of three sigma limit. [7]
- b)** Tensile test is carried out on 120 specimen of cast iron. It is observed that the ultimate tensile strength is normally distributed with a mean of 300 MPa and standard deviation of 25 MPa. Determine: [10]
- the number of specimens having ultimate tensile strength less than 275 MPa
 - the number of specimens having ultimate tensile strength between 275 MPa and 335 MPa.

The are as 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

- Q7) a)** Explain the guidelines to be followed in the design of casting parts. [8]
- b)** What is design for assembly (DFA)? Explain the general principles to be followed while designing parts for assembly. [10]

OR

- Q8) a)** Explain the following terms used in Johnson's method of optimum design: [6]
- Functional requirement parameter
 - Geometrical parameter
 - Material parameter
- b)** A tensile bar of length 450 mm is subjected to constant tensile force of 4000 N. If the factor of safety is 1.5, design bar with the objective of minimizing the material weight, using optimum material from the list given below. [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
Aluminium alloy	2800	132	150
Titanium alloy	4500	2200	800



[6180]-233

T.E. (Production Engineering)

FINITE ELEMENT ANALYSIS

(2019 Pattern) (Semester - I) (Elective - I) (311085 (A) - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

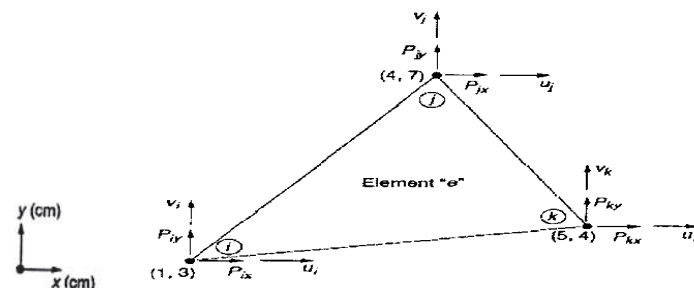
Q1) a) What is meant by plain stress and plain strain condition? Derive relationship between stress-strain in 2D elastic body. [9]

b) Determine the stresses and strains for the 2D CST element using any approach. [8]

OR

Q2) a) A triangular membrane element of thickness $t = 0.12$ cm, with the (x, y) coordinates of nodes indicated beside the node numbers, is shown in Fig. Take $E = 210$ GPa and $\mu = 0.25$, determine the following: [10]

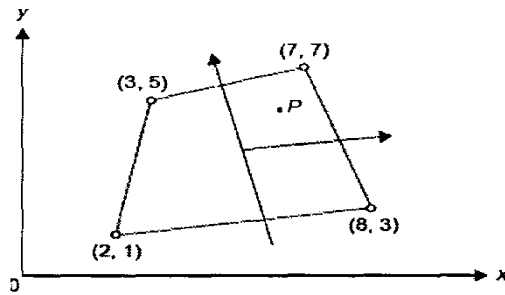
- i) Shape functions of the element, $N_i(x, y)$, $N_j(x, y)$, and $N_k(x, y)$.
- ii) Matrix $[B]$ that relates the strains to the nodal displacements.
- iii) Elasticity matrix $[D]$.
- iv) Element stiffness matrix,



b) Illustrate with examples the plane stress, plane strain, and axisymmetric problems. [7]

P.T.O.

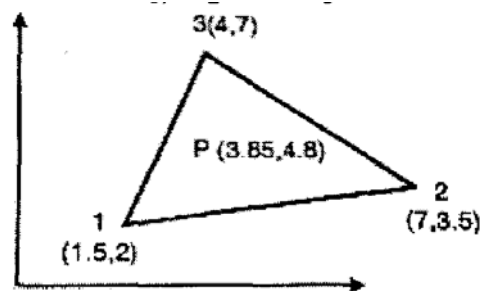
- Q3) a)** In the element shown in Fig., P is the point (6, 4). On this point the load components in x and y directions are 7 kN and 17 kN respectively. Determine its nodal equivalent forces. [10]



- b) Explain with neat sketch isoparametric, superparametric and subparametric elements. [7]

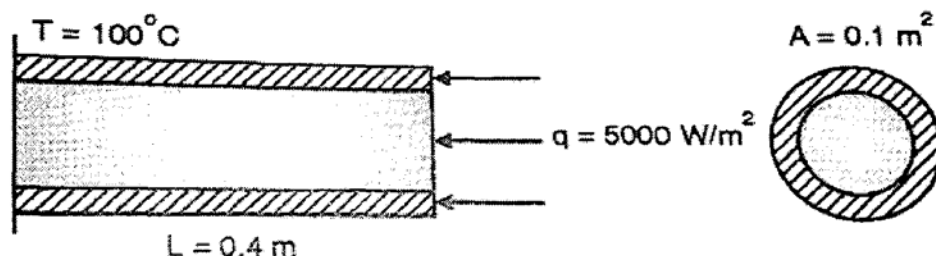
OR

- Q4) a)** Evaluate shape functions N_1 , N_2 and N_3 . [10]



- b) Explain FEA analysis of 2D-quadrilateral element problems. [7]

- Q5) a)** The fin shown in fig. is insulated on the perimeter. The left end has a constant temperature of 110°C . A positive heat flux of $q = 5500\text{W/m}^2$ acts on the right end. Let $K_{xx} = 6\text{ W/m}^\circ\text{C}$ and cross sectional area $A = 0.12\text{ m}^2$. [10]



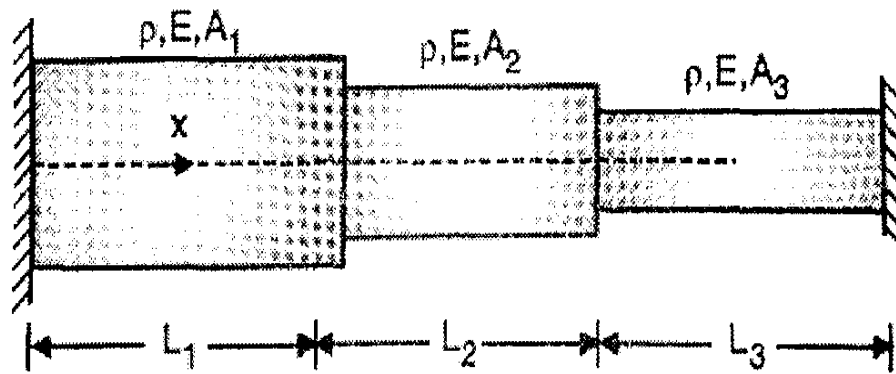
- b) Explain the steps involved in processing step, to solve 1D heat transfer problem using FE Problem. [8]

OR

- Q6) a)** Derive the ESM formulation for 1D steady state heat conduction problems.[10]
- b)** Write short notes on boundary conditions that prevail in 1D steady state heat conduction. [8]

- Q7) a)** Find the un-damped natural frequencies of longitudinal vibration of the stepped bar shown in fig. with the following data using consistent mass matrices:

$$L_1 = L_2 = L_3 = 0.1 \text{ m}, A_1 = 1, A_2 = 2, A_3 = 0.3 \times 10^{-3} \text{ m}^2, E = 2.1 \times 10^{11} \text{ N/m}^2, \text{ and } \rho = 7.8 \times 10^3 \text{ Kg/m}^3. \quad [12]$$



- b)** Differentiate between consistent mass matrix and lumped mass matrix.[6]

OR

- Q8) a)** Explain Eigen value problem for un-damped free vibration system. [6]
- b)** Derive consistent mass matrix for bar and beam element by stating shape functions. [12]



Total No. of Questions : 8]

SEAT No. :

P7706

[6180] - 234

[Total No. of Pages : 2

T.E. (Production Engineering)

ADVANCES IN MANUFACTURING PROCESSES

(2019 Pattern) (Semester - I) (311085 (A) - II) (Elective - I)

Time : 2 ½ 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 jf necessary.*
- 4) *Use of Non-programmable scientjfic calculators is allowed.*
- 5) *Figures to the right indicate full marks.*

- Q1) a)** Explain with neat sketch the principle of working, advantages and applications of evaporative-pattern casting. **[6]**
- b) Explain why squeeze casting produces parts with better mechanical properties, dimensional accuracy, and surface finish than do expendable-mold processes. **[6]**
- c) Explain with neat sketch the principle of working, advantages and applications of continuous casting. **[6]**

OR

- Q2) a)** Outline of production steps in a typical sand-casting operation. **[6]**
- b) Explain with neat sketch the principle of working, advantages and applications of vacuum-mold casting. **[6]**
- c) Describe the differences between expendable and permanent molds. **[6]**

- Q3) a)** What is meant by welding position? With neat sketches explain the different types of welding positions. Define the terms “weld slope” and “weld rotation” in this regard. **[9]**
- b) Discuss the types of joints used in the welds. State the factors which are considered in the design of welded joints. **[8]**

OR

P.T.O.

Q4) a) Explain in the brief the significance and uses of estimation of peak temperature during welding? Write the expression for estimation of peak temperature during welding. [8]

b) A single full penetration weld pass is made on steel using the following parameters $E = 20 \text{ V}$, $I = 200 \text{ A}$, $v = 5 \text{ mm/s}$, $T_0 = 25^\circ\text{C}$, $T_m = 1510^\circ\text{C}$, $\rho_c = 0.0044 \text{ J/mm}^3^\circ\text{C}$, $t = 5\text{mm}$, $f_l = 0.9$, $H_{\text{net}} = 720 \text{ J/mm}$. Calculate the peak temperatures at distances of 1.5 and 3.0 mm from the weld fusion boundary. [9]

Q5) a) Explain with neat sketch the effect of duty cycle on percentage decrease in surface roughness. [8]

b) Explain with neat sketch the principle of working, equipment, mechanism of material removal, process parameters, performance characterization, applications of magnetorheological abrasive flow finishing process. [9]

OR

Q6) a) Explain with neat sketch the principle of working, equipment mechanism of material removal, process parameters, performance characterization, applications of magnetic abrasive finishing process. [8]

b) Explain the constituents of magnetorheological fluids. Explain with cause and effect diagram of process parameters of magnetorheological abrasive flow finishing process [9]

Q7) a) List the various gear grinding methods. Explain in brief the gear grinding process with neat sketch. [6]

b) Write short note on thread grinding, and thread rolling. [6]

c) Explain continuous horizontal broaching machine with neat sketch. [6]

OR

Q8) a) Explain the principle of gear shaping. List advantages and limitations of gear shaping. [6]

b) What are the different methods of thread manufacturing? Explain anyone with a neat sketch. [6]

c) Explain principle of Gear hobbing. List advantages & disadvantages of gear hobbing. [6]



Total No. of Questions : 8]

SEAT No. :

P7707

[Total No. of Pages : 2

[6180] - 235

T.E. (Production Engineering)

MECHATRONICS

(2019 Pattern) (Semester - I) (Elective - I) (311085 (A)-III)

Time : 2 ½ 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) Describe working of Digital to analog convertor. [6]
b) State the six types of Boolean laws. [6]
c) Describe Dual Slope A/D Converter. [6]

OR

- Q2)** a) What are the advantages and disadvantages of the binary system? [6]
b) What are the seven basic designs of logic gates? [6]
c) A 5-bit D/A converter produces $V_{OUT} = 0.2$ V for a digital input of 0001. Find the value of V_{out} for an input of 1111. [6]

- Q3)** a) Explain in brief control system parameters in process control. [6]
b) What are Dead Time Responses in Laplace form? [6]
c) Write note on Laplace transform. [6]

OR

- Q4)** a) Explain Lag Responses in Laplace Form. [6]
b) Which are the types of Second-Order Response in Laplace transform? [6]
c) Describe Process Dynamics Laplace. [6]

- Q5)** a) Explain Derivative Controllers. [6]
b) What is Proportional and Integral Controller? [6]
c) Explain closed-loop control system with PD Controller. [5]

OR

P.T.O.

- Q6)** a) Describe Proportional plus Integral plus Derivative Controller (PID Controller). [6]
b) State general guidelines for designing a PID Controller. [6]
c) Which are the advantages and disadvantages of Proportional Controller? [5]
- Q7)** a) Explain the Ladder language of PLC programming. [6]
b) Describe five basic programming models of PLC. [6]
c) Explain an SFC program for tank level control using PLC. [5]

OR

- Q8)** a) Describe programmable logic controller with sample ladder logic program. [6]
b) State ladder relay instructions of PLC programming. [6]
c) Explain Timer Instructions with example in PLC. [5]



Total No. of Questions : 8]

SEAT No. :

P7708

[6180] - 236

[Total No. of Pages : 2

T.E. (Production)

SUPPLY CHAIN MANAGEMENT

(2019 Pattern) (Semester - I) (Elective - I) (311085 (A) - IV)

Time : 2 ½ 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 jf necessary.
- 4) Use of Non-programmable scientjfic 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) Write short note on Automated Storage/Retrieval. **[6]**

OR

- Q2) a)** Explain Stores System in detail. **[5]**
- b) Write in detail on Store Accounting. **[6]**
- c) Explain Value Analysis in detail. **[6]**
- Q3) a)** Explain the factors influencing distribution network design. **[6]**
- b) How to select a distribution network design? **[6]**
- c) Explain network design decisions using decision trees. **[6]**

OR

- Q4) a)** Explain design options for a distribution network. **[6]**
- b) Explain types of distribution strategies with examples. **[6]**
- c) Discuss the role of cycle inventory in the supply chain. **[6]**

P.T.O.

- Q5)** a) What is Cycle Inventory? Why is Cycle Inventory important? [5]
b) Explain Revenue Management for Multiple Customer Segments. [6]
c) Explain Multiple-item, Multiple-location Inventory Management. [6]

OR

- Q6)** a) Explain the Managing of Uncertainty in Supply Chain. [5]
b) How Supply Chain Risk Pooling Works? [6]
c) Explain four “R” strategy of revenue management. [6]

- Q7)** a) Explain Supply Chain Integration. [6]
b) Explain Supply Chain Process Restructuring. [6]
c) Explain Effective Forecasting in details. [6]

OR

- Q8)** a) Explain Lack of Supply Chain Coordination in detail. [6]
b) What are the causes of Bullwhip effect? [6]
c) Explain the Role of Information in Supply Chain. [6]



[6180]-237

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 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) To design a drawing die for a component as shown in figure no. 1, calculate following values for a sheet of thickness 5 mm and yield strength 360 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

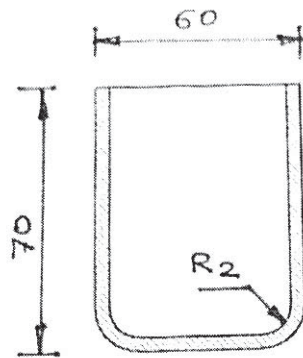


Figure No.1

All dimensions in mm.

- b) Calculate bending force required for 90 degree bending of steel plate of thickness 3 mm in a V die. The die opening can be taken as twelve times the thickness. The length of bent part is 2 meter and UTS is equal to 450 MPa. [6]

OR

P.T.O.

- Q2) a)** What is the meaning of bend allowance in sheet bending? Explain working of types of bending dies with suitable sketches. [9]
- b)** With suitable example, explain use of Area Method in calculation of blank size. [9]

- Q3) a)** How inserts are useful in forging die. Explain types of die inserts used in forging with suitable sketches. [9]
- b)** Discuss various guidelines to be used for designing ribs, webs and drafts in forging die design with suitable sketches. [8]

OR

- Q4) a)** What is the outcome of edging operation in forging? With suitable example explain design of edging impression in forging die design. [9]
- b)** Describe the rules of upset forging with suitable sketches. [8]

- Q5) a)** Discuss die casting defects with causes and remedies. [9]
- b)** Explain classification of dies in die casting. [9]

OR

- Q6) a)** Describe working of cold chamber die casting machine with suitable sketches. [9]
- b)** Explain working of air-injection type die casting machine with suitable sketch. [9]

- Q7) a)** Explain fan gate, pin point gate and film gate with suitable sketches. [9]
- b)** Explain types of runners used in plastic molding with suitable sketches. [8]

OR

- Q8) a)** Determine, [9]
- i) Shot capacity with Nylon 66.
- ii) Number of cavities for a mould by shot capacity method for a given data.

Material = Nylon 66, Mass of the component = 45 g., Swept volume = 100 cm^3 , Density = 1.14 g/cm^3 , Constant = 0.85.

- b)** Describe rotational molding with suitable sketches. [8]



Total No. of Questions : 8]

SEAT No. :

P7710

[Total No. of Pages : 2

[6180]-238

T.E. (Production Engineering)

PRODUCTION AND OPERATIONS MANAGEMENT

(2019 Pattern) (Semester-II) (311089(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, 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 logarithmic table, slide rule is electronic pocket calculator is allowed.
- 5) Figures to the right indicates full marks.

- Q1)** a) Explain in detail the need of production planning and control. [9]
b) Describe in detail centralized PPC and Decentralized PPC. [8]

OR

- Q2)** a) Explain principles of PPC. [9]
b) Write a short note on: role of PPC in POM. [8]

- Q3)** a) Explain the factors Influencing Facility Location. [9]
b) Describe objectives of Material Handling. [8]

OR

- Q4)** a) Explain various types of plant layouts in detail. [9]
b) Explain selection criteria for Material Handling Equipment's. [8]

- Q5)** a) Explain in detail 'P' system and 'Q' system of Inventory control. [9]
b) Arijeet Industries requires 18,000 units/year which will be used in its main product. The ordering cost is Rs. 138 per order and the carrying cost per unit per year is 22% of the purchase price per unit which is Rs.78. [9]
Find,

- i) Economic order quantity.
- ii) Number of orders per year.
- iii) Time between successive orders.

OR

P.T.O.

- Q6)** a) What is selective inventory control? Explain ABC analysis in brief. [9]
b) An automobile factory manufacturer manufactures Engine within the factory. The particulars of this engine are given below.

Demand rate=16,000 units/ year

Production rate = 38,000 units/year

Set-up cost = Rs. 550/ set-up

Carrying cost = Rs. 17 /unit/year

Find EBQ Total cost and Cycle time. [9]

Q7) Write a short note on: [18]

- a) Material Requirement Planning (MRP)
- b) Manufacturing Resource Planning (MRP II)

OR

- Q8)** a) What is Just in time (JIT) manufacturing? Explain JIT in detail. [9]
b) Describe sustainable production and green manufacturing in detail. [9]



Total No. of Questions : 8]

SEAT No. :

P7711

[Total No. of Pages : 2

[6180]-239

T.E. (Production)

PROCESS ENGINEERING AND RESOURCE PLANNING

(2019 Pattern) (Semester-II) (311090 (A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, 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) Assume suitable data if necessary.

Q1) a) Explain in details equilibrium theories? **[8]**

b) Explain the causes of work piece variation? **[9]**

OR

Q2) a) What is mean by mechanical control? **[8]**

b) What are variable influencing work piece control. **[9]**

Q3) a) What are factors to be considered while selecting the tooling? **[9]**

b) What you know about process sheet design, **[8]**

OR

Q4) a) What re factors to be considered while selecting the machine or equipment?[9]

b) Explain the types of tooling. **[8]**

Q5) a) What are the factors affecting process selection. **[9]**

b) Explain TOC? **[9]**

OR

Q6) a) What is mean by capacity utilization? **[9]**

b) Explain in details with example OEE. **[9]**

P.T.O.

Q7) a) Explain how the CAPP (Computer Aided process planning) is useful in Industry. **[9]**

b) Short note on- Generative process planning? **[9]**

OR

Q8) a) Short note on-knowledge based process planning. **[9]**

b) What are advantages of CAPP over manual process planning? **[9]**



Total No. of Questions : 8]

SEAT No. :

P7712

[Total No. of Pages : 2

[6180]-241

T.E. (Production)

NANO MANUFACTURING

(2019 Pattern) (Semester - II) (Elective - II) (311091 A - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume Suitable data if necessary.

- Q1) a)** What is the reason for using unconventional 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]



Total No. of Questions : 8]

SEAT No. :

P7713

[6180]-242

[Total No. of Pages : 2

T.E. (Production)

STATISTICS AND NUMERICAL METHODS

(2019 Pattern) (Semester - II) (Elective - II) (311091 (A) - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) 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 absolute error? Explain in detail. [9]

- b) Evaluate error in the volume V of tank given by $V = (\pi / 4)d^2 l$ at $d = 1.5\text{m}$ and $l = 2.25\text{m}$ if error in measurement of dia. d is $\pm 0.015\text{m}$ & l is $\pm 0.017\text{m}$. [9]

OR

Q2) a) What do you understand from root of an equation, algebraic and transcendental equation? [9]

- b) Find the roots of equation $2x^3 + 4x^2 - 8$ using bisection method. Do three iterations. [9]

Q3) a) Discuss how the curve fitting is significant in engineering experiments.[9]

- b) Explain various methods of least square criteria's. [8]

OR

Q4) a) What is Newton Raphson method? Explain it. [9]

- b) Discuss fitting of power equations. [8]

P.T.O.

Q5) a) Use Simpson's 3/8 rule to evaluate [9]

$$\int_0^{\pi/2} \sqrt{\sin x + \cos x} \, dx = \int_0^{\pi/2} (\sin x + \cos x)^{1/2} \, dx \text{ (Consider only one strip i.e. 3 sub strips).}$$

b) From following table. Calculate $f(3.5)$ using forward difference formula. [9]

x	2	3	4	5	6
y	19	48	99	178	291

OR

Q6) a) Evaluate $\int_0^3 2x - x^2 \, dx$, taking 6 intervals by Trapezoidal rule. [9]

b) The following are the co-ordinates of a set of points. find x at =2 [9]

x	0	1	2	3
y	0	1	7	25

Q7) a) What is multiple optimization? Explain use of multiple optimization in manufacturing. [9]

b) Write short note on [8]

- i) Genetic Algorithm (GA) optimization
- ii) Simulated Annealing (SA) optimization

OR

Q8) a) Discuss Lagrange multipliers in detail. [9]

b) What is classical optimization? Explain with one case study. [8]



Total No. of Questions : 8]

SEAT No. :

P7714

[6180]-243

[Total No. of Pages : 5

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) 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 current assets holding period method of estimating working capital. **[6]**

b) A *pro forma* cost sheet of a company provides the following data: **[6]**

₹	
Costs (per unit):	
Raw materials	52.0
Direct labour	19.5
Overheads	39.0
Total cost (per unit)	110.5
Profit	19.5
Selling price	130.0

The following is the additional information available:

Average raw material in stock: one month; average materials in process: half a month. Credit allowed by suppliers: one month; credit allowed to debtors: two months. Time lag in payment of wages: one and a half weeks. Overheads: one month. One-fourth of sales are on cash basis. Cash balance is expected to be ₹1,20,000. You are required to prepare a statement showing the working capital needed to finance a level of activity of 70,000 units of output. You may assume that production is carried on evenly, throughout the year and wages and overheads accrue similarly.

c) Briefly explain factors that determine the working capital needs of a firm. **[5]**

OR

P.T.O.

- Q2)** a) How is working capital affected by (a) sales (b) technology and production policy and (c) inflation? Explain. [6]
- b) Suppose a firm deposits ₹. 50 lakhs at the end of each year, for 4 years at the rate of 6 per cent interest and compounding is done on a quarterly basis. What is the compound value at the end of the 4th year? [6]
- c) Is there a difference between the project's and the firm's cost of capital? Explain. [5]

- Q3)** a) Write short notes on : [6]
- i) Uniform Costing
- ii) Historical Costing

- b) From the following details of stores receipts and issues of materials in a manufacturing unit, prepare the stores ledger using Base Stock Method of valuing the issues of LIFO; assume base stock 200 tonnes.

1.1.2021	Purchased 500 tones at ₹ 2 per ton	
10.1.2021	Purchased 300 tones at ₹ 2.10 per ton	
15.1.2021	Issued 600 tons	
20.1.2021	Purchased 400 tones at ₹ 2.20 per ton	
25.1.2021	Issued 300 tons	
27.1.2021	Purchased 500 tons at ₹ 2.10 per ton	
31.1.2021	Issued 200 tons	[6]

- c) Ramesh Ltd. has three production departments A, B and C and six service departments. The following figures are extracted from the records of the company:

Production Department		Service Departments.		[5]
A	₹16,000	Stores	₹2,000	
B	₹10,000	Timekeeping	₹3,000	
C	₹12,000	Maintenance	₹1,000	
	₹38,000	Power	₹2,000	
		Welfare	₹1,000	
		Supervision	₹2,000	
		Total	₹49,000	

The other information available in respect of the production departments:

Particulars	Production Departments		
	A	B	C
No. of Employees	40	30	20
No. of Stores Requisition	30	20	10
Horse Power of Machines	500	500	600
Machine Hours	2500	1500	1000

You are required to apportion the costs of various service departments to production departments.

OR

Q4) a) Write short note on : [6]

- i) Marginal Costing
- ii) Standard Costing

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]

Normal rate per hour ₹ 1.80
Standard time per unit 20 seconds

Differentials to be applies are:

80% of the piece rate below the standard;

120% of the piece rate at or above standard.

Worker A produced 1,300 units per day of 8 hours & worker B 1,500 units per day of 8 hours.

c) From the following particulars calculate labour turnover rate by applying: i) Separation Method; ii) Replacement Method and (iii) Flux Method. No. of workers on the pay roll [5]

At the beginning of the month = 900

At the end of the month = 1100

During the month 10 workers left, 40 workers were discharged and 150 workers were recruited. Of these 25 workers are recruited in the vacancies of those leaving while the rest were engaged for an expansion scheme.

Q5) a) Define Standard Costing. What do you understand by Standard Cost and Standard Costing? [6]

b) Discuss the preliminary steps for determination of Standard Cost. [6]

c) Calculate Material Cost Variance from the following information: [6]

Standard Price of material per kg = ₹ 4

Standard Usage of materials = 800 kgs

Actual Usage of materials = 920 kgs

Actual Price of materials per kg = ₹ 3

Actual Cost of materials ₹ 2,760

Standard cost of material for actual production ₹ 3,200

OR

Q6) a) What are the differences between Standard Costing and Estimated Costing? [6]

b) Explain the different types of Material Cost Variance. [6]

c) From the following particulars, calculate Labour Variance: [6]

Standard hours = 200

Standard rate for actual production = ₹ 1 per hour

Actual hour = 190

Actual Rate = ₹ 1.25 per hour

Q7) a) What do you understand by Marginal Costing? Define Marginal Costing. Briefly explain the features of marginal costing. [6]

b) What are the merits and demerits of process costing? [6]

c) From the following information, calculate the amount of profit using marginal cost technique: [6]

Fixed cost ₹ 3,00,000

Variable cost per unit ₹ 5

Selling price per unit ₹ 10

Output level 1,00,000 units

OR

- Q8)** a) What is meant by Cost Driver? Explain role of Cost Driver in tracing costs to products. [6]
- b) Write Short notes on : [6]
- i) Normal Process Loss
 - ii) Abnormal Process Loss
 - iii) Abnormal Gain
- c) In Process A, 1,000 units were introduced at a cost of ₹ 20,000, the other expenditure incurred in the process were materials ₹ 10,000 and wages ₹ 5,000. 10% is the normal loss during production and possess a scrap value of ₹ 3 each. The output of process A was only 800 units. Find out the value of Abnormal Loss. [6]



Total No. of Questions : 8]

SEAT No. :

P-7715

[Total No. of Pages : 2

[6180]-244

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) *Figure to the right indicates full marks.*
- 3) *Neat Diagram must be drawn wherever necessary.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) What is meant by predictive maintenance? Explain in detail. [9]
b) What is the function of availability? What is the importance of availability? What are the types of availability? [8]

OR

- Q2)** a) Describe the condition monitoring technique using maintenance practices. [9]
b) Define Maintainability and availability. Compare it with reliability. [8]

- Q3)** a) What is the purpose of 7 quality control tools? How these 7 QC tools are used to solve problems? [9]
b) What are 8 pillars of TPM? Explain each pillar in detail. [8]

OR

- Q4)** a) How does QFD help in decision making? Explain Quality Function Deployment with relevant case study/example. [9]
b) What is Concurrent Engineering? What is the main goal of concurrent engineering? What are some challenges in implementing concurrent engineering? [8]

P.T.O.

- Q5)** a) Explain in detail the term Computer Aided Process Planning and the types of Computer Aided Process Planning. [9]
- b) What does capital market mean? How does the company raise funds in capital market? [9]

OR

- Q6)** a) Explain Material Resource Planning with example? How can the use of MRP contribute to productivity? [9]
- b) What is the difference between dispatching and scheduling? [9]

- Q7)** a) Explain objectives and functions of Material Management. [9]
- b) What is the difference of money market and capital market? [9]

OR

- Q8)** a) How is machining time estimated? Which are major factors that govern machining time? [9]
- b) Write a short note on Time Value of Money. [9]



Total No. of Questions : 8]

SEAT No. :

P-7716

[Total No. of Pages : 4

[6180]-245

T.E. (Production S/W)

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) Figure 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 and pocket calculator is allowed.

Q1) a) A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below : [12]

- i) To raise the valve through 50 mm during 120° rotation of the cam;
- ii) To keep the valve fully raised through next 30°;
- iii) To lower the valve during next 60°; and
- iv) To keep the valve closed during rest of the revolution i.e. 150°;

The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm. Draw the profile of the cam when the line of the stroke is offset 15 mm from the axis of the cam shaft.

The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion. Determine the maximum acceleration of the valve rod when the cam shaft rotates at 100 r.p.m.

Draw the displacement, the velocity and the acceleration diagrams for one complete revolution of the cam.

- b) What is punching press? Describe with neat sketch the operation of flywheel in punching press. [6]

P.T.O.

OR

Q2) a) Sketch different types of cams and follower and name it. [6]

b) A punching press is required to punch 40 mm diameter holes in a plate of 15 mm thickness at the rate of 30 holes per minute. It requires 6 N-m of energy per mm^2 of sheared area. If the punching takes 1/10 of a second and the r.p.m. of the flywheel varies from 160 to 140, determine the mass of the flywheel having radius of gyration of 1 metre. [12]

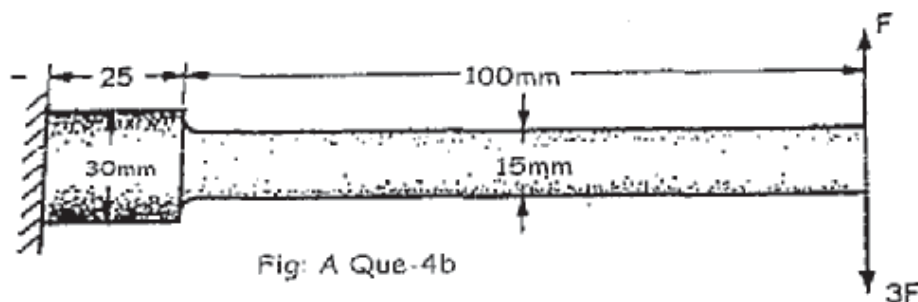
Q3) a) What is stress concentration? What are the various causes of stress concentration? Discuss the various methods of reducing the effect of stress concentration. [8]

b) A steel bar of 50 mm diameter is subjected to a completely reversed bending stress 250 N/mm^2 . The ultimate tensile strength of steel is 600 N/mm^2 . The surface finish factor and size factor are 0.43 and 0.85 respectively. The reliability factor is 0.897. Assuming there is no stress concentration, determine the life of the bar. [9]

OR

Q4) a) Explain the laboratory method of determining endurance limit of ferrous material with neat sketch. [8]

b) A cantilever beam made of cold drawn steel 35C8 ($S_{ut} = 550 \text{ N/mm}^2$ and $S_{yt} = 320 \text{ N/mm}^2$), shown in Fig. A, is subjected to a load which varies from $-F$ to $3F$. The surface finish factor and size factor are 0.89 and 0.85 respectively. The theoretical stress concentration factor and notch sensitivity at the fillet are 1.42 and 0.9 respectively. If the factor of safety is 2, determine the maximum value of F , which the cantilever beam can withstand for infinite life. [9]



Q5) a) Explain the terms : **[8]**

- i) Assignable causes ii) Chance causes
- iii) Design tolerance iv) Natural tolerance

b) The tensile strengths of a population of 700 connecting rods are normally distributed with a mean of 450 N/mm² and a standard deviation of 50 N/mm². Determine : **[10]**

- i) the number of connecting rods having strength less than 395 N/mm²; and
- ii) the number of connecting rods having strength between 395 N/mm² and 595N/mm²

(Exa 5.9; Page 368)

Z	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7
Area	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554
Z	2.8	2.9	3.0	3.1				
Area	0.4974	0.4981	0.4987	0.4990				

[Use linear interpolation for values in between.]

OR

Q6) a) What is the importance of the reliability in the modern engineering design? How it differs from the factor of safety? **[6]**

b) The breaking capacities of the batch of two hundred wires are tabulated as follows : **[12]**

Breaking capacity, N	Number of Wires
260-280	4
280-300	24
300-320	100
320-340	64
340-360	8

The designer has specified 270 N and 350 N as lower and upper limits respectively for the breaking capacity of wires. Determine the percentage of wires likely to be rejected.

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	2.8	2.9	3.0	3.1
Area	0.4918	0.4938	0.4953	0.4965	0.4974	0.4981	0.4987	0.4990

Use linear interpolation for values in between.

- Q7)** a) What is design for assembly (DFA)? Explain the general principles to be followed for DFA. [9]
- b) Explain the following terms : [8]
- i) Optimum design
 - ii) Adequate design
 - iii) Material parameters
 - iv) Primary design equation

OR

- Q8)** a) Explain the guidelines to be followed in the design of [10]
- i) Casting process
 - ii) Forging process
- b) What is concurrent engineering? What are its benefits in the product design? [7]



[6180]-246

T.E. (Production Sandwich Engineering)
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, 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 and mention it clearly.*
- 5) *Use of non-programmable calculaor is allowed.*

Q1) a) Show that for rolling process $(\Delta h)_{\max} = \mu^2 R$

Where, $(\Delta h)_{\max}$ = Maximum draft μ = Coefficient of friction

R = Rolling radius

Consider rolling of strip initial thickness h_0 . **[8]**

b) Calculate the ruling load to reduce steel 600mm wide and 30mm thick by 20%. Roll diameter 800mm flow stress of steel 150 N/mm². 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 3.5 mm at 1060° C. When yield stress was 1.05 KN/mm² 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/mm². Passion ration = 0.35, Coefficient of Friction = 0.3. **[8]**

- Q3) a)** For a slab casting $500 \times 250 \times 50$ mm which to be made in cast iron. Calculate the choke area. Take density of material as 7.86 gms/cm^3 , fluidity of iron at 22 inches, mass density of molten metal (ρ) as 6.09 gms/cm^3 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 diameter equal) necessary to feed a steel slab casting $25 \times 25 \times 5$ 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 = 0.9m

Thickness = 0.2m Tool Bite = 0.3 m

$\sigma_0 = 50 \text{ MPa}$ = at start completion of forging

$\sigma_0 = 150 \text{ MPa}$ = 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

$\mu = 0.05$ and yield stress 530 N/mm^2

- ii) at 900°C , $\sigma_0 = 60 \text{ Mpa}$ 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 $\times$ 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.

What is the diameter of work piece after forging? [9]

- Q7)** a) What is the difference between toggle clamping and ram clamping in injection molding machines? [9]
- b) Explain following part injection mould i) Guide pillar & guide bush
ii) Register ring [9]

OR

- Q8)** a) Differentiate between Two plate mold Three plate mold with figure. [9]
- b) What are the various Types of Gates used in Injection Molding? Explain with neat sketch. [9]



Total No. of Questions : 8]

SEAT No. :

P-7718

[Total No. of Pages : 2

[6180]-247

T.E. (Production Sandwich)

METROLOGY AND QUALITY CONTROL

(2019 Pattern) (Semester - II) (311125(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Elaborate concept of machine vision system. [6]

b) Classify and explain types of CMM. [6]

c) State functioning of AC and DC Interferometer. [5]

OR

Q2) a) What are probes? How to classify probes. [6]

b) Explain procedure to measure roundness error on CMM. [6]

c) What are applications of laser interferometry. [5]

Q3) a) Discuss various methods for measurement of straightness. [6]

b) State procedure of two wire method. [6]

c) Draw neat sketch of profile projector. How to measure thread geometry on profile projector. [6]

OR

Q4) a) Explain procedure of three wire method. [6]

b) Draw neat sketch of gear tooth Vernier caliper. Elaborate it. [6]

c) Discuss various methods for measurement of flatness. [6]

P.T.O.

- Q5)** a) Explain various power measuring techniques. [6]
b) Describe various flow measuring techniques. [6]
c) Write a short note on Venturimeter. [5]

OR

- Q6)** a) Explain construction and working of thermocouple with neat sketch. [6]
b) What is reliability? Why study of reliability is essential. [5]
c) Draw neat sketch of mechanical force measurement device. [6]

- Q7)** a) Explain the concept of Statistical quality control. State its advantages. [6]
b) Differentiate between assignable and non-assignable causes. [6]
c) Define the following terms with respect to SQC : [6]
i) Data
ii) Sample
iii) Variable data
iv) Attribute data

OR

- Q8)** a) Explain the use of control charts in quality control. Also state different types of control charts. [6]
b) What is meant by process capability? Explain how it influences the quality control. [6]
c) Write a short note on : [6]
i) P chart
ii) C chart



Total No. of Questions : 8]

SEAT No. :

P-7719

[Total No. of Pages : 3

[6180]-248

T.E. (Production Sandwich)

STATISTICS AND NUMERICAL OPTIMIZATION METHODS

(2019 Pattern) (Semester-II) (311088(A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figure to the right side 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) Perform five iteration of the bisection method to obtain the smallest positive root of the equation $f(x) = x^3 - 5x + 1 = 0$ [9]

b) Perform the Newton Raphson method to obtain the root of the equation $f(x) = \cos x - x e^x = 0$ [8]

OR

Q2) a) Solve following equation using gauss elimination method [8]

$$10X_1 - X_2 + 2X_3 = 4$$

$$X_1 + 10X_2 - X_3 = 3$$

$$2X_1 + 3X_2 + 20X_3 = 7$$

b) Solve following equation using gauss Seidal method upto three approximations [9]

$$20X + Y - 2Z = 17$$

$$3X + 20Y - Z = -18$$

$$2X - 3y + 20Z = 25$$

P.T.O.

- Q3) a)** Fit a straight line using least square method to the following data. [8]

x	6	7	7	8	8	8	9	9	10
y	5	5	4	5	4	3	4	3	3

- b) Evaluate $f(3)$ by Using Lagrange's Interpolation formula from the following data [9]

x	0	1	2	5
f(x)	2	3	12	147

OR

- Q4) a)** State the order of the polynomial which might be suitable for the following Function. Calculate $f(160)$ using Newton Forward Difference Method. [9]

x	100	150	200	250	300	350	400
y	10.63	13.03	15.04	16.81	18.42	19.90	21.27

- b) Using a method of least square fit the curve $y = ae^{bx}$ to the following data. [8]

x	0	1	2	3
y	1.05	2.10	3.85	8.30

- Q5) a)** State the order of the polynomial which might be suitable for the following function. Calculate $f(1.5)$ using Newton Divided Difference Method. [9]

i	0	1	2	3	4
x	1	2	3	4	5
f(x)	0	7	26	63	124

- b) Evaluate $\int_0^{0.6} e^{x-2}$ by using Trapezoidal Method and Simpson's $1/3^{\text{rd}}$ rule corresponding to seven intervals. [9]

OR

- Q6) a)** Using Newton Backward Difference Method formula, Construct an interpolating Polynomial of degree 3 for the data [9]

$$f(-0.75) = -0.0718125,$$

$$f(-0.5) = -0.02475$$

$$f(-0.25) = 0.3349375$$

$$f(0) = 1.10100$$

Hence find $f(-1/3)$

- b) Use Simpsons 1/3rd rule and Trapezoidal Method to evaluate $\int_0^1 \left(\frac{x^2}{1+x^3} \right) dx$ corresponding to Four intervals. [9]

- Q7)** a) Describe in brief Method of Lagrange multipliers. [9]
b) Explain the Generalized reduced gradient Method. [9]

OR

- Q8)** a) Write in brief steepest descent method suitable example. [9]
b) Brief on : genetic algorithm and simulated annealing. [9]



Total No. of Questions : 8]

SEAT No. :

P-7720

[Total No. of Pages : 2

[6180]-249

T.E. (Production Sandwich)

ADVANCED MATERIALS

(2019 Pattern) (Semester - II) (311126A)-I (Elective-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1) a)** What are the manufacturing methods involved in Autoclave for advanced materials production? **[8]**
- b) What is the purpose and significance of conducting a macromechanical analysis of a lamina? **[9]**

OR

- Q2) a)** Explain the process of RTM and its role in manufacturing advanced materials? **[9]**
- b) What is the role of the laminate-laminate code in the macromechanical analysis of laminates? **[8]**

OR

- Q3) a)** Explain the classifications of Functionally Graded Materials with its Applications? **[8]**
- b) Explain the Shape Memory Alloys (SMAs) with its Classifications, Composition and Applications? **[9]**
- Q4) a)** What are different systems used in the preparation of Functionally Graded Materials? Explain some notable properties? **[8]**
- b) Can you give examples of applications where Shape Memory Alloys are commonly used? **[9]**

P.T.O.

- Q5) 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]**

OR

- Q6) a)** What are the unique properties exhibited by materials at the nano scale? State their advantages and disadvantages? **[9]**
- b)** How does bio-functionality play a role in the design and development of biomaterials? **[9]**

- Q7) a)** Explain the composition of Nickel base super alloys and their role in enhancing properties and State their Applications? **[9]**
- b)** What are the important metallurgical aspects of Aluminum alloys with their properties and Applications? **[9]**

OR

- Q8) a)** What are the strengthening mechanisms employed in Iron base super alloys? State their properties and Applications? **[9]**
- b)** What are the significant properties of Titanium alloys? State their important metallurgical aspects and Applications? **[9]**



Total No. of Questions : 8]

SEAT No. :

P-7721

[Total No. of Pages : 3

[6180]-250

T.E. (Production/Sandwich Engineering)

COSTING AND COST CONTROL

(2019 Pattern) (Semester-II) (311126A-II) (Elective-II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) a) Explain direct cost, indirect cost for estimating machining cost. [8]

b) Following information is made available from the costing records of a factory: **[10]**

- i) The original cost of the machine: Rs.1,00,000
Estimated life: 10 years
Residual Value: Rs. 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 Rs. 500 per month.
- iv) Two operators attend the machine during operations along with two other machines. Their total wages including fringe benefits, amounting to Rs. 5,000 per month is paid.
- v) Other overheads attributable to the machine are Rs. 10,431 per year.
Using above data, calculate machine hour rate.

OR

P.T.O.

- Q2) a)** What is Machine Hour Rate? What are its advantages and disadvantages? [8]
- b)** The following information has been collected from the cost records of a small company for the year ended 31st March, 2014: [10]

Rs.

Direct Materials	2,50,000
Direct Labour	2,00,000
Direct Expenses	20,000
Works Overheads	1,60,000
Office Expenses	94,500

The total number of direct labour hours were 1,00,000 involving 40,000 machine hours. What should be the price quoted for a job involving 2,000 labour hours @Rs. 3 per hour, 1,000 machine hours and Rs.10,000 in direct materials if the profit desired is 20% on the selling price?

- Q3) a)** Distinguish between allocation, apportionment and absorption in connection with factory overhead expenses. [8]
- b)** The following information is obtained from the records of a factory regarding the execution of two orders for the same quantity of a commodity : [9]

	Materials Rs.	Wages Rs.	Sale Price Rs.	Percentage of profit on Cost of Production%
First order	25,000	20,000	85,800	10
Second order		36,000	28,000	1,23,760 12

Find out the percentage of Factory Overheads and Office Overheads.

OR

- Q4) a)** What is meant by absorption of overheads? What factors should be considered in obtaining a rate for absorption of overheads? [9]
- b)** What are the general considerations that should decide your choice of basis for distribution of overhead costs to departments? [8]
- Q5) a)** What is Job Costing? Discuss the nature of contract costing and explain how costs are recorded in contracts. [8]
- b)** What is a 'Cost Driver'? What is the role of cost driver in tracing cost to products? [9]

OR

- Q6)** a) Distinguish between ‘ Job Costing’ and ‘Process Costing’ & ‘Job Costing’ and ‘Contract Costing’. **[8]**
- b) What are the benefits of activity based costing? Distinguish between traditional costing system and activity based costing. **[9]**

Q7) Write Short note on: **[18]**

- a) Budget and budgetary control
- b) Profit volume ratio

OR

Q8) Write Short note on: **[18]**

- a) Value analysis and Value engineering
- b) Zero Base Budgeting



Total No. of Questions : 8]

SEAT No. :

P-7722

[Total No. of Pages : 2

[6180]-251

T.E. (Production/Sandwich)

ADVANCED JOINING TECHNOLOGY

(2019 Pattern) (Semester-II) (311126A-III) (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 indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.

- Q1)** a) Explain Roll welding and Hot pressure welding processes in short. Give its applications. **[8]**
- b) Explain Explosive welding stating its advantages, disadvantages and applications of the process. **[10]**

OR

- Q2)** a) Write short notes on : **[10]**
- i) adhesive bonding
 - ii) Brazing & Soldering
- b) Explain Friction welding stating its advantages, disadvantages and applications of the process. **[8]**
- Q3)** a) Explain Thermit welding stating its advantages, disadvantages and applications of the process. **[9]**
- b) Explain Atomic hydrogen welding stating its advantages, disadvantages and applications of the process. **[8]**

OR

- Q4)** a) Explain Friction stir welding stating its advantages, disadvantages and applications of the process. **[9]**
- b) Write short notes on: **[8]**
- i) Cold Metal Transfer Joining
 - ii) 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 Ultrasonic Testing of weldments. **[9]**

OR

- Q6) a)** Write short notes on : **[8]**
i) Radio graphs of weldments
ii) Life assessment of weldments
b) Describe in short, the liquid penetration test of Weldments. **[10]**

- Q7) a)** Write Short notes on : **[8]**
i) Weld thermal cycles and their effects
ii) concept of HAZ
b) What do you understand by weldability? Explain how weldability is assessed in short. **[9]**

OR

- Q8) a)** Explain the following weld defects, their causes and remedies. **[9]**
i) Lack of penetration
ii) Porosity
iii) Lack of fusion
b) What are different weldability test? Describe any one in short. **[8]**



Total No. of Questions : 8]

SEAT No. :

P-7723

[Total No. of Pages : 2

[6180]-252

T.E. (Production Engineering) (Sandwich)

WORLD CLASS MANUFACTURING

(2019 Pattern) (Semester-II) (311126A-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 indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.*

Q1) a) Name and briefly explain the various machine cells and layouts used in industries. **[9]**

b) What is Production Flow Analysis? List the steps involved in carrying out PFA. **[8]**

OR

Q2) a) What are the various types of coding systems widely used? Explain in brief. **[9]**

b) State and explain characteristics of Group Technology. **[8]**

Q3) a) What is Genechi Genbitsu? State and explain its importance with suitable example. **[9]**

b) Distinguish between preventive maintenance and breakdown maintenance. **[8]**

OR

Q4) a) Explain the concept of Total Productive Maintenance (TPM) in brief. **[9]**

b) What is Quality Function Deployment? Explain in brief. **[8]**

P.T.O.

- Q5) a)** What is Drum-Buffer-Rope Approach? Explain it in detail. **[9]**
- b) What is throughput accounting in Theory of Constraints? What are the limitations of throughput accounting? How do you calculate throughput in accounting? **[9]**

OR

- Q6) a)** What is Bottleneck Scheduling? Explain its application of TOC in industry. **[9]**
- b) What is 5S methodology? State and explain in details steps in 5S Methodology. **[9]**

- Q7) 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]**

OR

- Q8) a)** What is Lean Thinking and how can it be applied to logistics? **[9]**
- b) What are Cyber-Physical Systems? Write down benefits of Cyber Physical Systems. **[9]**



Total No. of Questions : 8]

SEAT No. :

P7724

[6180]-253

[Total No. of Pages : 4

T.E. (Mechatronics Engineering)
MACHINE DESIGN
(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) Neat diagram must be drawn wherever necessary.
- 3) Use of drawing instruments, electronic pocket calculators are allowed.
- 4) Figure to the right indicates full marks.
- 5) Assume suitable data, if necessary.

Q1) a) A square threaded screw having 50 mm nominal diameter and 10 mm pitch is used for lifting a load of 20 KN through distance of 170 mm. Find the work done in lifting the load and the efficiency of the screw, when: **[10]**

- i) The load rotates with the screw; and
- ii) The load rests on the loose head which does not rotate with the screw.

The external and internal diameters of the bearing surface of the loose head are 60mm and 10mm respectively, while the coefficient of friction for the bearing surface is 0.08.

- b) Discuss efficiency of Power Screw. **[4]**
- c) Explain the differential screw with neat sketch. **[4]**

OR

Q2) a) In a machine tool application, the tool holder is pulled by means of an operating nut mounted on a screw. The tool holders travels at a speed of 5m/min. The screw has a single start square thread of 48 mm. nominal diameter and 8 mm pitch. The operating nut exerts a force of 500 N to drive the tool holder. The mean radius of friction collar is 40 mm. If the coefficient of friction for thread and collar surface is 0.15, **[10]**

P.T.O.

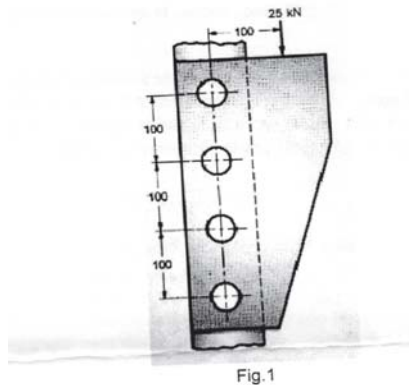
calculate:

- i) The power required to drive the screw.
 - ii) The efficiency of the mechanism.
- b) Derive the formula for torque required to raise the load by a square threaded power screw. [4]
- c) Explain the self-locking and over-hauling screw. [4]
- Q3) a)** A cantilever beam of circular cross section, made of alloy steel 30Ni4Cr1($S_{ut} = 1500 \text{ N/mm}^2$), is fixed at one end and subjected to a completely reversed force of 1000N at the free end. The force is perpendicular to the axis of beam. The distance between fixed and free end of the cantilever beam is 400 mm. The theoretical stress concentration factor and notch sensitivity are 1.33 and 0.85 respectively. The surface finish factor and size factor are 0.79 and 0.85 respectively. The temperature factor and reliability factor are 0.975 and 0.868 respectively. The desired life of beam is 50000 cycles. If the required factor of safety is 1.5, determine the diameter of beam. [10]
- b) Explain the modified Goodman's diagram for axial and bending fluctuating stresses. [4]
- c) Write short note on: [4]
- i) Stress Concentration
 - ii) Endurance strength

OR

- Q4) a)** A circular bar, made of steel, is subjected to an axial load which varies from - 300 kN to 700 kN. The endurance limit is 265 MPa, while tensile yield strength is 350MPa. The stress concentration factor is 1.8. If the required factor of safety is 2.0, determine the diameter of rod. [10]
- b) List and explain the factors affecting the endurance strength. [4]
- c) What are the causes of stress concentration? [4]

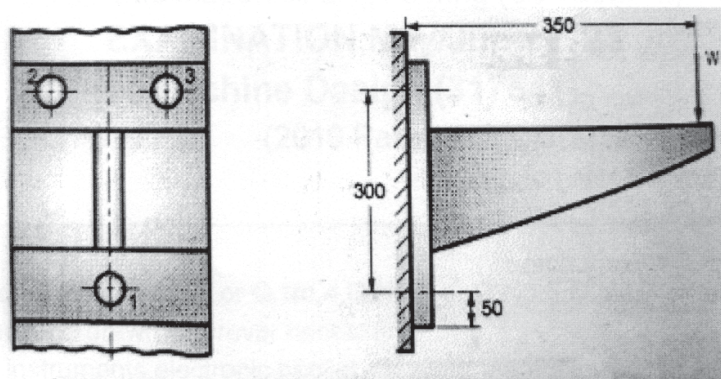
- Q5) a)** A bracket, fixed to a vertical column by means of four identical bolts, is subjected to an eccentric load of 25 kN as shown in fig.1. If the permissible shear stress for the bolt is 60 N/mm^2 , determine the size of the bolt. [7]



- b) What is meant by preloading of bolts? State the advantages and Applications. [5]
- c) Give a welding symbol system standardized by the American Welding Society. [5]

OR

- Q6) a)** A steel bracket is fixed to the vertical support by three bolts of size M20, two at the top and one at the bottom, as shown in fig.2. If the permissible tensile stress for the bolt is 60 N/mm^2 , determine the maximum load that can be supported by bracket at 350 mm from the vertical support. [7]



- b) Explain Turn Buckle, also state two applications of it. [5]
- c) State advantages and limitations of welded Joints. [5]

- Q7) a)** It is required to design a helical compression spring of circular wire, subjected to an axial load, which varies from 2.5 KN. to 3.5KN. For this range of load the deflection of spring should be limited to 5 mm. The spring index is 5 and the spring has square and ground ends. For spring wire material, $S_{ut} = 1050$ MPa. and $G = 81370$ MPa. If permissible shear stress for the spring wire is $0.5 S_{ut}$ calculate:
- i) The wire diameter and mean coil diameter.
 - ii) The required spring rate
 - iii) The number of active coils and total number of coils
 - iv) The solid length of spring
 - v) The free length of spring [7]
- b) Write the difference between Helical tension spring and Helical compression spring. [5]
- c) Explain leaf spring with neat sketch. [5]

OR

- Q8) a)** A load of 1KN. Is dropped axially on a closed coiled helical compression spring from a height of 250 mm. The spring has 20 active coils. The wire diameter is 20mm while spring index is 8. If the modulus of rigidity for the spring material is 0.84×10^5 MPa, determine : [7]
- i) The deflection of spring and
 - ii) The stress induced in the spring
- b) Explain different types of stresses induced in the helical spring. [5]
- c) Explain with a neat sketch, nipping of leaf springs. [5]



Total No. of Questions : 8]

SEAT No. :

P7725

[Total No. of Pages : 2

[6180]-254

**T.E. (Mechatronics Engineering)
MANUFACTURING PROCESSES
(2019 Pattern) (Semester-I) (317542)**

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) Use of drawing instruments, electronic pocket calculators are allowed.
- 4) Figure to the right indicate full marks.
- 5) Assume Suitable data if necessary.

- Q1) a)** Index 69 division by compound indexing method **[10]**
b) Explain single point cutting tool geometry with figure **[4]**
c) Explain with neat sketch orthogonal and oblique cutting method **[4]**

OR

- Q2) a)** A metal cutting test was conducted on a lathe and following were noted: **[10]**

Vertical force on the tool = 2000 N,

Depth of cut = 3.00 mm

Feed = 6 cuts/mm

Overall efficiency of machine = 80%

Determine the

Power in N/m² of the chip cross sectional area on the tool,

Power required for cutting the material

- b) Explain the relation between shear velocity, cutting velocity and chip flow velocity **[4]**
- c) Explain with neat sketch whitworth quick return mechanism of shaper machine **[4]**

P.T.O.

- Q3)** a) Explain with a neat sketch of oxy-acetylene gas welding . Describe the types of flame with neat sketch. [8]
b) What is adhesive bonding ? What are its types? What are its application? [5]
c) What is the soldering process? why flux is used in soldering [5]

OR

- Q4)** a) Explain with a neat sketch of the Arc welding process. Also give the advantages , limitations and application of Arc welding. [10]
b) Describe the types of bond between the added material and base metal.[4]
c) What precaution are necessary in handling oxy acetylene cylinder. [4]

- Q5)** a) Explain the construction and working principle of EDM with neat sketch [7]
b) What are the application of ultrasonic machining ? Why can very hard material be cut better by ultrasonic machining than soft ones? [5]
c) What is FDM in 3 D printing? what are the advantages of fused deposition modeling [5]

OR

- Q6)** a) What is the principle behind Electrical Discharge Machining ? Discuss briefly the process indicating voltage, current and temperature. [7]
b) Give a schematic diagram of laser beam machining. Explain interaction of laser beam with workpiece. [5]
c) Explain Selective laser sintering process . Give its advantages and limitations. [5]

- Q7)** a) Explain diffusion process in I C. Fabrication with neat sketch [7]
b) Explain digital integrated circuit with neat sketch. [5]
c) What is electric packaging? How are electronic components packaged?[5]

OR

- Q8)** a) Explain the basic fabrication process of the integrated circuit. [7]
b) Which material is used for PCB fabrication? Give applications of PCB?[5]
c) short note on: [5]
i) Processing sequence steps in ICs
ii) Trends in ICs



Total No. of Questions : 8]

SEAT No. :

P7726

[6180]-255

[Total No. of Pages : 3

T.E. (Mechatronics Engineering)
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 diagram must be drawn wherever necessary.
- 3) Use of drawing instruments electronic pocket calculators are allowed.
- 4) Figure to the right indicates full marks.
- 5) Assume suitable data, if necessary.

Q1) a) What is the importance of stability? Define absolute & relative stability.[4]

b) Sketch root locus of the unity feedback system with open loop transfer

function $G(s) = \frac{k}{s(s+1)(s+4)}$ [8]

c) Examine stability of the following system given by [6]

$$s^4 + 5s^3 + 2s^2 + 3s + 1$$

using Routh-Hurwitz stability criterion. Find the number of roots in the right half of the s-plane.

OR

Q2) a) Define stable, unstable, marginally stable and conditionally stable systems. [6]

b) A unity feedback system has the loop transfer function, [8]

$$G(s) = \frac{k}{s(s+1)(s+3)(s+4)}$$

Determine : Breakaway points, intersection with imaginary axis. Plot root locus.

c) What are the advantages and limitations of Routh Hurwitz stability criterion. [4]

P.T.O.

- Q3)** a) Explain Nyquist stability criterion. [6]
 b) Define the terms : [4]
 i) Bandwidth
 ii) Gain Margin
 iii) Phase cross over frequency
 c) If $G(s)H(s) = \frac{1}{s(s+1)}$ [8]

Find Resonance peak and resonance frequency.

OR

- Q4)** a) Explain advantages and limitations of frequency domain approach. [6]
 b) For the system with closed loop transfer function [8]

$$G(s) = \frac{25}{s^2 + 6s + 25}$$

determine resonant peak, resonant frequency, damping factor, and natural frequency.

- c) State and explain the various frequency domain specifications. [4]
Q5) a) State the advantages of Bode plot. [4]
 b) What are asymptotic Bode plot? How correction can be applied to accurate Bode plot? [6]
 c) For the unity feedback system with open loop transfer function. [8]

$$G(s) = \frac{50}{s(s+2)(s+10)}$$

sketch Bode plot. Determine gain crossover frequency, phase crossover frequency, gain margin and phase margin. Also investigate the stability.

OR

- Q6)** a) Discuss the nature of bode plot of : **[8]**
- i) Pole at origin
 - ii) Simple pole
 - iii) Simple zero
 - iv) Quadratic pole
- b) Explain steps to sketch Bode plot. **[4]**
- c) Explain the procedure to obtain gain margin and phase margin from the Bode plot. **[6]**

- Q7)** a) What do you understand by Integral Reset in PID controller? Explain with suitable example. **[6]**
- b) Why derivative mode is called anticipatory control mode. **[5]**
- c) What is a PID controller? Explain in detail. **[5]**

OR

- Q8)** a) Explain the Ziegler - Nichols tuning method of tuning a PID controller. **[6]**
- b) What is integral control mode? State its characteristics. **[5]**
- c) Explain concept of industrial automation. **[5]**



Total No. of Questions : 8]

SEAT No. :

P7727

[6180]-256

[Total No. of Pages : 2

T.E. (Mechatronics Engineering)
DIGITAL SIGNAL PROCESSING
(2019 Pattern) (Semester - I) (317544)

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) Figure to the right indicates full marks.
- 3) Neat diagram must be drawn wherever necessary.
- 4) Assume suitable data, if necessary.

- Q1)** a) Why is DTFT used? Write formula for discrete time Fourier transform. **[4]**
- b) $x[n] = (1/4)^n u[n]$. Find Fourier transform of $x[n]$. **[6]**
- c) Write symmetry, convolution, frequency shifting and time shifting property of DTFT. **[8]**

OR

- Q2)** a) Find the impulse response of following difference equation using DTFT
 $y[n] + (1/4)y[n-1] + (1/8)y[n-2] = x[n] - x[n-1]$ **[10]**
- b) List the properties for Discrete Time Fourier transform. Write mathematical expressions and significance for any 3 properties. **[8]**

OR

- Q3)** a) Find the response of an filter with impulse response $h[n] = [1, 2, 4]$ to the input sequence $x[n] = [1, 2]$. **[8]**
- b) Determine DFT for the sequence **[10]**

$$x[n] = 1/4 \text{ for } 0 \leq n \leq 2$$

$$= 0 \text{ elsewhere}$$

OR

P.T.O.

- Q4)** a) List the properties for DFT. Write mathematical expressions and significance for any 3 properties. [8]
- b) Given $x[n] = [0, 1, 2, 3]$ Find $X(k)$ using DIT FFT algorithm. [10]

- Q5)** a) Compare IIR and FIR filter techniques. Write at least 4 points. [6]
- b) Write steps for designing a digital filter using bilinear transformation.
- Obtain $H(Z)$ if $H_a(s) = 1/(s+1)^2$ if $T=0.1$ Sec using bilinear transformation. [11]

OR

- Q6)** a) For analog transfer function determine $H(z)$ using impulse invariant technique. Assume $T = 1$ sec. [8]

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

- b) Explain the impulse invariance technique in detail. What is drawback of it? How Bilinear transformation removes it? [9]
- Q7)** a) How DSP can be used for vibration analysis and control? Explain with the help of a neat block diagram and appropriate waveforms. [8]
- b) List various windowing techniques that you have studied. Comment on frequency domain characteristics of different window techniques used in FIR filter design. [9]

OR

- Q8)** a) Draw parallel realization of [8]
 $H(z) = (1 - Z^{-1}) / (1 - 0.2Z^{-1} - 0.15Z^{-2})$
- b) List various applications of DSP. Explain any one application in detail by drawing a neat block diagram and appropriate waveforms. [9]



Total No. of Questions : 8]

SEAT No. :

P7728

[6180] - 257

[Total No. of Pages : 2

T.E. (Mechatronics Engineering)
MICROCONTROLLER
(2019 Pattern) (Semester - I) (317545)

Time : 2 ½ 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 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) Explain with the help of diagram the structure of TCON and TMOD Register. **[6]**
- c) Write an Embedded c program for 8051 to count 00H to FFH on port P2. **[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) Write a note on programming of External hardware interrupts in C. [5]
b) Explain different types of SFR's associated with interrupt. [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 a note on serial communication in 8051. [5]
b) Write short notes on : SCON Register of 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's 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 a assembly language program to rotate stepper motor 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 output port. [10]
b) Draw and explain the interfacing diagram of Single key with 8051 microcontroller. [7]



Total No. of Questions : 8]

SEAT No. :

P7729

[Total No. of Pages : 2

[6180]-258

T.E. (Mechatronics Engineering)

INDUSTRIAL AUTOMATION

(2019 Pattern) (Semester - II) (317547)

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 and 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) 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

OR

Q2) a) Draw a ladder diagram for following comparison operations: **[8]**

i) Less than

ii) Greater than

b) Draw a ladder diagram for MUL, DIV and SQR math operations. **[9]**

Q3) a) Explain multi-bit data processing with suitable diagram. **[8]**

b) Explain analog output application for Analog In/ Analog or BCD out with neat sketch. **[9]**

OR

P.T.O.

- Q4)** 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]

- Q5)** a) State the need of drives and explain variable frequency drive (VFD) in detail. [6]
b) Draw a block diagram for motion control and state its different elements.[6]
c) Explain working of HMI with suitable example. [6]

OR

- Q6)** a) Explain selection criterion for drives and also enlist various methods of speed control for PLC. [6]
b) State the need of HMI with its advantages. [6]
c) Compare PLC and SCADA on any six points. [6]

- Q7)** a) Explain SCADA system with its benefits. [6]
b) Differentiate between PLCs and RTUs. [6]
c) Write a short note on: Master Terminal Units (MTU). [6]

OR

- Q8)** a) State different SCADA packages and compare among each other's. [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]



Total No. of Questions : 8]

SEAT No. :

P7730

[Total No. of Pages : 2

[6180]-259

T.E. (Mechatronics Engineering)
ELECTRO MECHANICAL SYSTEMS
(2019 Pattern) (Semester-II) (317548)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve questions Q.1 or Q.2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
- 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) Explain the accumulators. State its types. Explain any one. [6]
b) Explain the Intensifiers and write its applications. [6]
c) Difference between Meter in and Meter out circuits. [6]

OR

- Q2)** a) Explain single acting Intensifier/booster with neat sketch. [6]
b) Explain with a neat sketch the types of Pressure Intensifiers. [6]
c) Explain Meter in and Meter out circuits. [6]

- Q3)** a) Sketch and explain the general layout of Pneumatic Systems. [6]
b) What are the major components of Pneumatic systems? [6]
c) What are the advantages of Pneumatic Systems. [5]

OR

- Q4)** a) What are the applications of pneumatic systems. [6]
b) What is FRL unit? What is its function? [6]
c) What are the disadvantages of pneumatic systems. [5]

P.T.O.

- Q5)** a) Draw Pneumatic circuits using quick exhaust valve. [6]
b) Draw the Circuit for - Speed Control of a Pneumatic motor and explain it. [6]
c) Draw the Circuit for - Operating SAC using 3/2 DCV and explain it. [6]

OR

- Q6)** a) Draw the Circuit for - Operating DAC using 4/2 DCV and explain it. [6]
b) Draw the Circuit for - Operating Two SAC in Sequence and explain it. [6]
c) Draw the Circuit for - Operating SAC and DAC in Sequence and explain it. [6]

- Q7)** a) Explain the selection criterion of PLC in detail. [6]
b) Explain Electro-pneumatic systems. [6]
c) Explain the function of electrical control solenoid valves. [5]

OR

- Q8)** a) What is ladder logic diagram in PLC. Explain its functions. [6]
b) Explain the use of PLC for industrial process control. [6]
c) What is an Input/Output Processor? [5]



Total No. of Questions : 8]

SEAT No. :

P7731

[Total No. of Pages : 4

[6180]-260

T.E. (Mechatronics Engg.)

FINITE ELEMENT ANALYSIS

(2019 Pattern) (Semester-II) (317549)

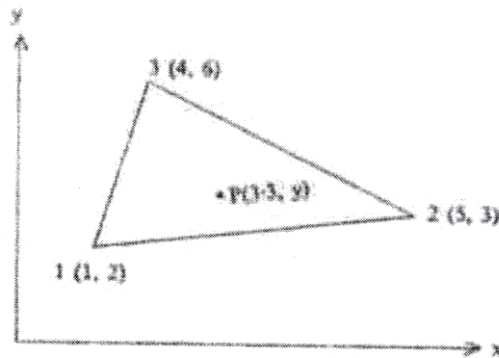
Time : 2½ Hours]

[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)** The nodal coordinate of triangular element are shown in the figure. At the interior point 'P' the x-coordinate is 3.3. $N_1=0.3$. Determine N_2 , N_3 and the y-coordinate of point P. **[10]**



- b) Explain the tricks for post processing in computer aided engineering. **[8]**

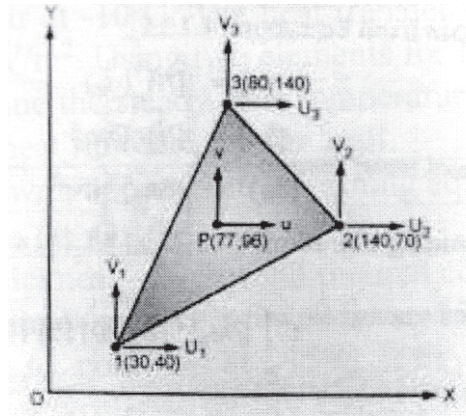
OR

- Q2) a)** In a triangular element, the nodes 1, 2 and 3 have cartesian coordinates : (30,40), (14,70) and (80,140) respectively. The displacement in mm at nodes 1, 2 and 3 are (0.1,0.5), (0.6,0.5) and (0.4, 0.3) respectively. The point P, Within the element has cartesian coordinates (77,96). For point P. determine:

- i) The natural coordinates.
- ii) The shape functions.
- iii) The displacement of point P

[10]

P.T.O.



b) Explain verification and validation of results in FEA post processing?[8]

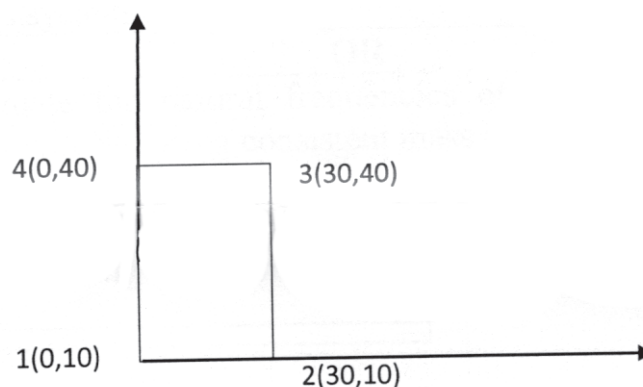
Q3) a) Evaluate the following integrals using 2-point or 3-point Gaussian quadrature method. Also compare with the exact solution. [10]

$$\int_5^{10} (1 + x + x^2) dx$$

b) Differentiate between p-refinement and h-refinement. [7]

OR

Q4) a) For the element shown in fig. assemble Jacobian Matrix and strain displacement matrix for the Gaussian point (0.7, 0.5) [10]

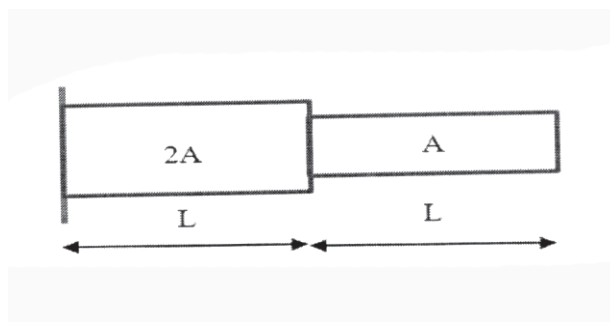


b) Explain the terms isoparametric, subparametric and superparametric elements. [7]

- Q5) a)** A brick wall has a thickness of 0.6m and thermal conductivity of $0.8 \text{ W/m}^\circ\text{K}$. The inner surface of wall is at 28°C and outer surface. is exposed to cold air at -10°C . The heat transfer coefficient at outer surface is 40 W/m^2 . Using two elements for finite element formulation, determine the steady state temperature distribution within the wall and heat flux through the wall. **[10]**
- b)** Define Fin. Explain with appropriate governing equations. **[7]**

OR

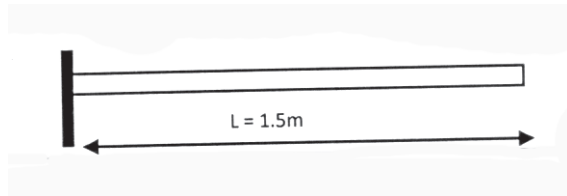
- Q6) a)** A brick wall has a thickness of 0.6m and thermal conductivity of $0.75 \text{ W/m}^\circ\text{K}$. The inner surface of wall is at 15°C and outer surface is exposed to cold air at -15°C . The heat transfer coefficient at outer surface is 40 W/m^2 . Using two elements for finite element formulation, determine the steady state temperature distribution within the wall and heat flux through the wall. **[10]**
- b)** Explain essential and natural boundary conditions and solving for temperature distribution. **[7]**
- Q7) a)** Find the natural frequencies of longitudinal vibrations of the same stepped shaft of areas $A=1000\text{mm}^2$ and $2A=2000\text{mm}^2$ and of equal lengths (L), when it is constrained at one end, as shown in fig. **[10]**



- b)** Differentiate between Lumped mass system and consistent mass system. **[8]**

OR

- Q8) a)** Estimate the natural frequencies of axial vibrations of bar shown in fig. using consistent mass matrices. The bar is having uniform cross-section as $A=50 \times 10^{-6} \text{m}^2$. Length=1.5m, modulus of elasticity= $2 \times 10^{11} \text{ N/m}^2$ and density= 7800 kg/m^3 . Model the bar using two elements. **[10]**



- b)** Enlist and explain different types of Dynamic analysis. **[8]**



Total No. of Questions : 8]

SEAT No. :

P7732

[6180]-261

[Total No. of Pages : 2

T.E. (Mechatronics Engineering)
EMBEDDED SYSTEM DESIGN
(2019 Pattern) (Semester - II) (317550)

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) Draw and Explain the capture mode of CCP module. **[6]**
- b) Write a program to create a square wave of 2.5 kHz periods and 50% duty cycle. **[6]**
- c) Design and Draw a DC Motor control using PWM. **[6]**

OR

- Q2)** a) Draw and Explain the compare mode of CCP module. **[6]**
- b) Write a program to generate a square wave of 1Hz to blink LED. **[6]**
- c) Explain the concept of CCP modes of PIC18458. **[6]**

- Q3)** a) What is peripheral Interrupt, ISR ? **[5]**
- b) Draw and Explain interrupt structure of PIC18F458 microcontroller. **[5]**
- c) How do you calculate the duty cycle of a PWM signal? **[7]**

OR

- Q4)** a) Explain External Interrupt INT0 and its programming in PIC18FXX. **[5]**
- b) Write in details Interrupt programming language. **[5]**
- c) What is MPLAB IDE and what is its significance in PIC microcontroller programming? **[7]**

P.T.O.

- Q5)** a) Design a PIC 18 based data acquisition system for Temperature Measurement using LM 35. Write a program to display temperature on LCD. [5]
- b) Design a frequency counter for counting number of pulses and display same on LCD. [5]
- c) Draw a neat interfacing diagram to display “SPPU” on 4th position in line one and “UNIVERSITY” at 5th position on the second line, write an embedded C Program. [8]

OR

- Q6)** a) Interface ADC to PIC 18 Microcontroller. Write a program to get from Channel 0 to ADC the result on ON port C and port D every quarter of a second. [5]
- b) Design a frequency counter for counting number of pulses and display same on LCD. [5]
- c) Write a program to display temperature on LCD. [8]
- Q7)** a) Explain the SPI mode MSSP structure used for serial communication.[10]
- b) Explain the use of BRG register for calculation of Baud rate with UART block Diagram. [7]

OR

- Q8)** a) Explain the MSSP with SPI MODE. [10]
- b) Explain the use of the BRGH register for calculation of BAUD rates. Draw and Explain UART transmitter block diagram. [7]



Total No. of Questions : 8]

SEAT No. :

P8794

[Total No. of Pages : 2

[6180]-262A

T.E. (Mechatronics Engineering)

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

(2019 Pattern) (Semester - II) (317551)

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

- Q1) a)** Explain hard and soft margins of Support Vector Machine (SVM) with the help of sketch. **[5]**
- b) List down advantages and limitations of the Logistic Regression. **[5]**
- c) Explain cost function in linear and logistic Regression. **[8]**

OR

- Q2) a)** Discuss the advantages and limitations of using KNN for classification tasks. Calculate the accuracy, precision and recall of a KNN classifier given the following confusion matrix: **[10]**

	Predicted Negative	Predicted Positive
Actual Negative	100	20
Actual Positive	30	50

- b) Explain the concept of Naïve Bayes algorithm and its application in classification tasks. Discuss the strengths and weakness of the Naïve Bayes algorithm. **[8]**
- Q3) a)** Differentiate between clustering and classification. **[5]**
- b) Describe different evaluation metrics used in machine learning, such as accuracy, precision, recall, F1 score. **[5]**
- c) Explain the importance of data quality in machine learning. How can you ensure the data collected is of high quality? **[7]**

OR

P.T.O.

- Q4)** a) Why is data pre-processing a critical step in the machine learning pipeline? Provide examples of common data preprocessing tasks. [9]
- b) Discuss the importance of cross-validation in model selection and how it helps in assessing model performance. [8]

- Q5)** a) Compare and contrast value-based and policy-based reinforcement learning algorithms. [5]
- b) Explain the concept of exploration vs. exploitation in reinforcement learning. [5]
- c) Define Markov Decision Process (MDP) and explain its key components. How does it serve as a framework for solving reinforcement learning problems? [8]

OR

- Q6)** a) Explain the architecture and functioning of an artificial neural network. How do neural networks simulate the workings of the human brain? [5]
- b) Differentiate between positive and negative reinforcement in the context of reinforcement learning. [5]
- c) Provide examples of how reinforcement learning can be applied in mechanical engineering to optimize processes or control systems. [8]

- Q7)** a) What is predictive maintenance and how does it differ from traditional, reactive maintenance strategies? Provide an example of a real-world application. [8]
- b) Explain the importance of early fault detection in industrial processes. How can advanced sensor technologies and machine learning algorithms be used to achieve this goal? [9]

OR

- Q8)** a) Give examples of industries where process optimization has led to significant improvements in efficiency, cost reduction, or product quality. [7]
- b) What is control algorithm tuning and why is it necessary in the operation of control systems? [5]
- c) Discuss the applications of material inspection in aerospace, automotive, or infrastructure projects. [5]



Total No. of Questions : 8]

SEAT No. :

P7734

[6180]-263

[Total No. of Pages : 2

T.E. (Robotics & Automation Engineering)
EMBEDDED SYSTEM IN ROBOTICS
(2019 Pattern) (Semester - I) (Theory) (311501 (A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory i.e. Solve Q.No.1 or Q.No. 2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6 Q.No.7 or Q.No.8.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Use of electronic pocket calculators are allowed.*
- 4) *Figure to the right indicates full marks.*
- 5) *Assume suitable data, if necessary.*

- Q1) a)** What is embedded serial communication? Explain SPI in detail. **[9]**
- b) Explain SCI in detail. Enlist the applications. **[9]**

OR

- Q2) a)** Write short note on : **[9]**
- i) Serial Communication Protocol
 - ii) Embedded Peripherals
- b) Explain field Bus in detail. Enlist its applications. **[9]**

- Q3) a)** Write a short note on **[8]**
- i) Operators
 - ii) Software and its type
- b) What is embedded networking? Explain in detail. **[9]**

OR

- Q4) a)** Explain SFR in detail. **[8]**
- b) Explain peripheral communication with example. **[9]**

P.T.O.

- Q5)** a) What is multitasking? Explain need of multitasking with example. [8]
b) Define kernel. Explain functions of kernel. [9]

OR

- Q6)** a) Define operating system. Explain functions of operating system. [8]
b) Explain foreground and background system in detail. [9]

- Q7)** a) Write a short note on [8]
i) VI Editors
ii) Pieces of Linux (any 4)
b) Write any five commands from Linux with description. [10]

OR

- Q8)** a) Explain types of device drivers, with its need. [8]
b) Write a short note on [10]
i) Kernel Module
ii) Use of Linux in embedded system



Total No. of Questions : 8]

SEAT No. :

P7735

[6180]-264

[Total No. of Pages : 3

T.E. (Robotics & Automation Engineering)
HYDRAULICS & PNEUMATICS
(2019 Pattern) (Semester - I) (311502 (A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.No.1 or Q.No. 2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Use of calculator is allowed.
- 4) Figure to the right indicates full marks.
- 5) Assume suitable data, if necessary.

- Q1) a)** Draw a simple sketch and ISO symbol of a pressure relief valve, and explain its working. State its importance in hydraulic systems. **[8]**
- b) Classify different types of Pressure control valves used in the hydraulic circuits. Draw ISO symbol for each. **[9]**

OR

- Q2) a)** Draw neat sketch and explain the following with their applications in circuit. **[8]**
- i) Three Way, Two Position Direction Control Valve.
 - ii) Four Way, Three Position Direction Control Valve (Closed Centre).
- b) Explain shuttle valve with a neat sketch. State its application with a typical circuit. **[9]**
- Q3) a)** Draw a regenerative circuit by using 4/3 DCV and explain its application. **[9]**
- b) Explain counterbalance valve circuit with neat sketch. **[9]**

OR

P.T.O.

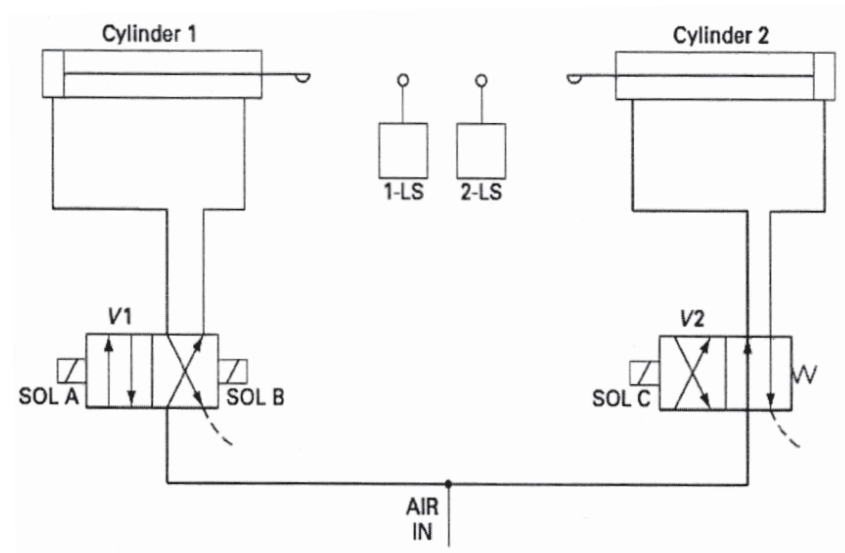
- Q4) a)** Differentiate between meter in circuit and meter out circuit. [9]
- b)** Draw a neat sketch of Pump unloading circuit. State function of unloading valve. [9]

- Q5) a)** Explain with neat sketch working of “AND” valve and with the help of circuit diagram explain any one typical application of it. [9]
- b)** Draw and explain the application of a pilot check valve for locking a double-acting cylinder. [9]

OR

- Q6) a)** Draw and Explain a typical sketch for sequencing of two double acting cylinders in respect of pneumatics. [9]
- b)** Draw circuit for : [9]
- Controlling speed of pneumatic double acting cylinder.
 - Speed control of a pneumatic motor

- Q7) a)** Explain an Electro-hydraulic servo system with neat sketch? [8]
- b)** Explain the complete operation of the system shown in fig. [9]

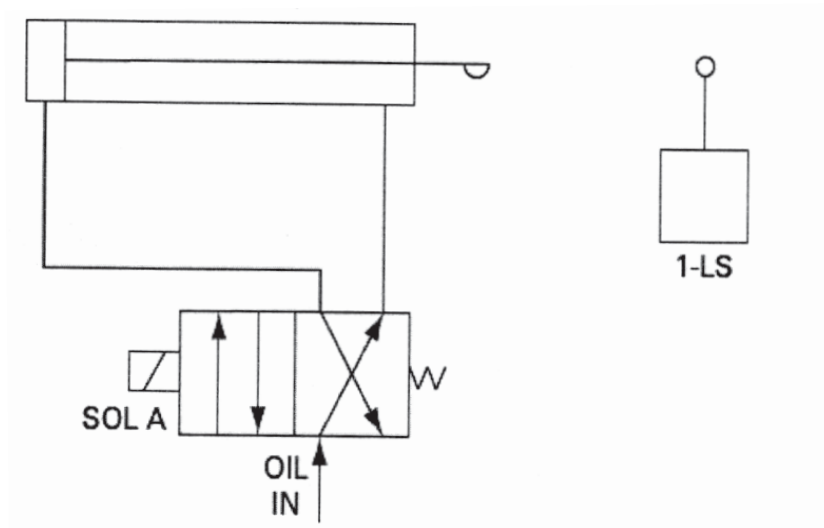


OR

Q8) a) What is a programmable logic controller? State the main function of each of the following elements of a PLC : **[8]**

- i) CPU
- ii) Programmer/monitor
- iii) I/O module

b) Explain the complete operation of the system shown in fig. **[9]**



Total No. of Questions : 8]

SEAT No. :

P7736

[Total No. of Pages : 3

[6180]-265

T.E. (Robotics and Automation)

ROBOT KINEMATICS AND DYNAMICS

(2019 Pattern) (Semester-I) (311503A)

Time : 2½ Hours]

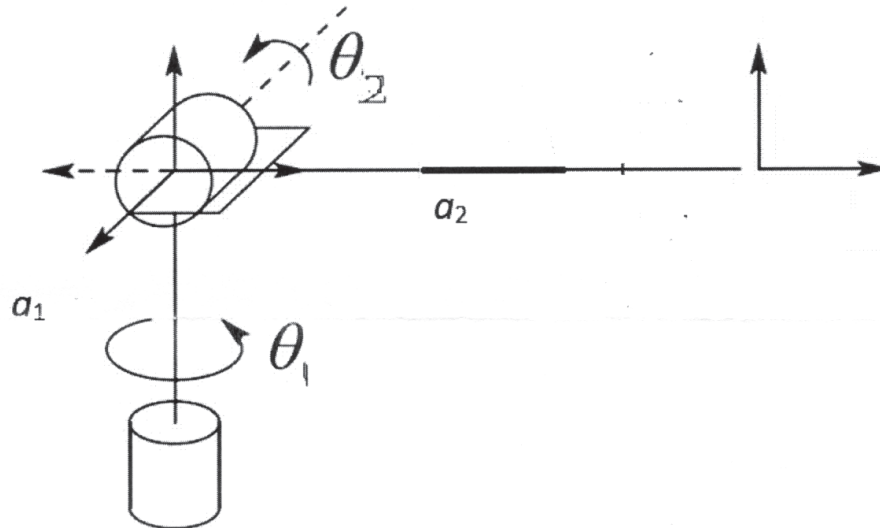
[Max. Marks : 70

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) Draw the flowchart and explain any one numerical method used to solve inverse kinematics problems. [6]

b) For the robot shown in Figure, use inverse kinematics to obtain the joint parameters θ_1 and θ_2 to bring the robot end effector to the position (32, 25, 10). Consider $a_1 = 45$ cm, and $a_2 = 50$ cm. [12]



OR

P.T.O.

- Q2) a)** Determine the gradient of a function $5x_1x_2 - x_2^2 + 20$ at $x_1=3$ and $x_2 = 2$ [8]
- b)** Explain following terms related to genetic algorithm: [10]
- i) Population size
 - ii) Crossover probability
 - iii) Mutation probability
 - iv) Reproduction operator
 - v) Fitness function

- Q3) a)** Discuss various considerations in gripper selection and design. [8]
- b)** Determine the gripper force required for a mechanical gripper having two fingers used to hold the part weighing 10kg. Assume that the coefficient of friction between the fingers and the part surface is 0.30 and the 'g' factor of 3. [6]
- c)** What are the limitations of vacuum grippers? [4]

OR

- Q4) a)** Explain the design aspects of mechanical grippers. [6]
- b)** Write short note on: Selection criteria for grippers. [6]
- c)** Explain the principle of working of an acoustic sensor to measure the distance of the object from the gripper. [6]

- Q5) a)** Determine the angular position, angular velocity, and angular acceleration of a robot arm with revolute joint at $t=10$ seconds if it rotates from 10° to 70° in 25 seconds. [9]
- b)** Explain Newton-Euler formulation for manipulator dynamics. [8]

OR

- Q6) a)** What is robot forward dynamics? What are input and output parameters in forward dynamics. Explain the applications of forward dynamics in robot design. [5]
- b)** For a single rotary manipulator link, the gripper force is $= [0, -30 \text{ N}, 0]$, mass of the link $= 30 \text{ Kg}$, Angular velocity of link $(\omega) = 6 \text{ rad/s}$, Angular acceleration of link $= -18 \text{ rad/s}^2$, Length of link $= 2 \text{ m}$ with CG located at 0.8 m from joint. Determine the resultant joint reaction force in base co-ordinate system for angular position of 40° . [12]

- Q7)** a) Discuss the balancing of V-engines. [7]
- b) Define the following terms: [10]
- i) Swaying Couple
 - ii) Hammer blow
 - iii) Tractive force
 - iv) Primary balancing
 - v) Secondary balancing

OR

- Q8)** a) What is balancing? What are types of balancing? [8]
- b) A circular disc mounted on a shaft carries three attached masses of 4 kg, 3kg, and 2.5 kg at radial distances of 75 mm, 85 mm and 50 mm and at the angular positions of 45° , 135° and 240° respectively. The angular positions are measured counter-clockwise from the reference line along the x-axis. Determine the amount of the counter mass at a radial distance of 75 mm required for the static balance. [9]



Total No. of Questions : 8]

SEAT No. :

P7737

[6180]-266

[Total No. of Pages : 2

T.E. (Robotics & Automation Engineering)
SENSORS TECHNOLOGY
(2019 Pattern) (Semester - I) (311504 (A))

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q.No.1 or Q.No. 2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6 Q.No.7 or Q.No.8.*
- 2) *Neat diagram must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*
- 4) *Use of electronic pocket calculator is allowed.*

- Q1) a)** Explain working principle of Resistance Temperature Detector (RTD). Also list the several application of RTD. **[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 the following term. **[9]**
- i) Thermal Energy
 - ii) Absolute Temperature
 - iii) Relative Temperature

- Q3) 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]**

OR

P.T.O.

- Q4)** a) Distinguish between “Point Type Level Sensor” and “Continuous Type Level Sensor” [8]
- b) Write a note on [9]
- i) Piezoelectric Accelerometer
- ii) Piezoresistive Accelerometer

- Q5)** a) Explain the working of Load Cell with suitable circuit diagram also state the advantages and application of the same. [9]
- b) Explain the role of Wheatstone Meter Bridge in Strain Gauge Circuit also state the advantages and application of the same. [9]

OR

- Q6)** a) Explain Bounded type Strain Gauge also state the advantages and application of the same. [9]
- b) Distinguish between Metal Foil type and Semiconductor type Strain Gauge. [9]
- Q7)** a) Explain in detail construction and working of “Bio Sensor” with suitable example. Also state the advantages and application of the same. [9]
- b) Write a short note on Thermal Detectors and explain its any two types. [9]

OR

- Q8)** a) Explain “Nanotechnology”. How Nanotechnology plays an vital role in sensor technology. [9]
- b) Explain in detail position and motion sensors. [9]



Total No. of Questions : 8]

SEAT No. :

P7738

[Total No. of Pages : 3

[6180]-267

T.E. (Robotics & Automation)

STATISTICS AND NUMERICAL METHODS

(2019 Pattern) (Semester - I) (311505(A)-I) (Elective - 1)

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 necessary.*
- 5) *Use of Calculator is allowed.*

Q1) a) Round off the number 865250 and 37.46235 to four significant figures and compute find absolute, relative and percentage errors. **[8]**

b) Find the Positive root of $f(x) = 2x^3 - 3x - 6 = 0$ by Newton-Raphson method correct to five decimal places. **[9]**

OR

Q2) a) Using Bisection Method determine a real root of the equation $f(x) = 8x^3 - 2x - 1 = 0$. **[8]**

b) Explain in short: **[9]**

i) Round off Error

ii) Truncation Error

iii) Absolute Error

P.T.O.

Q3) a) Certain experimental values of x & y are given below:

$(0, -1), (2, 5), (5, 12), (7, 20)$, if the straight line $Y = a_0 + a_1 X$ is fitted to the above data, Find the approximate values of a_0 and a_1 . [9]

b) The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface: [9]

$x = \text{height}$	100	150	200	250	300	350	400
$y = \text{distance}$	10.63	13.03	15.04	16.81	18.42	19.00	21.27

Find the values of y when $x = 160$ ft.

OR

Q4) a) The function $y = \sin x$ is tabulated below: [9]

x	$y = \sin x$
0	0
$\pi/4$	0.70711
$\pi/2$	1.0

b) Find the cubic polynomial which takes the following values: [9]

$x:$	0	1	2	3
$F(x):$	1	2	1	10

Evaluate $f(4)$.

Q5) a) Given $dy/dx = y - x$ where $y(0) = 2$. Find $y(0.1)$ and $y(0.2)$ correct to four decimal places. [9]

b) Evaluate - correct to three decimal places. Using Trapezoidal rule with $h = 0.5, 0.25$ and 0.125 . [9]

$$I = \int_0^1 \frac{1}{1+x} dx$$

OR

- Q6) a)** Evaluate - correct to three decimal places. Using Simpson's 1/3rd rule with $h = 0.5, 0.25$ and 0.125 . **[9]**

$$I = \int_0^1 \frac{1}{1+x} dx$$

- b) Given $dy/dx = 1 + y^2$, where $y = 0$ when $x = 0$, find $y(0.2)$, $y(0.4)$ and $y(0.6)$. **[9]**

- Q7) a)** How is an inequality constrained optimization problem converted into an unconstrained problem for use in GAs? What are the basic operations used in GAs? **[8]**

- b) Steel plates are available in thicknesses (in inches) of **[9]**

$\frac{1}{32}, \frac{1}{16}, \frac{3}{32}, \frac{1}{8}, \frac{5}{32}, \frac{3}{16}, \frac{7}{32}, \frac{1}{4}, \frac{9}{32}, \frac{5}{16}, \frac{11}{32}, \frac{3}{8}, \frac{13}{32}, \frac{7}{16}, \frac{15}{32}, \frac{1}{2}$ from a manufacturer. If the thickness of the steel plate, to be used in the construction of a pressure vessel, is considered as a discrete design variable, determine the size of the binary string to be used to select a thickness from the available values.

OR

- Q8) a)** Find the minimum of the following function using simulated annealing: **[8]**

$$f(X) = 500 - 20x_1 - 26x_2 - 4x_1x_2 + 4x_1^2 + 3x_2^2$$

- b) What is the physical basis of SA? Can you consider SA as a zeroth-order search method? **[9]**



Total No. of Questions : 8]

SEAT No. :

P7739

[6180] - 268

[Total No. of Pages : 3

T.E. (Robotics & Automation)
FINITE ELEMENT ANALYSIS

(2019 Pattern) (Semester - I) (Elective - I) (311505 (A) - II)

Time : 2 ½ Hours]

[Max. Marks : 70

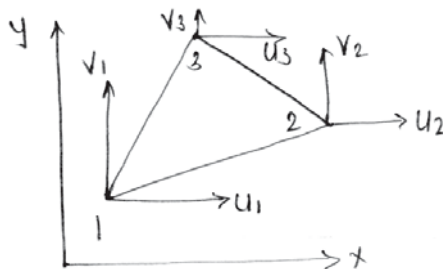
Instructions to the candidates:

- 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 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 1 D linear Element in Natural Coordinate. **[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]**

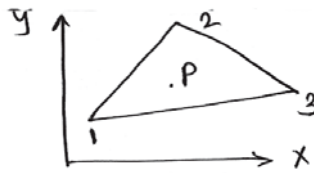
OR

- 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. **[10]**
- i) Displacement of point P,
 - ii) Strain-displacement relationship
 - iii) Element stress
 - iv) Strains



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.

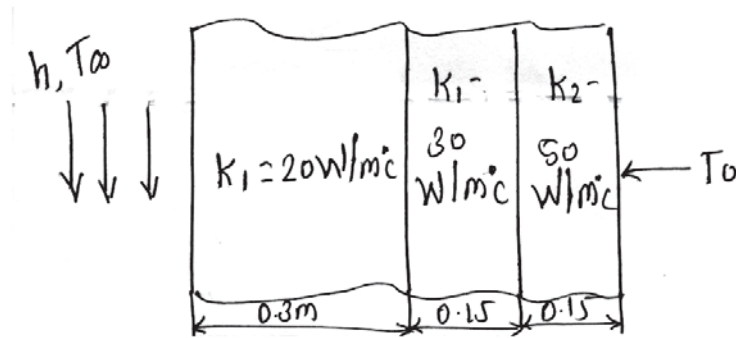


OR

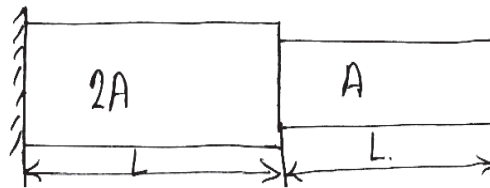
- Q4) a)** What are the condition for Axisymmetric Problem? **[4]**
- b) Explain the difference between isoparametric, subparametric and superparametric elements. **[5]**
- c) Triangular elements are used for stress analysis of a plate subjected to plane load. The components of displacement along x and y axes at the nodes i, j and k of an element are found to be $(-0.001, 0.01)$, $(-0.002, 0.01)$ 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, **[8]**
 find:
- 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 1 D heat Transfer problem using Finite Element Problem? **[7]**
- b) A metallic fin with thermal conductivity $360 \text{ W/m}^\circ\text{C}$, 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 $9 \text{ W/m}^2\text{C}$. Take the width of the fin to be 1 m . **[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 $T_0 = 20^\circ\text{C}$. Convection heat transfer takes place on the inner surface of the wall with $T_\infty = 800^\circ\text{C}$ and $h = 25\text{W/m}^2\text{C}$. Determine the temperature distribution in the wall. [10]

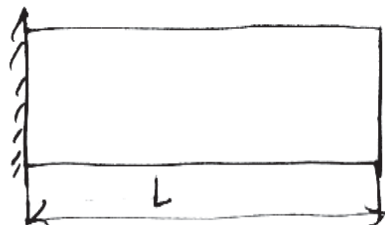


- Q7)** a) Explain Eigen Values for undamped free vibration system? [8]
 b) Find the natural frequencies of longitudinal vibrations of the same stepped shaft of areas $A = 12,000\text{ mm}^2$ and $2A = 2,500\text{ mm}^2$ and of equal length ($L = 1\text{m}$), when it is constrained at one end, as shown 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. [10]
 Take $E = 2 \times 10^{11}\text{ N/m}^2$, $\rho = 7800\text{ kg/m}^3$, $L = 1\text{m}$.



Total No. of Questions : 8]

SEAT No. :

P7740

[6180] - 269

[Total No. of Pages : 2

T.E. (Robotics & Automation)
INDUSTRIAL ROBOTICS AND MATERIAL
HANDLING SYSTEMS

(2019 Pattern) (Semester - I) (311505 (A) - III) (Elective - I)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Define precision. How are robots classified based on geometry? **[9]**

b) Write short note on CNC machine tool loading in detail. **[9]**

OR

Q2) a) What are the characteristics of an industrial robot? Explain the anatomy of a robot manipulator in detail? **[9]**

b) What is a robotic joint? List the various types of joints used in robots. Distinguish between prismatic and revolute joints. **[9]**

Q3) a) Explain the working principle of an end effector with the help of a sketch and give its important applications. **[8]**

b) How are the robot end effectors classified? Explain the different end effectors used on robots. **[9]**

OR

Q4) a) Discuss the various factors to be considered in selecting a gripper. **[5]**

b) Write in brief Selection of Robot for various applications. **[12]**

P.T.O.

- Q5) a)** Write a short note on Spot welding Robots used in automobile manufacturing Industry. **[8]**
- b) Write a short note on Spray painting Robot used in manufacturing Industry. **[9]**

OR

- Q6) a)** Explain Coating, Deburring, cleaning operations and explain the robots used to for these operations. **[8]**
- b) Write in brief about Robotic vision systems. **[9]**

Q7) Write a short note on: **[18]**

- a) Climbing Robots.
- b) Machine mounted Robots.

OR

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

- a) Interfacing Robots with computers.
- b) Lee's Algorithm for obstacle avoidance.



Total No. of Questions : 8]

SEAT No. :

P7741

[6180] - 270

[Total No. of Pages : 3

T.E. (Robotics & Automation Engineering)
INTELLIGENT MANUFACTURING SYSTEM
(2019 Pattern) (Semester - I) (Elective - I) (311505 (A) - IV)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the application of simulated annealing algorithm to inventory control problem. **[12]**

b) Explain applications of fuzzy logic in manufacturing automation. **[5]**

OR

Q2) a) Using a simulated annealing algorithm to solve a minimization problem, function value of 20 is updated to new value of 30 at temperature of 55°C. What is the probability of accepting the new solution? **[8]**

b) The spring back (S) in bending operations is mathematically expressed as: $S = -24.7 + 13.3t + 9.19r - 4.06t \cdot r + 0.0073 r \cdot \theta + 0.941t^2 - 0.607r^2$. Where, t = sheet thickness (mm), θ = sheet orientation (degrees) and r = punch tip radius

Perform two iterations of genetic algorithm to minimize S considering bounds of variables as: $1 \leq t \leq 2\text{mm}$, $0 \leq \theta \leq 90$ degrees and $1 \leq r \leq 4\text{mm}$. **[9]**

P.T.O.

- 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]

Machines	Parts								
	A	B	C	D	E	F	G	H	I
1					1				1
2	1			1				1	
3		1				1			1
4	1								1
5			1		1				
6		1				1	1		
7			1					1	

- b) Explain Similarity Coefficient (SC) method for grouping of parts and machines. [9]

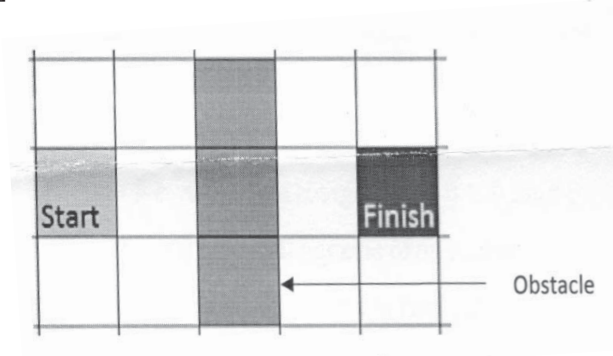
OR

- Q4) a)** Apply row and column masking algorithm for grouping of the parts (P) and machines (M) from the following part machine incidence matrix. [9]

Machines	Parts							
	1	2	3	4	5	6	7	8
1		1				1		1
2				1		1		
3	1				1		1	1
4		1	1					1
5	1				1		1	
6		1	1					1
7				1		1		

- b) Explain the 'Weighted Minkowski metric' method of group technology. [9]

- Q5) a)** Use A* 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 application of genetic algorithm for robot path planning. **[8]**

OR

- Q6) a)** Explain the following terms related to Dijkstra's Algorithm used in path planning. **[10]**

- i) Graph
 - ii) Source and Destination vertex
 - iii) Non negative edges
 - iv) Time complexity
 - v) Space complexity
- b) Write short note on: Path planning robot control in dynamic environment. **[7]**

- Q7)** Explain the following algorithms and their applications to flexible manufacturing system. **[18]**

- a) Real coded genetic algorithm
- b) Ant colony optimization
- c) K-Means clustering

OR

- Q8)** Write short notes on: **[18]**

- a) Automated guide vehicles
- b) Issues in implementation of flexible manufacturing system.
- c) Automated storage and retrieval system



Total No. of Questions : 8]

SEAT No. :

P7742

[Total No. of Pages : 3

[6180]-271

T.E. (Robotics & Automation)

ROBOT PROGRAMMING

(2019 Pattern) (Semester - II) (311508 - 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 and Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*
- 5) *Use of Logarithmic Table, Slide rule is Electronic pocket calculator is allowed.*

Q1) a) Differentiate between the command structure of VAL-I and VAL-II language in Robot Programming. **[8]**

b) Explain various program instructions used in VAL-II. **[9]**

OR

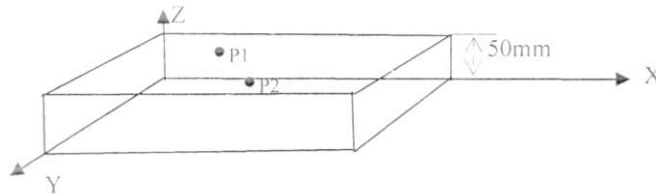
Q2) a) Develop a program using VAL II robot programming language for a PUMA 560 robot when setting input signal at 105th port of controller it unloads a cylindrical part of 10mm diameter, from machine 1 positioned at point P1 with coordinates (150, 250, 0) mm and orientation (0, 90, 0)° and load the part on Machine 2 positioned at P2 with coordinates (150, 250, 50) mm and orientation (0, 90, 0)°. The speed of robot motion is 30 in./s. However, because of safety precautions, the speed is reduced to 10 in./s while moving to a machine for an unloading or loading operation. **[9]**

b) Explain the following instruction in VAL - II with example: **[8]**

- i) LISTP
- ii) EXECUTE
- iii) RETRY
- iv) ENABLE

P.T.O.

- Q3) a)** Develop a program using RAPID robot programming language using RAPID procedure for drilling operation from point P1 (100,200,50) to P2(200, 250, 50)mm such that both the holes are of 5mm diameter and with depth of 50mm. While executing the program the orientation of end effector remains same as (0,90,0)°. [9]



- b) Explain the following instruction in RAPID with example: [9]

- i) AccSet
- ii) SetDO
- iii) MoveAbsJ
- iv) ISignalDO
- v) WaitDO
- vi) MoveL

OR

- Q4) a)** Explain the Position Instructions and Input/ Signal Instruction in RAPID with the help of examples of programs. [9]

- b) Define Data types. Explain any four data type used in RAPID with the help of examples of programs. [9]

- Q5) a)** Explain the following instruction in AML with example: [9]

- i) AMOVE
- ii) DMOVE
- iii) EOD
- iv) QMONITOR
- v) ERASE
- vi) PRINT

- b) Explain the following code & output when executed in AML: [9]
- i) MONITOR (LED, 2,0,0,1.5, 'passed');
MOVE (ARM, fgoal, LED);
 - ii) ATTN: SUBR;
MOTPARMS: NEW STOPMOVE;
WAITMOVE;
BREAK (EOL, 'ATTENTION REQUESTED');
APPLY ('AMOVE', MOTPARMS);
END;
 - iii) DMOVE (<4,5,6>,<30,-60,90>);
 - iv) SPEED (0.8)

OR

- Q6)** a) Define Sensor Instruction. Explain any four sensor instructions with examples used in AML. [9]
- b) Define Motion Control. Explain any four motion controls with examples used in AML. [9]
- Q7)** a) Define the concept of singularities. Explain the methods of detecting possible collision of robots and what are the features added to avoid it. [9]
- b) Write a short note on "Robot Economics". [8]

OR

- Q8)** a) Explain in details about "Robot cycle time analysis". [9]
- b) Explain the "repeatability measurement of robot". [8]



Total No. of Questions : 8]

SEAT No. :

P7743

[Total No. of Pages : 3

[6180]-272

T.E. (Robotics and Automation)

ARTIFICIAL INTELLIGENCE FOR ROBOTICS

(2019 Pattern) (Semester - II) (311509 A)

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

Q1) a) Explain with suitable example difference between informed search and uninformed search algorithm. **[9]**

- b) In a minimization problem, current value of a certain parameter x is 20. The lower and upper bounds of parameter x are 10 and 50 respectively. If simulated annealing algorithm is used to update x using 5 random numbers having sum 1.87, what will be the updated value? **[8]**

OR

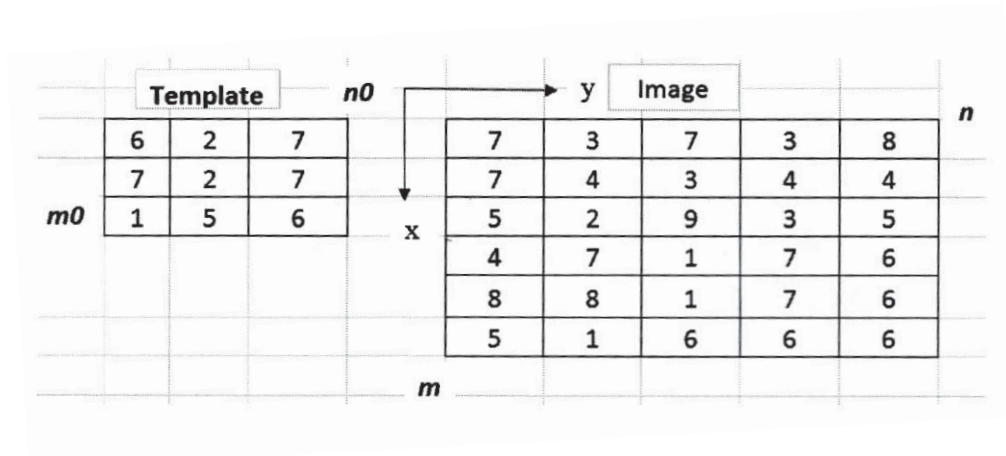
Q2) a) Ant colony optimization is used to solve a travelling salesmen problem with 5 stations. The distance matrix is given below. Considering starting station as A, what is the % probability that an ant will choose the path A to D? Assume initial pheromone deposition level as 1. **[10]**

	A	B	C	D	E
A	0	14	16	19	12
B	14	0	15	13	10
C	16	15	0	11	17
D	19	13	11	0	21
E	12	10	17	21	0

- b) Explain the steps of Tabu search method. **[7]**

P.T.O.

- Q3) a)** For the image and template shown in Figure, determine the performance index for translation (3, 1) using template matching technique. **[10]**



- b)** Explain region growing method for image segmentation. **[7]**

OR

- Q4) a)** Determine the gradient of intensity of a pixel having intensity 3 in the image given below. Use Prewitt operator. **[10]**

2	6	8
4	3	2
1	7	6

- b)** Write note on: Robot vision system. **[7]**

- Q5) a)** What are different methods to deal with moving obstacles? **[10]**

- b)** Write note on: Path Planning Robot Control in Dynamic Environments. **[8]**

OR

- Q6) a)** Explain route optimization for AS/RS systems. **[8]**

- b)** A perceptron having weights corresponding to the three inputs have the following **[10]**

Value: $w_1 = 2$; $w_2 = -4$; and $w_3 = 1$

and the activation of the unit is given by the step-function:

$$\phi(v) = 1 \text{ if } v \geq 0 \text{ otherwise } 0$$

Calculate the output value y of the given perceptron for each of the following input patterns:

Pattern	P1	P2	P3	P4
X1	1	0	1	1
X2	0	1	0	1
X3	0	1	1	1

- 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 in Fig. below. The obstacles are in the form of tool storage racks at locations (1, 6), (2, 4) and (4, 3). [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: Flexible manufacturing system. [9]

OR

- Q8) a)** Explain with suitable example techniques for automatic tool path generation. [9]
- b) What is real time scheduling in flexible manufacturing system? Explain with suitable example. [9]



[6180]-273

T.E. (Robotics & Automation)
FLEXIBLE MANUFACTURING SYSTEM
(2019 Pattern) (Semester-II) (311510(A))

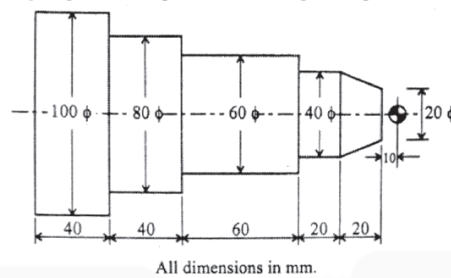
Time : 2½ Hours]

[Max. Marks : 70]

Instructions to the candidates:

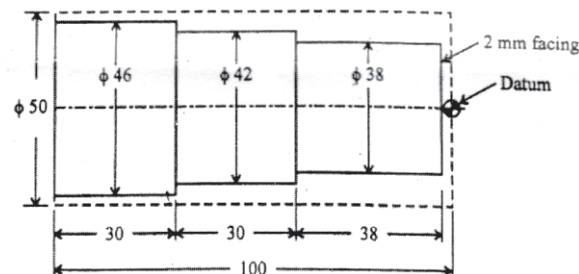
- 1) Figures to the right indicate full marks.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Assume suitable data if necessary.
- 4) Use of Logarithmic table, slide rule is Electronic pocket calculator is allowed.
- 5) Answer Q.1 or Q.2, Q3 or Q4, Q5 or Q6, Q7 or Q8.

- Q1) a)** What are the basic components of the NC system and explain the function of each component? [9]
- b)** Prepare part programming of following component. [9]



OR

- Q2) a)** Describe various G and M codes used in CNC machines. [9]
- b)** Prepare part programming of following component. [9]



P.T.O.

- Q3)** a) Explain with block diagram the main elements of CIM system. [9]
b) Explain the concept of ERP? [8]

OR

- Q4)** a) What is a material requirement planning? Explain the various inputs to the MRP system? [9]
b) Explain about computer aided process planning (CAPP). [8]

- Q5)** a) What are the different types of material handling equipment? [9]
b) What are the components of the AS/RS system? [9]

OR

- Q6)** a) Explain the working principle of a robot with the help of a neat sketch. Also describe the components. [9]
b) What are different types of AGV explain with their principle of working. [9]

- Q7)** a) What do you know about tool Management? Write note on tool Room Service and Tool Allocation. [9]
b) Draw and explain block diagram offered detection in vibration. [8]

OR

- Q8)** a) Explain the term Tool Monitoring and fault detection. [9]
b) What are the different types of tool strategies? Explain each. [8]



Total No. of Questions : 8]

SEAT No. :

P7745

[6180]-274

[Total No. of Pages : 2

T.E. (Robotics and Automation)

MICRO - ELECTRO - MECHANICAL SYSTEMS

(2019 Pattern) (Semester - II) (Elective - II) (311511 (A) - 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) Figures to the right indicate full marks.
- 4) Assume Suitable data if necessary.
- 5) Use of logarithmic Table, slide rule is Electronic pocket calculator is allowed.

- Q1)** a) Explain in brief with a neat sketch of Comb drive devices and Parallel plate capacitors along with their application. **[8]**
- b) Differentiate with neat sketch, thermal resistors and thermal bimorph. Also, Explain the applications for each. **[9]**

OR

- Q2)** a) What are piezo-resistive sensors? Explain the different piezo-resistive sensor materials. **[8]**
- b) Briefly explain the applications of comb drive devices with respect to : **[9]**
- i) Flow Sensors
 - ii) Actuators
- Q3)** a) Explain with a neat sketch of magnetic actuators and micro-magnetic components. **[9]**
- b) Briefly explain the applications of parallel plate capacitors with respect to: **[9]**
- i) Tactile Sensors
 - ii) Pressure Sensors

OR

P.T.O.

- Q4) a)** Write in brief one case study of MEMS in magnetic actuators. **[9]**
b) Write in brief one case study in piezoelectric sensors and actuators from a fabrication point of view. **[9]**

- Q5) a)** What are polymers? Explain in brief Liquid Crystal Polymer and PDMS with their applications. **[8]**
b) Briefly explain PMMA and applications related to flow sensors. **[9]**

OR

- Q6) a)** Briefly explain polyimide and the application of polymers related to tactile sensors. **[8]**
b) Briefly explain SU-8 and the application of polymers related to pressure sensors. **[9]**

- Q7) a)** Briefly explain the Blood pressure sensor and an Acceleration sensor with respect to overview, history and applications. **[9]**
b) Briefly explain the overview, history and application of Zigbee and Gyros. **[9]**

OR

- Q8) a)** Briefly explain the history, overview and application of Ultrasonic Distance ranging sensors. **[9]**
b) With a neat sketch explain Voice transmissions and Wireless cameras. **[9]**



Total No. of Questions : 8]

SEAT No. :

P7746

[6180]-275

[Total No. of Pages : 2

T.E. (Robotics and Automation Engineering)

HUMANOID ROBOTS

(2019 Pattern) (Semester - II) (Elective - II) (311511 (A) - 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) 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. **[10]**

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.

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?

A humanoid robot has a mass of 12 kg. The inertia tensor of the robot's body is given as follows: $I_{xx} = 1.5 \text{ kgm}^2$, $I_{yy} = 3 \text{ kgm}^2$, $I_{zz} = 1 \text{ kgm}^2$. Calculate the total moment of inertia for the robot's body. **[10]**

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) AI techniques

OR

- Q8)** Write short note on [18]
a) A.I. Robotics applications.
b) Cobots
c) Social Robotics



Total No. of Questions : 8]

SEAT No. :

P7747

[6180]-276

[Total No. of Pages : 2

T.E. (Robotics and Automation)
MODELING AND SIMULATION
(2019 Pattern) (Semester - II) (Elective - II) (311511 (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) Figures to the right indicate full marks.

- Q1)** a) What is the nature of simulation models? [6]
b) Which are the inputs of simulation model? [6]
c) When to use simulations? [5]

OR

- Q2)** a) What is input modeling in simulation? [6]
b) Which are the four phases of input modeling for simulation? [6]
c) What is a Histogram? [5]

- Q3)** 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 Uniform. [5]

OR

- Q4)** 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 Weibull. [5]

P.T.O.

- Q5)** a) Discuss “simulation is more widely applied to manufacturing systems than to any other application area”. [6]
- b) Describe types of manufacturing issues typically addressed by simulation. [6]
- c) Which are the common measures of performance obtained from a simulation study of a manufacturing system? [6]

OR

- Q6)** a) Discuss the need for and the quantity of equipment and personnel in manufacturing system design. [6]
- b) Describe Evaluation 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]

- 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. :

P-7748

[Total No. of Pages : 2

[6180]-278

T.E. (Artificial Intelligence and Machine Learning)

DESIGN AND ANALYSIS OF ALGORITHMS

(2019 Pattern) (Semester-I) (318541)

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 principal of optimality with 0/1 Knapsack problem. [8]
b) Differentiate between dynamic programming and greedy method. [6]
c) Explain Warshal's algorithm with suitable example. [4]

OR

- Q2)** a) Explain Floyd's algorithm and give example. [8]
b) Consider following instance for simple knapsack problem. Find the solution using greedy method. [6]
N=8
P= {11,21,31, 33, 43, 53, 55, 65}
W= {1, 11,21,23, 33, 43, 45, 55}
M=110 .
c) What is optimal binary search tree? Explain with optimality. [4]

- Q3)** a) Apply backtracking technique to solve the following instance of the subset sum problem S = [1, 3, 4, 5] and d=[11 16] [7]
b) Write the backtracking algorithm for N-Queen problem and explain with suitable example. [6]
c) Draw state space tree for 4-Queen's problem. [4]

OR

P.T.O.

- Q4)** a) Explain algorithm of graph coloring using backtracking. Give suitable example. [7]
 b) Write an algorithm to find Hamiltonian Path using backtracking method. [6]
 c) Write recursive backtracking algorithm for sum of subset problem. [4]

- Q5)** a) What is travelling salesman problem? Find the solution of following travelling salesman problem using branch and bound method. [8]

Cost Matrix	∞	20	30	10	11
	15	∞	16	4	2
	3	5	∞	2	4
	19	6	18	∞	3
	16	4	7	16	∞

- b) Compare backtracking and branch and bound method. [6]
 c) Write an algorithm for least cost(LC) branch and bound. [4]

OR

- Q6)** a) Explain the concept of bounding function using branch and bound. [8]
 b) Explain strategies of branch and bound. [6]
 c) Write an algorithm for FIFO Branch and Bound. [4]

- Q7)** a) Prove that Clique problem is NP complete. [7]
 b) Explain Vertex Cover Problem in detail. [6]
 c) Write applications of NP classes of computational complexity. [4]

OR

- Q8)** a) Write non deterministic algorithm for sorting elements of an array. [7]
 b) Write an algorithm for pointer doubling problem. What is its time complexity. [6]
 c) Explain in detail Parallel Computing. [4]



Total No. of Questions : 8]

SEAT No. :

P-7749

[Total No. of Pages : 2

[6180]-279

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, 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) What is IPV6 protocol? Explain advantages of IPV6 over IPV4 protocol [8]
- b) Write short note on Constrained nodes. [6]
- c) Write applications of IEEE 802.15.4? [4]

OR

- Q2)** a) Explain detail architecture of MQTT protocol. [8]
- b) State and describe various characteristics of LoRaWAN technology? [6]
- c) Explain IEEE 802.11ah protocol. [4]

- Q3)** a) Explain requirements of unstructured data storage. [7]
- b) Explain Data Integration platforms. [6]
- c) Explain Cisco frameworks. [4]

OR

- Q4)** a) List and Explain any three IOT frameworks. [7]
- b) Write short note on Data Warehouse. [6]
- c) State and describe unstructured data storage challenges. [4]

P.T.O.

- Q5)** a) Explain different types of data analytics. [8]
b) Explain encrypting in Data in Motion. [6]
c) Explain key features of Clouds to support IOT. [4]

OR

- Q6)** a) Explain Everything as a Service cloud service model (XAAS). [8]
b) Short note on 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 in Asset management using IOT. [6]
c) Explain in brief IOT cloud platforms. [4]

OR

- Q8)** a) Describe advantages and disadvantages of IOT 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. :

P-7750

[Total No. of Pages : 2

[6180]-280

T.E. (Artificial Intelligence and Machine Learning)

WEB TECHNOLOGY

(2019 Pattern) (Semester - I) (318543) (Backlog)

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 if necessary.

- Q1)** a) What are web frameworks? Explain advantages of web framework. What are the different types of web frameworks? [8]
- b) Explain angular forms with example. [6]
- c) What are routers? Explain the steps to create angular routers. [4]

OR

- Q2)** a) Explain angular project structure.State and explain any 4 components and modules of Angular JS. [8]
- b) What is typescript? Explain variables and Modules in TS. [6]
- c) What is CLI? Explain any 4 Commands in angular CLI. [4]

- Q3)** a) What are modules in Node.JS. List the different types of built in modules in Node.JS [7]
- b) Explain the different file operations in Node.JS with proper syntax and example. [6]
- c) What is difference between JavaScript and Node.js? [4]

OR

P.T.O.

Q4) a) Write the steps to perform any three CRUDE operations using Node.JS and MongoDB. [7]

b) How to create HTTP server and socket server? [6]

c) What is Express JS? [4]

Q5) a) What is basic structure of jQuery Mobile page? Name the CDN files which are used with jQuery Mobile? [8]

b) Write a code to create any two widgets of your choice in JQuery Mobile. [6]

c) Explain any four form components in JQuery mobile. [4]

OR

Q6) a) Explain list in JQuery Mobile. How to divide list in JQuery mobile? [8]

b) Explain multipage template in JQuery mobile. [6]

c) List all the roles in JQuery mobile. [4]

Q7) a) What is AWS Elastic Beanstalk? What are the benefits of AWS Elastic Beanstalk? [7]

b) Write a short note on : [6]

i) Application loadbalancer

ii) Network load balancer

c) What is Amazon EC2? Explain the features of Amazon EC2. [4]

OR

Q8) a) Explain the steps to deploy a web application on amazon EC2. [7]

b) What is PUTTY? How to connect EC2 instance with PUTTY? [6]

c) What are the Important AWS Cloud Services? [4]



Total No. of Questions : 8]

SEAT No. :

P-7751

[Total No. of Pages : 2

[6180]-281

T.E. (Artificial Intelligence and Machine Learning)
MANAGEMENT AND ENTREPRENEURSHIP FOR IT
INDUSTRY
(2019 Pattern) (Semester - I) (318544)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Define Entrepreneur. What are characteristic of an entrepreneur? [6]
b) Write about barriers to entrepreneurship. [6]
c) Explain about identification of business opportunity. [6]

OR

- Q2)** a) Discuss about entrepreneurship in India. [6]
b) Explain the types of Entrepreneur in detail. [6]
c) Explain [6]
i) Market feasibility
ii) Technical feasibility
ii) Financial feasibility

- Q3)** a) Define a project. What are the contents of a project report? [7]
b) Compare enterprise resource planning systems with other information systems in a business organization. [6]
c) Describe supply chain management. [4]

OR

P.T.O.

- Q4)** a) Explain the meaning of a project. State the significance and importance of a project report. [7]
b) Describe the meaning and importance of enterprise resource planning. [6]
c) Describe various types of reports generated in ERP. [4]

- Q5)** a) Explain MSME-DI and NISIC. [6]
b) List the characteristics of small scale Industries. [6]
c) Explain trademark, copy rights and patents. [6]

OR

- Q6)** a) Explain characteristics of small and micro industries. [6]
b) Explain steps involved in establishing micro and small enterprise. [6]
c) Write short note on-i) SIDBI ii) DIC iii) SSI. [6]

- Q7)** a) Explain i) WIPO ii) WTO iii) GATTs [6]
b) Discuss Need for Private Rights versus Public Interests. [5]
c) Explain Criticisms and Politics of Intellectual Property Rights. [6]

OR

- Q8)** a) Explain Economic analysis of Intellectual Property Rights. [6]
b) What intellectual property rights Explain in detail? [5]
c) Explain Advantages and Disadvantages of IPR. [6]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P8648

[6180] - 282 A

T.E.

ROBOTICS

**Artificial Intelligence and Machine Learning
(2019 Pattern) (Semester - I) (Elective - I) (318545 A)**

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Assume suitable data if necessary.*
- 4) *Figures to the right indicate full marks.*

- Q1)** a) Write short note on homogenous transformations and Manipulator. [6]
b) Discuss inverse or Back Solution with problems. [6]
c) What are different techniques of obtaining Inverse Solution? [6]

OR

- Q2)** a) Explain Coordinate Reference Frames and establishing link in coordinate frames. [6]
b) Explain Denavit-Hartenberg Matrix. [6]
c) Write short note on Properties of Transformation Matrices. [6]
- Q3)** a) Discuss design Aspect for gripper. [6]
b) What is End Effector? And also explain its types. [6]
c) How end effectors can be used as tool? [6]

OR

- Q4)** a) Explain Force analysis for various basic gripper systems. [6]
b) What is Gripper? And also explain its types. [6]
c) What are the uses of sensors in robot? Give examples and explain any one. [6]

P.T.O.

- Q5)** a) Explain the different types of Robot languages. [6]
b) Discuss Robot Control Sequencing. [6]
c) Give Brief about Artificial intelligence and Robot Programming. [6]

OR

- Q6)** a) Explain the various capabilities and limitations of the robot languages. [6]
b) What are general considerations in Robot material handling? [6]
c) What are Computational elements in Robotic Applications - Control. [6]

- Q7)** a) What are future manufacturing applications of robot? [6]
b) In which type of production, robots are preferred for loading and unloading function? Explain. [6]
c) Discuss Social and Labor Issues related to robotics. [5]

OR

- Q8)** a) List out some applications of robot? [6]
b) What is the future scope of robotics technology in the service industry? [5]
c) Discuss Hazardous and Inaccessible Nonmanufacturing Environments related to robotics. [6]



Total No. of Questions : 8]

SEAT No. :

P-7753

[Total No. of Pages : 2

[6180]-283

T.E. (Artificial Intelligence and Machine Learning)

PATTERN RECOGNITION

(2019 Pattern) (Semester-I) (Elective-I) (318545B)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Prove that the bayes classifier is equivalent to the minimum distance classifier, assuming that the feature vector is Gaussian. [8]
- b) Explain Bayes Decision rule.Explain how it can be used for two class classification. [6]
- c) What is maximum entropy estimation. [4]

OR

- Q2)** a) Explain Gaussian mixture models. [8]
- b) What is the difference between maximum likelihood and Bayes method.[6]
- c) Explain Nearest neighbor algorithm with example. [4]

- Q3)** a) Explain the perceptron learning algorithm in detail. [7]
- b) Explain stochastic approximation of LMS algorithm. [6]
- c) Explain sum of error estimate. [4]

OR

- Q4)** a) Explain any Linear discriminant based algorithm. [7]
- b) Explain minimum squared error discriminant function. [6]
- c) Explain decision hyperplane. [4]

P.T.O.

- Q5)** a) Define clustering and explain clustering algorithms. [8]
b) Draw the model of single artificial neuron. [6]
c) Explain the three layer perceptron. [4]

OR

- Q6)** a) Describe the architecture and learning algorithm of back propagation network. [8]
b) Define the criterion functions used in clustering. [6]
c) Define the terms weight, bias, activations with respect to neural network. [4]

- Q7)** a) Explain principal component analysis for dimensionality reduction. [7]
b) Explain expectation maximization with the help of algorithm. [6]
c) Explain linear analysis discriminant function. [4]

OR

- Q8)** a) Explain following normal density function with formula [7]
i) Univariate normal density.
ii) Multivariate normal density.
b) What is the significance of Hidden Markov model in classifier design. [6]
c) Explain Bayesian parameter estimation. [4]



Total No. of Questions : 8]

SEAT No. :

P-7754

[Total No. Of Pages : 2

[6180]-284

T.E. (Artificial Intelligence and Machine Learning)
INFORMATION SECURITY
(2019 Pattern) (Semester - I) (318545 C) (Elective - I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Write a note on Diffie- Hellman key exchange. [6]
b) Explain in detail Elliptic Curve Cryptography [6]
c) Explain El Gamal algorithm in detail. [6]

OR

- Q2)** a) What is the Chinese remainder theorem & how is it used in public key cryptography? [6]
b) How do Fermat and Euler theorems contribute to the RSA algorithm?[6]
c) What are the different types of Cryptography. Explain Public Key Cryptography in detail. [6]

- Q3)** a) Explain Secure Hash Algorithm (SHA) in detail. [6]
b) Explain Hash Functions Based on Cipher Block Chaining in detail. [6]
c) How are digital signatures used to verify the authenticity of digital documents? [5]

OR

- Q4)** a) Write a short note on PKI X.509 Certificate. [6]
b) What are message authentication codes & how do they ensure message authentication? [6]
c) Which are the different Web Security issues? [5]

P.T.O.

- Q5)** a) What are the different types of access control mechanisms and how are they used in network security? [6]
- b) Explain the need of firewall and its characteristics. [6]
- c) Explain the concepts of trusted system & Trusted computing. [6]

OR

- Q6)** a) Draw & explain OSI Security architecture. [6]
- b) Write a note on Host based and network based Honeypot [6]
- c) What are types of Firewall, and also explain Intrusion prevention system: Host based in detail. [6]

- Q7)** a) What is mean by Proxy servers and Anonymizer? Explain with its categories [6]
- b) Write a note on Social Engineering. [6]
- c) Explain Cybercrime Scenario in India. [5]

OR

- Q8)** a) State the Amendments in Indian IT Act. [6]
- b) Write a note on Phishing. [6]
- c) State the Classification of Cybercrimes. Write a note on Cybercrime.[5]



Total No. of Questions : 8]

SEAT No. :

P-7755

[Total No. of Pages : 2

[6180]-285

T.E. (Artificial Intelligence and Machine Learning)

BUSINESS INTELLIGENCE

(2019 Pattern) (Semester-I) (Elective-I) (318545D)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.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 indicate full marks.*
- 4) Assume suitable data, if necessary.*

- Q1)** a) Explain the Closed Loop BPM Cycle and its significance in Business Performance Management. **[8]**
- b) What are Key Performance Indicators (KPIs) and how are they used in Performance Measurement? **[6]**
- c) Explain the concept of Visual Analytics. **[4]**

OR

- Q2)** a) Describe the Four Perspectives of the Balanced Scorecard and how they contribute to the overall business strategy. **[8]**
- b) Discuss the types of charts and graphs that are commonly used in Data and Information Visualization. **[6]**
- c) Define Performance Dashboards and their role in Business Reporting Systems. **[4]**

- Q3)** a) Differentiate between descriptive, predictive and prescriptive analytics. Give example of a business scenario where each of them can be used. **[7]**
- b) Explain the process of sensitivity analysis in decision making. **[6]**
- c) What are the benefits of using decision support systems in business? **[4]**

OR

P.T.O.

- Q4)** a) Describe the structure of mathematical models for decision support. Explain how certainty, uncertainty and risk are incorporated into these models. [7]
- b) Describe the role of decision trees in decision analysis. [6]
- c) What is goal seeking in decision making? [4]

- Q5)** a) Explain how business intelligence is used in fraud detection and retail industry. [8]
- b) How does BI support customer relationship management (CRM) and marketing? Give examples. [6]
- c) What is the role of visual and business analytics in BI. [4]

OR

- Q6)** a) Discuss the role of ERP in business intelligence and how it is used in finance, logistics and production Give examples. [8]
- b) Explain how telecommunications companies use business intelligence to gain insights into customer behavior and preferences. [6]
- c) What are the key components of a data warehouse? [4]

- Q7)** a) What are the critical success factors for implementing a BI strategy? Discuss the role of emerging technologies and cloud computing in BI implementation. [7]
- b) What are the impacts of analytics in organizations? [6]
- c) What are the issues of privacy and ethics in BI implementation? [4]

OR

- Q8)** a) How does location-based analytics help organizations? Discuss the ethical and legal issues associated with analytics. [7]
- b) What is BI search and text analytics? [6]
- c) What are the analytics applications for consumers? [4]



Total No. of Questions : 8]

SEAT No. :

P-7756

[Total No. of Pages : 2

[6180]-286

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 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 are linear regression assumptions? [6]
b) How do you evaluate a regression model's goodness of fit and choose metrics? [6]
c) Explain logistic regression advantage over linear regression? [6]

OR

- Q2)** a) How do you interpret logistic regression coefficients, odds ratios, and maximum likelihood estimation? [6]
b) How do you visualize fitting logistic regression curves? [6]
c) Explain generalized linear models. [6]

- Q3)** a) How does SVM work, what are kernel functions? [6]
b) How do ensemble methods such as bagging and boosting improve classification accuracy? [6]
c) What is random forest, how does it reduce overfitting? [5]

OR

- Q4)** a) How do you evaluate the performance of a classification model, and what are some metrics? [6]
b) What are the advantages and disadvantages of using different ensemble methods? [5]
c) How do bagging and bootstrap ensemble methods work? [6]

P.T.O.

- Q5)** a) How do decision trees partition data, and what is entropy's role in this process? [6]
b) What are the advantages and disadvantages of using random forests over other ensemble methods? [6]
c) What are commonly used algorithms for creating decision trees, and how do they differ? [6]

OR

- Q6)** a) How do bagging and boosting reduce variance and bias, respectively? [6]
b) What is C5.0 boosting, and how does it differ from other boosting methods? [6]
c) How does gradient boosting work, and what are some advantages of using the XGBoost library? [6]

- Q7)** a) What are unsupervised learning and clustering, and how do they relate? [6]
b) How does k-means assign data points to clusters, and what are its limitations? [6]
c) What is density-based spatial clustering, and how does it identify clusters of varying shapes and densities? [5]

OR

- Q8)** a) How do hierarchical clustering methods create a tree-like structure of clusters, and what are some advantages of using this approach? [6]
b) How do dendrograms help visualize hierarchical clustering results and choose the appropriate number of clusters? [5]
c) What are divisive clustering techniques, and how do they differ from agglomerative clustering methods? [6]



Total No. of Questions : 8]

SEAT No. :

P-7757

[Total No. of Pages : 2

[6180]-287

T.E. (Artificial Intelligence and Machine Learning)
DATA MINING AND WAREHOUSING
(2019 Pattern) (Semester - II) (318553)

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 if necessary.*

- Q1)** a) Compare K-Means with K-Medoids techniques for clustering. [6]
b) Explain various components of business intelligence. [6]
c) Explain the state the categories of clustering methods. [6]

OR

- Q2)** a) Explain DBSCAN method in details. [6]
b) What is hierarchical clustering? Explain Types of hierarchical clustering. [6]
c) What is roll of Data Mining in BI. [6]

- Q3)** a) Explain about the Three-tier data warehouse architecture with a neat diagram. [8]
b) What are steps in designing the data warehouse? Explain. [6]
c) Differences between operational database and data warehouse. [5]

OR

- Q4)** a) Describe in brief about Data warehouse implementation. [8]
b) Define data warehouse? What is the need of data warehouse explain in details. [6]
c) Write a short note on Data Mart. [5]

P.T.O.

- Q5)** a) Differentiate between OLTP and OLAP with example. [6]
b) Explain Data life cycle in details. [6]
c) Write a short note on ETL Process. [6]

OR

- Q6)** a) Explain data reduction strategies in details. [6]
b) What is the Significant role of metadata. [6]
c) Explain data discretization techniques in details. [6]

- Q7)** a) Suppose that a data warehouse consists of the three dimensions time, doctor and patient, and the two measures count and charge, where charge is the fee that a doctor charges a patient for a visit. Draw a Stars, Snowflakes and Fact Constellations Measures schema diagram for the above data warehouse. [9]
b) Differentiate between ROLAP, MOLAP and HOLAP. [6]

OR

- Q8)** a) Explain following OLAP operation in multi-dimensional data with example. [10]
i) Roll Up
ii) Drill Down
iii) Slice
iv) Dice
v) Pivot
b) Explain Concept Hierarchies in details. [5]



Total No. of Questions : 8]

SEAT No. :

P-7758

[Total No. of Pages : 2

[6180]-288

T.E. (Artificial Intelligence and Machine Learning)

ARTIFICIAL NEURAL NETWORK

(2019 Pattern) (Semester-II) (318554)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.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 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) Describe the feedforward process in MLPs and how it produces an output. **[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 backpropagation algorithm. How it is used to train multilayer perceptron. **[8]**
- c) Explain how multilayer perceptron can be used in image classification tasks. **[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]**

OR

P.T.O.

- 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 Boltzmann machines, and what are 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 ART. [4]

OR

- Q6)** a) Explain Adaptive Resonance Theory (ART) and its role in pattern recognition. Provide an example. [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) Discuss the architecture of Deep Recurrent Neural Networks (RNN) and their applications in speech recognition. Provide an example. [10]

OR

- Q8)** a) Explain the main differences between Traditional Machine Learning and Learning in Deep Neural Networks, including feature engineering, scalability, and interpretability. [8]
- b) Explain the challenges faced in training Deep Learning Networks, including overfitting, vanishing gradients and exploding gradients. [9]



Total No. of Questions : 8]

SEAT No. :

P-7759

[Total No. of Pages : 2

[6180]-289

T.E. (Artificial Intelligence and Machine Learning)

INDUSTRIAL INTERNET OF THINGS

(2019 Pattern) (Semester - II) (318555(A)) (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 indicate full marks.
- 4) Assume suitable data, if necessary.

- Q1)** a) Explain Enhancing Resiliency in Production Facilities through CPS. [8]
b) Explain work piece's memory Contents with the help of neat diagram.[6]
c) Explain Interoperability in Smart Automation. [4]

OR

- Q2)** a) Explain industry 4.0 in manufacturing process. [6]
b) Describe knowledge Mining in Databases. [6]
c) Explain communication technology in IIOT. [6]

- Q3)** a) Explain the role of computer control of machine tools and machine centers in today's industry. [8]
b) Explain the working of digital technology in manufacturing industry. [6]
c) Explain conditional monitoring in machine learning. [5]

OR

- Q4)** a) Explain the need for data and system interoperability in smart automation. [8]
b) Explain exemplary plant setup of two drives with the help of a diagram.[6]
c) Explain features of Cyber Physical system. [3]

P.T.O.

- Q5)** a) Explain skills and tools of open manufacturing with the help of neat diagram. [6]
b) Explain Centralized user intervention in detail. [6]
c) Write short note on : [6]
i) Product Innovation
ii) Service Innovation

OR

- Q6)** a) Explain key terms in advanced Manufacturing with suitable diagram. [8]
b) Explain Smart Factory and Industry 4.0 in advanced Manufacturing in detail. [6]
c) Explain the role of innovation ecosystems in Industry 4.0 adoption. [4]

- Q7)** a) Explain examples of Industrial IOT using real time. [6]
b) Explain the application of IOT in manufacturing plant. [6]
c) Explain the Smart Metering with example. [5]

OR

- Q8)** a) Explain
i) Application of IOT in healthcare. [6]
ii) Application of IOT in City Automation.
b) Explain the architecture of an IOT system in Smart Card. [7]
c) Explain the Major Applications of IOT In The Automotive Industry. [4]



Total No. of Questions : 8]

SEAT No. :

P-7760

[Total No. of Pages : 2

[6180]-290

T.E. (Artificial Intelligence and Machine Learning)

BRAIN COMPUTER INTERFACE

(2019 Pattern) (Semester - II) (318555B) (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 indicate full marks.
- 4) Assume suitable data; if necessary.

- Q1)** a) What is Frequency domain analysis? [6]
b) What is an Application in storm wave? [6]
c) Explain Properties Time domain analysis. [6]

OR

- Q2)** a) Which uses the principles of Fourier optics in detail? [6]
b) What is the Independent Component Analysis? [6]
c) Draw and explain Phase synchronization and coherence. [6]

- Q3)** a) Explain Binary classification of MACHINE LEARNING. [6]
b) Explain reconstruct the phase of light intensity. [6]
c) Which is the Multiclass Classification? [5]

OR

- Q4)** a) Explain Evaluation of classification, performance of BCI. [6]
b) Why we use RBF's? [5]
c) Explain Multilayer neural networks. [6]

P.T.O.

- Q5)** a) Which Generalized Support Vector Machine for Brain-Computer Interface? [6]
b) Explain Visual evoked potentials in BCI. [6]
c) Explain Flash visual evoked potentials. [6]

OR

- Q6)** a) How we can use visual evoked potentials in various stimulation conditions? [6]
b) What is the onset Flash visual evoked potentials? [6]
c) Explain offset Peak-to-valley amplitudes. [6]

- Q7)** a) Which are Determination Invasive BCIs. [6]
b) What is Decoding and Tracking Arm in Human Anatomy? [6]
c) What is Psychological and Social Implications in BCI? [5]

OR

- Q8)** a) Explain the task Dual-Use and Militarization. [6]
b) Why we use Multi-electrode array implants involve the collection?[5]
c) Explain functional Dual-Use and Misuse. [6]



Total No. of Questions : 8]

SEAT No. :

P-8795

[Total No. of Pages : 2

[6180]-301A

T.E. (Artificial Intelligence and 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, 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 different machine learning (ML) algorithms for botnet detection. [8]

b) Explain network and transport layer attacks. [6]

c) Explain different approaches used to identify botnet topology. [4]

OR

Q2) a) Explain different types of botnet topologies. [8]

b) Explain statistical and machine learning based anomaly detection techniques. [6]

c) Explain Naïve Bias and KNN algorithm. [4]

Q3) a) Explain leverage machine learning (ML) algorithms for fraud detection [7]

b) Explain different techniques for securing user authentication [6]

c) Explain how to protect sensitive information and assets. [4]

OR

Q4) a) Explain authentication abuse prevention techniques. [7]

b) Explain user authentication with keystroke recognition. [6]

c) Explain bagging and boosting techniques can improve an algorithm's effectiveness. [4]

P.T.O.

- Q5)** a) What is GAN? Explain its use in attack and defense scenarios. [8]
b) Explain the attacks against facial recognition procedures using adversarial examples. [6]
c) Explain the steps involved in model substitution. [4]

OR

- Q6)** a) Explain the main libraries and tools for developing adversarial examples. [8]
b) Explain the attacks against deep neural networks (DNNs) via model substitution. [6]
c) Explain the attacks against intrusion detection systems (IDS) via GANs. [4]

- Q7)** a) Explain the steps to be followed in preparation of raw data in Feature engineering. [7]
b) Explain how to split sample data into training and test sets. [6]
c) Explain bias-variance trade-offs with cross validation. [4]

OR

- Q8)** a) Evaluate a detector's performance using the ROC curve. [7]
b) What is cross validation. Explain its technique used for bias-variance trade-offs. [6]
c) Explain how to manage algorithms overfitting. [4]



Total No. of Questions : 8]

SEAT No. :

P-7762

[Total No. of Pages : 2

[6180]-302
T.E. (Semester - II)
ARTIFICIAL INTELLIGENCE AND MACHINE
LEARNING
Video Analytics
(2019 Pattern) (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 wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Explain briefly a HMM based classifier. [6]
b) Write about Deep learning networks. [6]
c) Explain fuzzy pattern classifier? [6]

OR

- Q2)** a) Explain different types of deep neural networks? [6]
b) Explain Neural networks. [6]
c) Define Bayesian classifier? What are the different types of Bayesian classifiers? [6]

- Q3)** a) What is crowd analysis? Explain method of crowd analysis. [6]
b) What is a perimeter security? Explain. [6]
c) Explain video analytics for security with example? [5]

OR

- Q4)** a) What is human action recognition using AI? [6]
b) With a brief explanation, explain human behavioural analysis. [6]
c) Discuss prediction of crowd congestion? [5]

P.T.O.

- Q5)** a) Explain purpose and methods of route planning. [6]
b) What is driver assistance? Explain Lane departure warning (LDW) [6]
c) Explain Customer behaviour analysis with example. [6]

OR

- Q6)** a) Explain Traffic rule violation detection. [6]
b) Explain video analytics for Business Intelligence. [6]
c) Write short note on Traffic Monitoring and assistance. [6]

- Q7)** a) What is Video Analysis Action Recognition? Explain applications of video action recognition [6]
b) Explain scene understanding in deep learning? [6]
c) What is meant by video rendering? Explain the process of rendering?[5]

OR

- Q8)** a) What is meant by video rendering? Explain purpose of rendering a video? [6]
b) Explain application of scene understanding? [6]
c) Discuss Video Analysis Action Recognition. [5]



Total No. of Questions : 8]

SEAT No. :

P6389

[Total No. of Pages : 2

[6180]-303

T.E. (Computer and Science and Design)

SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

(2019 Pattern) (Semester-VII) (410341)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Draw neat and clean diagram.*
- 2) *Assume suitable data necessary.*
- 3) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*

- Q1)** a) State and explain any 4 design principles. [6]
b) Abstraction & refinement are complementary concepts. Justify. [6]
c) Explain the following design concepts. [6]
i) Refinement
ii) Modularity
iii) Architecture

OR

- Q2)** a) Explain the quality attributes considered in software Design. [6]
b) Differentiate between abstraction and refinement. [6]
c) What do you understand by refactoring? Give the importance of refactoring in improving the quality of software. [6]
- Q3)** a) Explain W5HH principle in detail. [6]
b) Explain the role of people, project, product and process in project management. [6]
c) Explain the FP based estimation technique. [6]

OR

- Q4)** a) How risk projection is carried out using table? [6]
b) What is the need of project estimation? What are the steps while estimation of software? [6]
c) What is a task network in project scheduling? Explain with an example. [6]

P.T.O.

- Q5)** a) What do you understand by software Configuration Management SCM? Discuss the importance of SCM. [6]
- b) Compare forward engineering with reverse engineering. [6]
- c) Explain RMMM plan with suitable example. [5]

OR

- Q6)** a) How forward engineering is applied to Client Server Architectures? [6]
- b) Explain SCM repository in detail. What are advantages of SCM repository? [6]
- c) How risk projection is carried out using risk table? [5]

- Q7)** a) Explain the integration testing approaches. [6]
- b) Draw the flow graph for finding minimum of five numbers and derive the test cases using cyclomatic complexity. [6]
- c) Write a short note on Test Management and automation. [5]

OR

- Q8)** a) Explain the strategic approach to software testing. [6]
- b) What is unit testing? Explain the unit testing process. [6]
- c) Differentiate between alpha and beta testing. [5]



Total No. of Questions : 8]

SEAT No. :

P-7830

[Total No. of Pages : 3

[6180]-304

T.E. (Computer Science and Design Engg.)

THEORY OF COMPUTATION

(2021 Pattern) (Semester - I) (318242)

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) Explain the closure properties of Context-free languages (CFLs). [5]

b) Simplify given grammar [6]

$S \rightarrow ABaC$

$A \rightarrow BC$

$B \rightarrow b \mid \epsilon$

$C \rightarrow D \mid \epsilon$

$D \rightarrow d$

c) Prove that following CFG is ambiguous and find the equivalent unambiguous grammar. [6]

$S \rightarrow aS \mid Sa \mid a$

OR

Q2) a) If $S \rightarrow 0S \mid 1S \mid 0 \mid 1$ then find CFL. [5]

b) Construct grammar for $L = \{0^i 1^j 0^k \mid j > i + k\}$. [6]

c) Convert below CFG into CNF [6]

$S \rightarrow YA \mid XB$

$A \rightarrow YAA \mid XS \mid a$

$B \rightarrow XBB \mid YS \mid b$

P.T.O.

- Q3)** a) Define PDA. Explain the acceptance of language by PDA. [7]
 i) By Final State
 ii) By Empty Stack
 b) Construct PDA that accepts following language = $\{a^n b^n \mid n \geq 0\}$. Write simulation for string "aaabbb". [7]
 c) Find PDA for given grammar if production are [4]
 $S \rightarrow 0BB$
 $B \rightarrow 0S \mid 1S \mid 0$

OR

- Q4)** a) Construct CFG equivalent to PDA given by the transition function [7]
 $\delta(q_0, a, z_0) = \{q_0, az_0\}$
 $\delta(q_0, a, a) = \{q_0, aa\}$
 $\delta(q_0, b, a) = \{q_1, \epsilon\}$
 $\delta(q_1, b, a) = \{q_1, \epsilon\}$
 $\delta(q_1, \epsilon, z_0) = \{q_1, \epsilon\}$
 b) Design PDA for the grammar given below. [7]
 $E \rightarrow E + E, E \rightarrow E * E, E \rightarrow d$
 c) Differentiate between FSM and PDA. [4]
- Q5)** a) Define Turing Machine. Explain the power of Turing machine over finite automata. [4]
 b) Construct TM to generate language given by Regular Expression [6]
 $R = (a + b)^* bb$
 c) Design TM to accept language, $L = \{0^n 1^n \mid n \geq 1\}$. [8]

OR

- Q6)** a) Write short note on halting problem of Turing Machine. [4]
 b) Design TM to find 2's complement for binary number. [6]
 c) Explain the following terms [8]
 i) Composite Turing Machine
 ii) Universal Turing Machine
 iii) Iterative Turing Machine
 iv) Multi-tape Turing Machine

- Q7)** a) Discuss the categories of problems based on solvability with suitable example. [4]
- b) If L_1 and L_2 are recursive languages, then $L_1 \cup L_2$ and $L_1 \cap L_2$ are also recursive". Justify. [6]
- c) Differentiate the following [7]
Recursive and Recursively enumerable languages.

OR

- Q8)** a) Justify whether the Travelling Salesperson Problem is a class P or Class NP problem. [4]
- b) Write short note on following : [6]
i) P class problem
ii) NP class problem
- c) What is SAT problem? Explain in detail. [7]



Total No. of Questions : 8]

SEAT No. :

P-7831

[Total No. of Pages : 2

[6180]-305

T.E. (Computer Science and Design)

DATABASE SYSTEM DESIGN

(2019 Pattern) (Semester-I) (318243)

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 concepts of referential integrity constraint and entity integrity constraint with example. **[8]**

b) What is normalization on database? Explain 3rd normal form and BCNF with example. **[9]**

OR

Q2) a) Explain in brief Codd's 12 rules. **[8]**

b) What is the impact of insert, update and delete anomaly on overall design of database? How normalization is used to remove these anomalies? **[9]**

Q3) a) 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. **[9]**

b) Consider the following two transactions and schedule (time goes from top to bottom). Is this schedule conflict-serializable? Explain why or why not. **[9]**

T ₁	T ₂
R(A)	
W(A)	
	R(A)
	R(B)
R(B)	
W(B)	

OR

P.T.O.

- Q4)** a) To ensure atomicity despite failures we use Recovery Methods. Explain in detail log based recovery method. [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]

- Q5)** a) Explain the difference between SQL and NoSQL. [6]
- b) Explain CAP theorem and BASE properties. [6]
- c) List different NoSQL data Models and explain Document based Data Model. [6]

OR

- Q6)** a) With the help of diagram explain distributed database system. List features of distributed database. State the advantages of distributed databases. [6]
- b) Explain MapReduce operation in MongoDB with suitable example. [6]
- c) Explain any three aggregation functions using MongoDB with suitable example. [6]

- Q7)** a) Write short note on [8]
- i) Active database
- ii) Deductive database
- b) What is semi-structured data ? Explain features of semi-structured data model. [9]

OR

- Q8)** a) Write short note on [8]
- i) Geometric data
- ii) Geographic data
- b) Explain object relational database. What are its advantages and disadvantages? [9]



Total No. of Questions : 8]

SEAT No. :

P7763

[6180]-306

[Total No. of Pages : 2

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 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 Fractional Knapsack problem. For the given set of items and the knapsack capacity of 15 kg, find the subset of the items to be added in the knapsack such that the profit is maximum. **[8]**

Total Items: $n=4$

Profit: $(p_1, p_2, p_3, p_4) = (10, 10, 12, 18)$

Weight: $(w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$

Capacity=15

- b) Find the correct sequence for jobs that maximizes profit using following Instances, JobID (1, 2, 3, 4, 5), Deadline (2, 1, 2, 1, 3) and Profit (90, 20, 25, 23, 12). Comment on analysis of algorithm. **[10]**

OR

- Q2) a)** Explain the Knapsack problem using mathematical notations. Find an optimal solution for following 0/1 knapsack problem using dynamic programming, Number of objects $n=4$, Knapsack capacity $M=5$, Weights $(w_1, w_2, w_3, w_4) = (2, 3, 4, 5)$ & Profit $(p_1, p_2, p_3, p_4) = (3, 4, 5, 6)$. Comment on 0/1 knapsack algorithm analysis. **[8]**

- b) Discuss greedy strategy. Write the Control abstraction for greedy strategy. Name few problems that can be solved using divide and conquer. Discuss and write algorithm for any one problem and analyze the same. **[10]**

- Q3) a)** Explain Backtracking Method. What is N-Queens Problem? Give solution of 4-Queens Problem using Backtracking Method. **[8]**

- b) Discuss branch and bound approach and write algorithm for knapsack problem using branch and bound and analyze the same. **[10]**

OR

P.T.O.

- Q4)** a) Explain is state space tree? What are the different ways of searching an answer node in a state space tree explain with example. [8]
b) Discuss and write the algorithm for sum of subsets problem with Backtracking. Specify its complexity. [10]

- Q5)** a) Explain amortized analysis. Discuss stack Time-Space tradeoff and Binarycounter. [8]
b) Discuss Embedded system scheduling algorithms. [9]

OR

- Q6)** a) Explain following in brief with example. [8]
i) Randomized algorithm
ii) Approximation algorithm
b) Discuss amortized analysis? Explain aggregate and accounting techniques with example. [9]

- Q7)** a) What is distributed algorithm? Write and explain distributed minimum spanning tree algorithm. [8]
b) How Multithreaded Merge Sort algorithm works? Also explain its advantages and challenges. [9]

OR

- Q8)** a) Discuss following with respect to multithreaded algorithms: [8]
i) Performance measures
ii) Analyzing multithreaded algorithm
iii) Parallel loops
iv) Race conditions.
b) Write a note on [9]
i) The Naïve String-Matching Algorithm.
ii) The Rabin-Karp Algorithm.



Total No. of Questions : 8]

SEAT No. :

P7764

[Total No. of Pages : 2

[6180]-307

T.E. (Computer Science and Design Engineering)

INTERNET OF THINGS

(2021Pattern) (Elective-I) (Semester-I) (318245A) (Theory)

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) Illustrate any Communication API with Suitable IoT System. **[6]**
b) Demonstrate 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) Illustrate REST based Communication API with Suitable IoT System. **[6]**
b) Classify the four pillars of IoT. **[6]**
c) Explain the working of push-pull Communication model with the help of diagram. **[6]**

- Q3)** a) Explain M2M in detail **[6]**
b) Explain WSN Protocols in detail. **[6]**
c) Illustrate the various IoT applications developed using IP protocols. **[6]**

OR

- Q4)** a) Illustrate different issues with standardization of IoT Protocols. **[6]**
b) Explain why ZigBee is popular than Wi-Fi and Bluetooth in IoT. **[6]**
c) Explain Modbus Protocol in detail **[6]**

P.T.O.

- Q5)** a) Use the knowledge of Cloud computing to explain need of [6]
i) Amazon Auto Scaling
ii) Xively Cloud for IoT.
b) Explain SkyNet IoT Messaging Platform [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) Explain AutoBahn for IoT [5]

- Q7)** a) Show the use of classic pillars of information assurance while securing the IoT application. [6]
b) Explain Identity Establishment issue with respect to IoT security. [6]
c) Explain security model for IoT. [5]

OR

- Q8)** a) Examine how threat model is useful in securing IoT applications. [6]
b) Explain life cycle of an IoT device [6]
c) List and explain possible Vulnerabilities of IoT. [5]



Total No. of Questions : 8]

SEAT No. :

P-8783

[Total No. of Pages : 2

[6180]-311

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) List out various methods of statistical analysis ? Explain hypothesis testing, null hypothesis, and alternative hypothesis with example. [9]
- b) What is confusion Matrix? Explain the True Positive, False Positive, False Negative and True Negative with example. [9]

OR

- Q2)** a) Write short note on [8]
- i) AUC and ROC
 - ii) Sensitivity and Specificity
- b) Consider the confusion Matrix given below. Calculate Accuracy, Precision, Recall and F-score. [5]

Predicted Class \ Actual Class	Heart Disease	No Heart Disease
Heart Disease	107	53
No Heart Disease	64	79

- c) What is Hypothesis Testing? Comment on type-I and type-II error. [5]
- Q3)** a) What is Normalization and Standardization? Explain different feature scaling techniques. [9]
- b) Explain Ridge Regression and Lasso Regression in details. [8]
- OR
- Q4)** a) What is bias and variance? Explain bias-variance trade-off with respect to Overfitting and Underfitting. [8]
- b) Explain three different cross validation Techniques. [9]

P.T.O.

- Q5) a)** What dimension reduction? State few advantages of dimension reduction. Explain any one dimension reduction technique in detail. **[10]**
- b)** What is imbalance dataset? What are different Resampling Techniques? Explain any one method in depth. **[8]**

OR

- Q6) a)** Write short note on: **[10]**
- i) LDA
- ii) PCA
- b)** What is regression? Explain the Linear and logistic regression in depth. **[8]**

- Q7) a)** Write short notes on Correlation Coefficient and Rank Correlation. **[8]**
- b)** Write short notes on Residual Error and Mean Square Error. **[9]**

OR

- Q8) a)** Explain in detail Linear and Logistic regression with the help of suitable examples. **[8]**
- b)** Explain the Gradient Descent method. State and explain the different types of gradient descent. **[9]**



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P7765

[6180]-312

T.E. (Honors)

CYBER SECURITY

Information and Cyber Security

(2019 Pattern) (Semester-I) (310401)

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 whenever necessary.*
- 4) *Assume Suitable data if necessary.*

- Q1)** a) Explain Chinese remainder theorem and its implication in cryptography. **[9]**
b) Discuss Diffie-Hellman key exchange algorithm with example. **[8]**

OR

- Q2)** a) What do you mean by asymmetric cryptography algorithm? Explain the RSA algorithm with an example. **[9]**
b) Discuss elgamal arithmetic algorithm with example. **[8]**

- Q3)** a) Explain risk identification, risk Assessment, risk control strategies. **[9]**
b) Differentiate between quantitative and qualitative risk. **[8]**

OR

- Q4)** a) Define cyber crime. Explain any four categories of cyber crime. **[9]**
b) Discuss any four types of cyber attacks. **[8]**

- Q5)** a) Discuss working of PKI in detail. **[9]**
b) Differentiate between PGP and S/MIME. **[9]**

OR

- Q6)** a) Explain the IP security in detail. **[9]**
b) Explain the web security in detail. **[9]**

P.T.O.

Q7) a) Explain intrusion detection system & Its types. **[9]**

b) Discuss Worms, DoS and DDoS in detail. **[9]**

OR

Q8) a) Explain phishing, password cracking, key-loggers in detail. **[9]**

b) Discuss buffer overflow, spyware, adware in detail. **[9]**



Total No. of Questions : 8]

SEAT No. :

P7766

[Total No. of Pages : 2

[6180]-313

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 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 whenever necessary.
- 4) Assume Suitable data if necessary.

- Q1)** a) Explain random forest algorithm with appropriate example. [6]
b) Explain Apriori Algorithm used in machine learning with valid example. [6]
c) Write a note on [6]
i) Partitioning Clustering
ii) Density-Based Clustering

OR

- Q2)** a) What is clustering? Explain K-means clustering algorithm. [6]
b) State and explain how Naive Bays classifier can be used to solve the classification problems? [6]
c) Illustrate how you will evaluate association rules. [6]

- Q3)** a) State and explain the different constituents of the decision tree. [9]
b) Write a note on [8]
i) Entropy
ii) Gini index

OR

- Q4)** a) When do you use Backpropagation in Neural Networks? Explain by taking a suitable example. [9]
b) What is entropy? How entropy is calculated explain with a suitable example. [8]

P.T.O.

- Q5)** a) Define the term Dashboard along with its evolution and steps to design the dashboard. [9]
- b) Write a note On: [9]
- i) Histograms
 - ii) Bar garphs
 - iii) Scatterplots

OR

- Q6)** a) Explain the terms Network hierarchies and reports associated with data visualization. [6]
- b) Write a note on advanced visualization techniques and explain anyone of them. [6]
- c) Write a note on ‘display media for Dashboard’. [6]

- Q7)** a) What are different types of data model explain in brief. [6]
- b) List the advantages of multi-dimensional data model? [6]
- c) Discuss the challenges of clustering High-dimensional data. [5]

OR

- Q8)** a) Explain the need of data modelling. [6]
- b) Explain multidimensional data model with one example. [6]
- c) Explain Principal Component Analysis (PCA) with appropriate example. [5]



Total No. of Questions : 8]

SEAT No. :

P7767

[Total No. of Pages : 2

[6180]-314

T.E. (Honors) (Computer Engg.)

EMBEDDED SYSTEMS AND INTERNET OF THINGS

(2019 Pattern) (Semester-I) (310601)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn whenever necessary
- 4) Assume Suitable data if necessary.
- 5) Use of Non-Programmable scientific calculators 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) Differentiate between active and passive sensor. [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) List the open source IDE for embedded system application development. Explain any one in detail. [5]
b) Explain Design, Components and Coding requirements of embedded systems application? [6]
c) List the phases of SDLC. Explain SDLC requirements in detail. [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 different IoT enabling technologies which play a key-role and explain any one of them. [6]



Total No. of Questions : 8]

SEAT No. :

P7768

[Total No. of Pages : 2

[6180]-315

T.E. (Computer Engg.) (Honors)

VIRTUAL REALITY AND AUGMENTED REALITY

Virtual Reality

(2019 Pattern) (Semester-I) (310701)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn whenever necessary
- 4) Assume Suitable data if necessary.

Q1) a) Describe Physiology of the human eye with a diagram. **[9]**

b) What are axis angle representations of rotation? **[8]**

OR

Q2) a) What is Orthographic projection and Perspective projection. **[9]**

b) Write a note on Geometry of Virtual Worlds. **[8]**

Q3) a) Explain Rasterization in detail? **[6]**

b) Explain in detail the Rasterization process in Visual Rendering. **[12]**

OR

Q4) a) Explain following term w.r.t monocular depth cues with diagram. **[6]**

i) Retinal image size

ii) Height in the visual field

iii) Motion parallax

b) Explain the different ways to correct optical distortions? **[6]**

c) How to correct Optical Distortions. **[6]**

P.T.O.

- Q5)** a) Explain Tracking position and orientation? [7]
b) State and Explain different types of vection. [5]
c) Define velocities and acceleration? [5]

OR

- Q6)** a) Define the following terms w.r.t 2D Tracking system. [10]
i) Calibration
ii) Integration
iii) Registration
iv) Drift error
b) How the visibility problem is solved using Camera-based implementation. [7]

- Q7)** a) What are Design considerations and interaction mechanisms for virtual reality? [9]
b) Illustrate the different monaural cues. [9]

OR

- Q8)** a) Explain the interaction with Motor programs and remapping of audio?[12]
b) Explain Locomotion and Manipulation for the interaction mechanism of VR. [6]



Total No. of Questions : 8]

SEAT No. :

P7769

[Total No. of Pages : 2

[6180]-316

T.E. (Mechanical Engineering) (Honors)

SYSTEMS ENGINEERING

Foundations of Systems and Systems Engineering

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

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 whenever necessary.
- 4) Assume Suitable data if necessary.

Q1) a) Visualize the interconnectedness between the System Of Interest (SOI), enabling systems and the remaining systems within the operational environment. **[9]**

b) Enumerate and provide explanations for the various stages of the system life cycle, accompanied by a diagram. **[9]**

OR

Q2) a) Provide an explanations on system complexity and the concept of emergence within the field of System Engineering. **[9]**

b) Elaborate on Systems Science and demonstrate the interconnection between Systems Thinking, the General System Approach, and their application to Engineered Systems. **[9]**

Q3) a) Explain the process of defining architecture by presenting an IPO diagram for visual representation. **[9]**

b) Describe and provide an explanation of the various types of System Architecture. **[8]**

OR

Q4) a) Write short notes on Architectural views. **[8]**

b) Illustrate the Architecture Development and Traceability. **[9]**

P.T.O.

- Q5)** a) Define MBSE (Model-Based Systems Engineering) and illustrate the progression of MBSE over time with example. [9]
- b) Elaborate on the purpose of System Modeling Language (SysML) and demonstrate its practical significance in system modeling. [9]

OR

- Q6)** a) Illustrate the fundamental structure of SysML using a clear diagram while providing an accompanying explanation. [9]
- b) Provide an explanations on the topics of modeling, simulation, and trade-off analysis. [9]

- Q7)** a) Illustrate the application of simulation modeling within the Systems Engineering (SE) lifecycle. [8]
- b) Provide brief explanations on the foundations of quantitative modeling.[9]

OR

- Q8)** a) Elaborate on the significance of modeling in the process of decision-making. [8]
- b) Write a short notes on System dynamics modelling. [9]



Total No. of Questions : 8]

SEAT No. :

P7770

[Total No. of Pages : 2

[6180]-317

T.E. (Mechanical Engineering) (Honors)
ENERGY MANAGEMENT IN UTILITY SYSTEMS

Energy Management
(2019 Pattern) (Semester-I) (302021MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn whenever necessary*
- 4) *Assume Suitable data if necessary and mention the same clearly.*
- 5) *Use of steam tables, Mollier chart and calculator is allowed.*

Q1) a) Discuss the energy policy of the Government. **[10]**

b) Explain briefly Net Zero Energy Building(NZEB). **[8]**

OR

Q2) a) Discuss National Action Plan on Climate Change (NAPCC). **[10]**

b) What do you understand by designated consumers? **[8]**

Q3) a) Discuss ten steps of detailed energy audit. What are the areas that need to be focused during pre-audit phase? **[10]**

b) Explain the different instruments used for Energy Audit with application? **[7]**

OR

Q4) a) Define Energy audit and Distinguish between 'preliminary energy audit' and 'detailed energy audit'? **[10]**

b) Discuss energy audit report format. **[7]**

Q5) a) Explain Net Present Value and how NPV is calculated. **[10]**

b) Explain simple payback period. What are the limitations of it? **[8]**

OR

P.T.O.

Q6) a) Calculate Net present Value of a project at a discount rate of 16% with an Investment of Rs. 50,000 at the beginning of the first year, & saving of Rs. 23,000 & Rs. 36,000 at the end of the first & second year respectively. **[10]**

b) Define the Internal Rate of Return (IRR) and write its equation. List its advantages and disadvantages? **[8]**

Q7) a) Discuss International agreements about Environment and climate change. **[10]**

b) Discuss environmental impacts due to conventional energy use. **[7]**

OR

Q8) a) Explain in detail about Ozone Layer depletion process and its various effects. **[10]**

b) Write short note on Carbon credits. **[7]**



Total No. of Questions : 8]

SEAT No. :

P7771

[Total No. of Pages : 2

[6180]-318

T.E. (Mechanical / Automobile) (Honors)

ELECTRIC VEHICLES

e - Vehicle Technology

(2019 Pattern) (Semester - I) (302031 MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.No. 1 or Q.No.2, Q.No. 3 or Q.No.4, or Q.No. 5, or Q.No. 6, Q.No.7 or Q.No.8.
- 2) Figures to the right indicate full marks.
- 3) Draw the neat sketch wherever necessary.

- Q1)** a) Write a short note on li-ion battery with its working principal? [4]
b) What are the different chemistries of li-ion batteries? Make its comparative analysis on basis of power, energy and lifespan? [8]
c) Explain the advantages and disadvantages of li-ion batteries. [8]

OR

- Q2)** a) What are the Lithium ion battery charging precautions? [4]
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) Compare lead acid and li-ion batteries on basis of following parameters[8]
i) Access and expensive
ii) Energy efficiency
iii) Temperature performance
iv) Weight
v) Life cycle
vi) Energy density
vii) Power density
viii) Self discharge rate
b) Explain lead acid batteries with advantages, disadvantages and applications. [8]

OR

P.T.O.

- Q4) a)** Explain Nickel-Metal Hydride Batteries with advantages, disadvantages and applications. **[8]**
- b) Explain Li-ion supercapaciter with advantages, disadvantages and applications. **[8]**

- Q5) a)** What do you mean by drive system in electric vehicles? Explain with its significance for manufacturers and drivers. **[8]**
- b) Write in short different types of motars 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 Intelligent transportation applications? **[10]**
- b) Write a short note on Recycling Technology of Waste Batteries'? **[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 Charging algorithms for fast and efficient charging? **[10]**



Total No. of Questions : 8]

SEAT No. :

P7772

[Total No. of Pages : 2

[6180]-319
T.E. (Honors)
3D PRINTING
Additive Manufacturing Technology
(2019 Pattern) (Semester - I) (302011 MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Draw suitable neat diagrams, whenever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Assume suitable data if required.*

Q1) a) Explain with neat sketch construction & working. Advantages & limitations of Digital Light Processing (DLP) additive manufacturing technology.

[10]

b) List out benefits and drawbacks of Stereolithography (SLA). **[8]**

OR

Q2) a) Sketch and explain Continuous Liquid Interface Production (CLIP) additive manufacturing technology. **[10]**

b) What are the Limitations and Applications of Light - Based Photo-curing? **[8]**

Q3) a) Explain mechanism and parameters of Direct Metal Laser Sintering (DMLS) process with neat sketch. **[10]**

b) Write difference between: Metal Laser Sintering and electron Beam Melting. **[7]**

OR

Q4) a) Explain with neat sketch process mechanism and parameters of Selective Laser Sintering (SLS) process. **[10]**

b) Enlist materials used in laser based melting additive manufacturing technologies and state their applications in various industries. **[7]**

P.T.O.

- Q5) a)** What is Printing principle of binder jetting process? Explain the binder jetting process with its process parameters, benefits & applications. **[10]**
- b)** Explain in short with its advantages of any two following processes. **[8]**
- i) Multi Jet Modelling
 - ii) Polyjet Printing
 - iii) Multi Jet Fusion

OR

- Q6) a)** Explain with neat sketch Direct Metal Deposition (DMD). **[10]**
- b)** What are the applications of additive manufacturing technology 3D printing in prominent industries? **[8]**
- Q7) a)** Explain the applications of additive manufacturing technology in Food Processing & Consumer Applications. **[9]**
- b)** Explain the applications of additive manufacturing technology in Construction & Architectural sector. **[8]**

OR

- Q8) a)** What are the applications of additive manufacturing technology in aerospace and automotive industry? **[9]**
- b)** Explain the applications of additive manufacturing technology in fashion and jewellery industry. **[8]**



Total No. of Questions : 8]

SEAT No. :

P7773

[Total No. of Pages : 2

[6180]-320
T.E. (Honors)
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 and Q.7 or Q.8.*
- 2) Draw sketches wherever required.*
- 3) Figures to the right indicate full marks.*

- Q1)** a) What are the factors in selection and Design of Grippers. [6]
b) Explain with neat sketch magnetic Grippers. [6]
c) Explain with neat sketch vacuum grippers. [5]

OR

- Q2)** a) Explain various process tools as and effectors. [5]
b) What are Grippers? Explain their types and Application in various fields of Robotics. [6]
c) Explain with neat sketch Tactile sensor gripper. [6]

- Q3)** a) Explain with neat sketch capacitive sensor. [6]
b) Explain Machine Vision sensors in various Robotic Application. [6]
c) Explain with neat sketch LVDT sensor. [6]

OR

- Q4)** a) Explain with neat sketch force Torque sensor. [6]
b) Explain construction & working of piezo electric sensors. [6]
c) What is compliance used in Robotics. What is significance of compliance. [6]

P.T.O.

- Q5)** a) Explain with neat sketch steps in Trajectory planning. [6]
b) Enlist steps in Forward kinematic analysis. [5]
c) Write short note on Jacobian Transformation with one example. [6]

OR

- Q6)** a) A 200F planar R-R - manipulator has $L_1 = 120\text{mm}$, & $L_2 = 75\text{mm}$. Determine joint angles using geometric approach so that face end is located at (100,70). [6]
b) Compare illustrate & explain direct and inverse dynamics applicable to Robotics alongwith its applications. [5]
c) Explain with neat sketch - D-H parameter. [6]
- Q7)** a) Sketch and explain the Robotic vision systems. [6]
b) Explain various applications of Robots in (Any 3) [6]
i) Defence
ii) Sports
iii) Industry
iv) Hospitals
c) Explain Robot safety and also explain in Brief 5 groups at risk of direct injury from Robot. [6]

OR

- Q8)** a) Explain the Economic aspects in Robotics. [6]
b) Explain various Image preprocssing Techniques. [6]
c) What are Robot vision systems. Explain 3 levels of Robot vision system. [6]



Total No. of Questions : 8]

SEAT No. :

P7774

[Total No. of Pages : 2

[6180]-321

T.E. (Electronics & Telecommunication) (Honors)
INTRODUCTION TO BLOCK CHAIN TECHNOLOGY
(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) Explain consensus mechanism as a core component in blockchain. [6]
b) Compare permission and permissionless blockchain? [6]
c) What is public Blockchain? Explain in detail. [6]

OR

- Q2)** a) Explain private Blockchain? Give its advantages and disadvantages. [6]
b) What is Incentive Mechanism in blockchain? Explain. [6]
c) List the name of Blockchain protocol? Explain the same. [6]

- Q3)** a) What is Hyperledger Fabric? Explain its basic transaction flow. [9]
b) Explain in detail the distributed ledger in blockchain technology. [9]

OR

- Q4)** a) List the important applications of blockchain. Explain the application of blockchain in Healthcare system. [9]
b) What is Distributed ledger in blockchain technology? Explain in detail. [9]

P.T.O.

- Q5) a)** What is the SANDBOX? Also, explain the SANDBOX Metaverse? **[9]**
b) How to integrated blockchain API's in a website? Explain. **[8]**

OR

- Q6) a)** What is cloud based blockchain? Explain in detail. **[9]**
b) Is multichain a private blockchain? Explain, how it is used for financial transactions. **[8]**

- Q7) a)** How to improve the efficiency and transparency in supply chain management system, using blockchain technology? Explain in detail. **[9]**
b) What are the limitations of Remittances in existing process? How the blockchain is used to solve the limitations of Remittances in current process? **[8]**

OR

- Q8) a)** How the blockchain is useful in real estate? Explain, how it is used for time and cost saving? **[9]**
b) Explain the importance of blockchain in Renewable energy? Give one example in detail. **[8]**



Total No. of Questions : 10]

SEAT No. :

P7775

[Total No. of Pages : 2

[6180]-322
T.E. (Honors)
METRO CONSTRUCTION
Surveying in Metro Construction
(2019 Pattern) (Semester - I) (301301)

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 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 Basic Requirements of an Ideal Alignment for metro? [7]

b) Explain steps involved in Preliminary surveys for metro Construction.[7]

OR

Q2) a) Explain GIS and remote sensing with diagram use for metro Construction. [7]

b) Explain Criteria's for selection of Good Alignment for metro? [7]

Q3) a) Explain different types of gradient used in metro construction. [7]

b) Explain maintenance of permanent way is important in metro construction? [7]

OR

Q4) a) Explain factors affecting the mode of distribution of load on the track depend? [7]

b) Explain the term Track Modulus and its types. [7]

P.T.O.

- Q5)** a) Explain the term Architectural design in Metro station. [7]
b) Explain the functions of Main Building Areas for different Types of Metro Stations? [7]

OR

- Q6)** a) Explain in brief facilities provide should in metro station? [7]
b) Explain construction types of Metro station? [7]

- Q7)** a) Explain the various factors controlling the alignment of metro track. Explain any two in detail. [7]
b) Explain 'Safety Precautions in tunneling'. [7]

OR

- Q8)** a) Explain Final Location Survey for Metro project. [7]
b) Explain in brief Reconnaissance survey for metro construction. [7]

- Q9)** a) Difference between Track Modulus and Track stiffness. [7]
b) Explain Vertical track stiffness and its measurement techniques. [7]

OR

- Q10)** a) Explain on Tunnel alignment and grade. [7]
b) Explain various methods for 'Tunnel ventilation'. [7]



Total No. of Questions : 8]

SEAT No. :

P7694

[Total No. of Pages : 2

[6180]-323

T.E. (Civil Engg.) (Honors)

ARCHITECTURE AND TOWN PLANNING

Urban Housing and Infrastructure Planning

(2019 Pattern) (Semester-I) (301401)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) 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 whenever necessary
- 4) Assume Suitable data if necessary.
- 5) Use of non programmable scientific calculator is allowed.

- Q1)** a) Enlist different housing policies and explain the need of the same. [6]
b) Write a note on NHP. [6]
c) What are the objectives of NHB? [5]

OR

- Q2)** a) Explain the need of rural housing finance. [6]
b) Write a note on HUDCO. [6]
c) Explain role of Co-operative housing. [5]

- Q3)** a) What kind of data is required for provision & planning of urban infrastructure? [6]
b) Enlist types of urban infrastructure and explain any one in detail. [6]
c) What is the need of management of infrastructure development in urban areas? [5]

OR

- Q4)** a) Which data is required for provision and planning of storm water drainage system? Explain in detail. [6]
b) Define infrastructure and explain its impact on financial aspect of urbanism. [6]
c) Write a short note on area allocation for any two infrastructure activity as per URDPFI. [5]

P.T.O.

- Q5)** a) Enlist and explain: Technical , Ecological and social services. [6]
b) Explain the considerations in relation with the operations for different services. [6]
c) Enlist the components of water supply system and elaborate any one with sketch. [6]

OR

- Q6)** a) What cost recovery means? How to calculate cost recovery? [6]
b) What is meant by appropriate technology? Explain the same for rural area. [6]
c) Elaborate significance of different services in relation with livability of the area. [6]

- Q7)** a) What issues are observed in relation with transport network? [6]
b) Enlist different networks in urban areas and its need. [6]
c) Write a note on “National Urban Sanitation Policy-2008”. [6]

OR

- Q8)** a) What issues are observed in relation with sanitation network? [6]
b) Enlist different categories of green space and its norms as per URDPFI guidelines. [6]
c) Enlist salient features of National water policy. [6]



Total No. of Questions : 8]

SEAT No. :

P7776

[Total No. of Pages : 1

[6180]-324

T.E. (Printing Engineering) (Honors)
ADVANCE 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) Assume suitable data, if necessary.
- 4) Neat diagrams must be drawn wherever necessary.

- Q1)** a) Explain the static characteristics of sensors and actuators. [9]
b) Explain the LED and switch interfacing using Arduino Board. [9]

OR

- Q2)** a) Explain working and characteristics of any two types of actuator used in printing industry. [9]
b) Explain the DC motor interfacing using Arduino Board. [9]

- Q3)** a) Explain the Wi-Fi Communication system and explain the RTS and CTS handshaking signals used in WiFi. [8]
b) Explain the pinouts of ESP8266. [9]

OR

- Q4)** a) Explain any two protocols used in IOT applications. [8]
b) Compare Node MCU and Arduino Uno board. [9]

- Q5)** Describe the types of cloud services in detail for IOT applications. [18]

OR

- Q6)** Describe the issues and challenges in IOT. [18]

- Q7)** Describe in detail about application of IOT in Auto sector and smart home. [17]

OR

- Q8)** Explain the role of IOT implementation in Printing industry. [17]



Total No. of Questions : 8]

SEAT No. :

P-7777

[Total No. of Pages : 2

[6180]-325

T.E. Honors (Computer Engineering)

ARTIFICIAL INTELLIGENCE

(2019 Pattern) (Semester - II) (310303)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.

Q1) a) Explain various operators used in propositional logic for knowledge base building. **[9]**

b) Explain Bayesian inference using a suitable example. **[8]**

OR

Q2) a) What is knowledge representation in propositional logic. Compare propositional logic and predicate logic. **[9]**

b) Write a note on probability reasoning. **[8]**

Q3) a) Explain **[6]**

i) Supervised learning.

ii) Unsupervised Learning.

b) Explain linear regression. Find linear regression equation for the following two sets of data: **[6]**

X	Y
2	3
4	7
6	5
8	10

c) Explain how Support vector Machines are used for classification with suitable example. **[6]**

OR

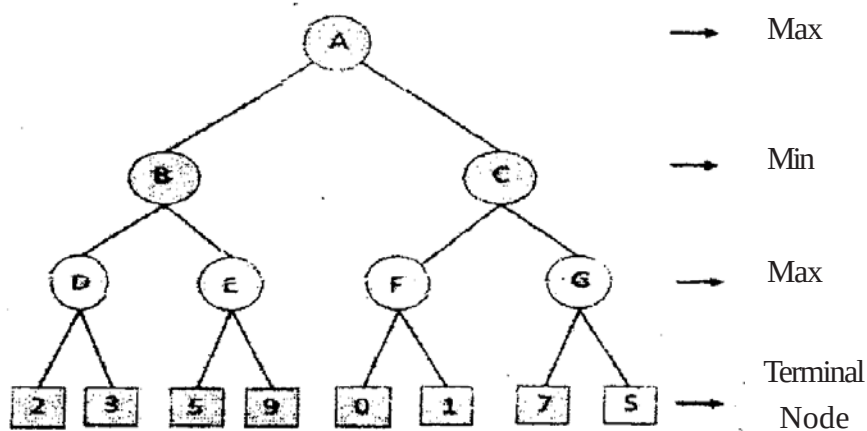
P.T.O.

- Q4)** a) With the help of an architecture diagram explain multilayer feed forward artificial neural network. [6]
 b) Explain how Decision Trees are used in Learning. [6]
 c) What is Artificial Neural Network? Give two applications of artificial neural networks in detail. [6]

- Q5)** a) Illustrate Mini-Max search for the tic-tac-toe game. [9]
 b) Write a note on : [8]
 i) Types of Games in AI
 ii) State-of-the-art Game Programs

OR

- Q6)** a) Solve given two player search tree using Alpha-beta pruning. [9]



- b) Explain Alpha-Beta Pruning with an example. [8]

- Q7)** a) Explain how sentiment analysis is done using Natural Language Processing techniques. [9]
 b) Represent the architecture of an expert system. label the various components in the diagram and explain. [9]

OR

- Q8)** a) Explain forward chaining and backward chaining for a simple example. [9]
 b) Explain general framework for computer vision applications. [9]



Total No. of Questions : 8]

SEAT No. :

P-8797

[Total No. of Pages : 2

[6180]-326

T.E. Honors (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.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 the component model in detail? [9]

b) Draw component relationship diagram with suitable example? [9]

OR

Q2) a) Explain and draw the component interaction diagram? [9]

b) Describe component description and deployment scenario? [9]

Q3) a) Explain the context of operational model design techniques in detail? [9]

b) Explain service quality in detail? [8]

OR

Q4) a) Draw and Explain with the help of Example "operational model relationship diagram" in detail? [9]

b) Illustrate operational patterns in detail? [8]

Q5) a) Illustrate the qualities required for metadata management? [9]

b) Describe nonfunctional requirements and indicates their relevance in the metadata context? [9]

OR

P.T.O.

- Q6)** a) Describe subcomponents of the MDM Service component? [9]
b) Give note on master data management, business scenarios & component deep dive in detail? [9]

- Q7)** a) Describe SABSA in detail. [8]
b) Explain COBIT and TOGAF in detail. [9]

OR

- Q8)** a) How to develop enterprise security architecture? Explain in detail. [8]
b) Describe measure and report the architecture development progress in detail. [9]



Total No. of Questions : 8]

SEAT No. :

P-7778

[Total No. of Pages : 2

[6180]-327

T.E. (Computer Engineering) (Honors)
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.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.
- 5) Use of Scientific Calculator is permitted.

Q1) a) With Linear algebra find the value of x, y and z for the given system equations - **[6]**

$$x + 2y + 3z = 6$$

$$3x - 2y + z = 2$$

$$4x + 2y + z = 7$$

b) Explain - **[6]**

i) LU decomposition

ii) Matrix factorization

c) Explain types of Eigenvector. **[6]**

OR

Q2) a) How to find Eigenvalues of a matrix? Explain with an example. **[6]**

b) Explain - **[6]**

i) Jacobian matrix

ii) Hessian matrix

c) Solve the following pair of linear equations by Substitution method- **[6]**

$$2x - 3y = 19 \text{ and } 3x - 2y = 21.$$

P.T.O.

- Q3)** a) Explain various challenges in Machine Learning. [8]
b) Differentiate between Supervised learning, Unsupervised learning, and Reinforcement Learning. [9]

OR

- Q4)** a) How to design a Learning System in Machine Learning? [8]
b) Explain the role of machine learning in data science by using a suitable example. Enlist disadvantages of Machine learning. [9]

- Q5)** a) Define Regression and explain simple and multiple linear Regression in detail. [8]
b) What are evaluation metrics for Regression Model? [10]

OR

- Q6)** a) What is the cost function? Discuss its use. Explain how to optimize the function. [8]
b) Explain different types of regression. [10]

- Q7)** a) What is a decision tree? Draw a sample decision tree. Explain the components of a decision tree. [9]
b) Explain Classification and Regression Tree. [8]

OR

- Q8)** a) What do you mean by entropy and information gain? Explain how to calculate. [8]
b) What is Bayes' Theorem? Explain the working of Naïve Bayes' Classifier. [9]



Total No. of Questions : 8]

SEAT No. :

P-7779

[Total No. Of Pages : 2

[6180]-328

T.E. (Computer Engineering) (Honors)
Internet of Things Architectures, Protocols and Systems
Programming
(2019 Pattern) (Semester - II) (310603)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Answer Q1 or Q2, Q3 or Q4, 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 the working of DTLS. **[6]**
- b) Explain in brief session layer protocols. **[6]**
- c) Describe in detail SCTP **[5]**

OR

- Q2) a)** Describe in brief transport layer protocols. **[6]**
- b) Explain in detail DCCP. **[6]**
- c) Explain in detail CoAP **[5]**

- Q3) a)** Describe Identity Management and Establishment in detail. **[6]**
- b) Describe IoT Security Models. **[6]**
- c) Explain in brief IoT Security Protocols **[6]**

OR

- Q4) a)** Explain in detail vulnerabilities security requirements and threat analysis. **[6]**
- b) What is IoT Security Tomography? Explain. **[6]**
- c) Describe IoT layered attacker model in detail. **[6]**

P.T.O.

- Q5)** a) Describe the components of Arduino [6]
b) Describe the role of Web/Cloud Services for IoT development. [6]
c) Explain the use of APIs. [5]

OR

- Q6)** a) Describe the components of Raspberry Pi. [6]
b) Explain essential features of web APIs. [6]
c) Describe the components of Intel Galileo [5]

- Q7)** a) Describe the role of IoT for Home Automation [6]
b) Describe the role of IoT for Agriculture applications. [6]
c) Describe the role of IoT for Telecom/5G. [6]

OR

- Q8)** a) Describe role of IoT for Smart Cities development. [6]
b) Describe the role of IoT for Industry. [6]
c) Describe the role of IoT for Health and Lifestyle [6]



Total No. of Questions : 8]

SEAT No. :

P-7780

[Total No. Of Pages : 2

[6180]-329

T.E. (Computer Engineering) (Honors)

Augmented Reality

(2019 Pattern) (Semester - II) (310703)

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) What are multiple cameras infrared tracking in AR? **[9]**

b) What are major software components used in AR? **[8]**

OR

Q2) a) Explain in detail role of Computer Vision in Augmented Reality **[9]**

b) Explain outdoor tracking in detail. **[8]**

Q3) a) Write note on: (Any 2) **[6]**

i) Template markers

ii) 2D barcode markers

iii) Imperceptible markers

b) Describe different tracking methods used in augmented reality. **[6]**

c) What is scene generator? **[6]**

OR

Q4) a) What are different types of markers? **[6]**

b) How to select a marker type. Explain with respect to system requirement. **[6]**

c) Explain feature based tracking method? **[6]**

P.T.O.

- Q5)** a) Explain optical see through and video see through devices. [8]
b) Explain all AR devices with suitable example? [10]

OR

- Q6)** a) Explain the term Virtual Retinal Systems. [8]
b) Compare optical see-through and video see through head mounted display [10]

- Q7)** a) Explain parallel tracking and mapping (PTAM) in detail. [9]
b) Explain any two applications of Mixed Reality in detail. [8]

OR

- Q8)** a) Explain the different variants of SLAM in detail? [9]
b) Explain the term Mixed Reality. [8]



Total No. of Questions : 8]

SEAT No. :

P-7781

[Total No. Of Pages : 2

[6180]-330

**T.E. (Mechanical Engineering) (Honors)
Model Based Systems Engineering
(2019 Pattern) (Semester - II) (302043 MJ)**

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

- Q1) a)** Explain the concept of Diagram and Model with Example [9]
- b) Explain any two features that a block can own with sketch [9]

OR

- Q2) a)** Write short notes on SysML diagrams [9]
- b) With a sketch demonstrate the Behavioral features of a block. [9]

- Q3) a)** Explain any one format of SysML formats. [9]
- b) With a neat sketch explain the basic structure of OOSEM [8]

OR

- Q4) a)** Explain process context with example. [8]
- b) Write a short note on Process, Method, Tool, and environment and depicts the relationship between them. [9]

P.T.O.

- Q5)** a) What are the artifacts and process behaviour explain with their purposes.[9]
b) Explain the concept of Modeling tool and diagramming tool with example. [9]

OR

- Q6)** a) Describe different process groups. [9]
b) Explain in brief the system engineering process. [9]

- Q7)** a) Explain any three Requirement validation techniques. [8]
b) Explain the model - based requirements engineering ontology with a neat sketch. [9]

OR

- Q8)** a) Demonstrate the Requirement concept with a neat sketch of Simple taxonomy for types of requirement [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. :

P-7782

[Total No. Of Pages : 2

[6180]-331

T.E. (Mechanical) (Honors)

**Energy Efficiency in Thermal Utilities
(2019 Pattern) (Semester - II) (302023MJ)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Attempt Q.1 OR Q.2, Q.3 OR Q.4, Q.5 OR Q.6, Q.7 OR Q.8*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right of each question indicate full marks.*
- 4) *Assume suitable data wherever necessary and mention the same clearly.*
- 5) *Use of steam tables, Mollier chart and calculator is allowed.*

Q1) a) List the types of steam trap and explain thermodynamic steam trap. **[10]**

b) Explain why steam is used as a heat transfer medium **[8]**

OR

Q2) a) Explain working of mechanical float type trap with neat schematic diagram. **[10]**

b) Discuss various ways for efficient steam utilization **[8]**

Q3) a) Explain typical furnace with neat diagram. **[10]**

b) Explain efficiency of furnace. List factor on which it depends. **[7]**

OR

Q4) a) Discuss different types of heat losses in furnaces. **[10]**

b) Explain any five important properties of Ceramic Fibers used in furnaces. **[7]**

P.T.O.

Q5) a) What are the benefits of Cogeneration? Explain bottoming cycle cogeneration system with suitable sketch. **[10]**

b) Explain Diesel engine cogeneration system with neat schematic sketch?**[8]**

OR

Q6) a) Explain steam turbine and gas turbine cogeneration system with schematic diagram. **[10]**

b) Explain Tri-generation with suitable schematic diagram **[8]**

Q7) a) What are the major points to be considered for developments of WHRS? **[10]**

b) What is a “heat pipe”? How does it work? **[7]**

OR

Q8) a) Explain the role of economizer in steam generation with schematic diagram. **[10]**

b) What are the sources of waste heat in a diesel engine? **[7]**



Total No. of Questions : 8]

SEAT No. :

P-7783

[Total No. of Pages : 2

[6180]-332

T.E. (Honors) (Mechanical/Electrical)
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 (Q.No. 1 or Q2, Q.3 or Q4, Q5 or Q6, Q.7 or Q.8)*
- 2) *Draw neat labeled diagrams wherever necessary*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of non-programmable electronic calculator is permitted.*
- 5) *Assume Suitable/Standard data if necessary.*

Q1) a) Explain Regenerative braking system. **[8]**

b) Explain Topology design of wheels. **[9]**

OR

Q2) a) Classify and Explain wheels and Braking 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 four 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]**

Q5) a) Explain constructional details of batteries (battery pack structure). **[9]**

b) Write short note on : **[9]**

i) Vent management system

ii) Pack cooling system

P.T.O.

OR

Q6) a) Explain Battery compartment. [9]

b) Write short note on : [9]

i) Battery life analysis

ii) Battery performance degradation

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. :

P-7784

[Total No. of Pages : 2

[6180]-333

T.E. (Honors) (Mechanical Engineering)
DESIGN FOR ADDITIVE MANUFACTURING
(2019 Pattern) (Semester - II) (302013MJ)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) How Additive manufacturing technologies are selected using decision methods? Explain function trade-off and time Vs Cost for Additive Manufacturing. **[9]**

b) What is form fit function? Why they are important? Explain with the help of suitable example. **[8]**

OR

Q2) a) What kind of role is thermodynamics of materials plays a role in additive manufacturing? What are Stresses, Thermal strains & Warpages during Printing? **[8]**

b) Explain distortion control methods in AM? Write a short note on Composition and Phase transformation in process monitoring and control of Additive Manufacturing. **[9]**

Q3) a) Explain the importance of heat treatment in AM. **[8]**

b) Write Classification and types of Slicing. Explain any one Slicing strategy in detail. **[10]**

OR

Q4) a) Write Classification and Types of 2D and 3D path Planning. Explain Path sequencing strategy. **[9]**

b) Write a short note on (i) Support Material (ii) Sanding (iii) Hot isostatic Processing. **[9]**

P.T.O.

- Q5) a)** What is significance of CAD specific and Material specific ISO and ASTM Standards? What is support structure integration? **[8]**
- b)** Write a short note on (i) Use of FEA (ii) Topology Optimization (iii) Continuum and Discrete Element Methods **[9]**

OR

- Q6) a)** Write short note on Continuum and Discrete Element Methods. **[8]**
- c)** What are various Infill Structure techniques? How selection of Infill Structure technique affects Printed components? **[9]**
- Q7) a)** How scanning is done in Reverse Engineering? What are 3D scanners? Write classification of Scanners. **[9]**
- b)** Explain data handling and reduction process in AM. **[9]**

OR

- Q8) a)** Write a short note on Scanned Geometry Refinement. How repairing is done of scanned geometry? **[9]**
- b)** What is Conventional use of reverse engineering procedure? What are various types of measuring device? Explain any one device in short. **[9]**



Total No. of Questions : 8]

SEAT No. :

P-7785

[Total No. Of Pages : 2

[6180]-334
T.E. (E & TC)
HONORS IN ROBOTICS
Robot Programming & Simulation
(2019 Pattern) (Semester - II) (304183 - HR)

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) *Assume Suitable data if necessary.*
- 4) *Figures to the right side indicate full marks.*

- Q1)** a) Explain WAIT, DELAY, SIGNAL commands with suitable examples. **[6]**
b) Write down basic VAL Language Commands and their functions. **[6]**
c) Explain Robot welding application using VAL program. **[6]**

OR

- Q2)** a) With respect to VAL-II Programming language explain simple, pick and place application. **[6]**
b) Write and explain VAL program for Palletizing application. **[6]**
c) Explain motion control, hand control, program control commands used in robotics programming with example. **[6]**
- Q3)** a) Which syntax move master command language uses? List and explain different types of commands. **[6]**
b) Describe the elements and function used in AML robotic language. **[5]**
c) List and explain the sensor commands used in AML language with example. **[6]**

OR

- Q4)** a) List and explain program control statement in AML **[6]**
b) Explain pick and place operation of industrial robot using rapid robot language. **[6]**
c) Explain the various Move master commands with example. **[5]**

P.T.O.

- Q5)** a) Draw a simple process chart diagram and explain its functions. [6]
b) Discuss how collision detection works in robotics. [6]
c) Write short note on [6]
i) Repeatability measurement
ii) Robot economics

OR

- Q6)** a) Describe robot jogging process [6]
b) Compare AR and VR in robotics [6]
c) Discuss in detail about Robot studio online software. [6]

- Q7)** a) Compare simulation packages with programming languages. [6]
b) Write short note on [6]
i) Distributed lag models
ii) Cobweb models
c) Classify simulation software and Describe a general purpose simulation package. [5]

OR

- Q8)** a) Describe Analog and Hybrid simulation. [6]
b) Describe Monte Carlo simulation method. [6]
c) Discuss different steps involved in the simulation. [5]



Total No. of Questions : 8]

SEAT No. :

P-7786

[Total No. Of Pages : 2

[6180]-335

T.E. (Electronics & Telecommunication) (Honors)
DECENTRALIZE & BLOCKCHAIN TECHNOLOGIES
(2019 Pattern) (Semester - II) (304183 HBCT)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Explain Proof of Activity and Proof of Burn in detail. [6]
b) What are Hash functions and Hash puzzles? [6]
c) Explain Proof of work in Blockchain. [6]

OR

- Q2)** a) Explain Proof of stake in detail. [6]
b) Write a short note on consensus algorithm. [6]
c) Explain terms i) Proof of Elapsed Time ii) Consensus Elements [6]

- Q3)** a) Explain the terms i) Ethereum Keypairs ii) Ethereum Languages. [6]
b) What is Ethereum? Enlist benefits of building on Ethereum. [6]
c) Explain Ethereum Virtual Machine (EVM) in detail. [6]

OR

- Q4)** a) What Are the Real-World Use Cases of Ethereum? [6]
b) What is the Difference Between Bitcoin and Ethereum Blockchain? [6]
c) Explain the terms i) Ethereum Accounts ii) Ethereum Clients [6]

P.T.O.

- Q5)** a) What are the various application areas of Block-chain Technology? Explain One in detail. **[8]**
- b) What is the goal of blockchain? How does blockchain help in decision making? **[9]**

OR

- Q6)** a) What are the 4 different types of blockchain technology? Enlist the selection criteria of Blockchain Technology. **[8]**
- b) How Block-chain is revolutionizing the Traditional Business Network? Explain with example. **[9]**

- Q7)** a) Explain medical record management system with blockchain technology? **[8]**
- b) Describe Domain Name Service in blockchain? **[9]**

OR

- Q8)** a) Explain future scope of blockchain in detail. **[8]**
- b) Where is blockchain used in real life? Explain the use of blockchain in IoT. **[9]**



Total No. of Questions : 10]

SEAT No. :

P-7787

[Total No. Of Pages : 2

[6180]-336
T.E. (Civil) (Honors)
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.7 or 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 purpose of land acquisition under the Right to fair compensation Act 2013 [7]

b) Explain the types of Land acquisition? [7]

OR

Q2) a) Explain 3G and 3H in land acquisition? [7]

b) Explain the important features of the new Land Acquisition Act 2013?[7]

Q3) a) Prepare detailed estimate of Elevated section (viaduct). [7]

b) Explain steps involved in construction of Underground section by Cut and Cover. [7]

OR

Q4) a) Which factors are influencing the investment decision? [7]

b) Enlist capital budgeting techniques and explain any 2 in brief. [7]

P.T.O.

- Q5)** 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]

OR

- Q6)** a) Define Financial Support for PPPs in Infrastructure. [7]
b) Explain types of contract documents used for construction. [7]

- Q7)** 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]

OR

- Q8)** a) Explain are merits and demerits of Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (New Act)? [7]
b) Explain the rules for land acquisition? [7]

- Q9)** a) Describe types of Construction Contract Specifications. [7]
b) Define how to calculate compensation under Land Acquisition Act 2013? [7]

OR

- Q10)** a) Explain Construction Contract Specifications? [7]
b) Explain the benefits of land acquisition? [7]



Total No. of Questions : 8]

SEAT No. :

P-7788

[Total No. Of Pages : 2

[6180]-337

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

- Q1)** a) Explain in detail any three benefits of Eco city. **[6]**
b) Elaborate in detail various phases of development of water bodies. **[6]**
c) What is green building? What concepts make green building, a sustainable building? **[5]**

OR

- Q2)** a) Write down the advantages of green belt and enlist the various factors which influence the design of green belt. **[6]**
b) Explain in brief various features of smart city. **[6]**
c) Write a note on green residential cluster. **[5]**

- Q3)** a) What is the necessity of proper drainage system in landscape planning? Also explain the surface drainage system for landscaping. **[6]**
b) What is behavioral science in landscape design? Explain in detail. **[6]**
c) Write a note on “landscape suitability analysis”. **[5]**

OR

- Q4)** a) Enlist various principles of landscape planning and explain any two in detail **[6]**
b) Explain any two types of subsurface drainage systems with neat sketch. **[6]**
c) Write a note on “landscape assessment”. **[5]**

P.T.O.

- Q5)** a) Draw a typical cross section of green roof. Also explain the function of each component. [7]
- b) Which are the main factors affecting landscaping? Explain in detail. [6]
- c) Write a note on “Impact of landscape on environment”. [5]

OR

- Q6)** a) What is meant by green roof? How it is beneficial? [6]
- b) Explain in detail the process of landscape planning. [6]
- c) Mention the components of landscape architecture and explain any one. [6]

- Q7)** a) Elaborate the concept of industrialized areas as landscape and treatment to be offered. [6]
- b) In what way landscape is developed in urban area? [6]
- c) Write a note on following: Landscape treatment for water logged areas. [6]

OR

- Q8)** a) Elaborate the means of improving landscape of existing road. [6]
- b) In what way landscape is developed in rural area? [6]
- c) Write a note on following: [6]
- i) Landscape treatment for coastal area
- ii) Landscape treatment for desert area



Total No. of Questions : 8]

SEAT No. :

P-7789

[Total No. of Pages : 2

[6180]-338

T.E. (Honors) (Printing)

SMART PACKAGING

(2019 Pattern) (Semester - II) (308213)

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

- Q1)** a) What is smart packaging? Describe in details active packaging? [10]
b) What are advantages of smart packaging? [7]

OR

- Q2)** a) Give an overview of smart packaging in the pharma industry. [6]
b) What is interactive packaging? [5]
c) How to choose the correct type of packaging for the particular application? [6]

- Q3)** a) What do you understand by IOT. Briefly explain the components of an IOT system and its application using RFID. [12]
b) Which were first applications of RFID technology. Describe any one application in brief. [6]

OR

- Q4)** a) Describe in brief the different types of RFID antennae. [6]
b) State the different types of RFID printers and enumerate the main differences between them. [12]

- Q5)** a) Explain the working principle of operation of NFC. Name the different modes of operations of NFC systems. [11]
b) Briefly explain any three NFC applications. [6]

P.T.O.

OR

- Q6)** a) What do you understand by NFC? How do NFC systems vary from RFID systems? Explain in terms of functionality and applications. **[10]**
- b) What are the advantages of NFC as compared to RFID systems? **[7]**
- Q7)** a) Give an overview of smart packaging in the pharma industry. **[12]**
- b) How to choose the correct type of packaging for the particular application? **[6]**

OR

- Q8)** a) Give examples use of intelligent packaging in Food packaging. **[6]**
- b) Describe any implementation stage of smart packaging in a food packaging industry. **[12]**



Total No. of Questions : 10]

SEAT No. :

P-8800

[Total No. of Pages : 3

[6180]-401
T.E. (Civil)
ADVANCED SURVEYING
(2015 Pattern) (Semester - II) (301007)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q.No. 1 or Q. No. 2, Q.No. 3 or Q. No. 4, Q.No. 5 or Q. No. 6., Q. No. 7 or Q. No. 8, Q. No.9 or Q. No. 10.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

Q1) a) State the objectives of geodetic surveying and methods used in it. State requirement of triangulation stations to be selected. **[5]**

b) Explain the equipments used for measurement of sounding. **[5]**

OR

Q2) a) Explain the factors governing accuracy in SBPS positioning. **[6]**

b) Define and explain the shore line survey. **[4]**

Q3) a) Describe the process of remote sensing. **[6]**

b) What do you mean by sounding? Explain how soundings are reduced and plotted. **[4]**

OR

Q4) a) What is GIS? Explain the raster and vector data structure. **[6]**

b) State different tide gauges used in hydrographic surveying. Explain any one in detail. **[4]**

Q5) a) Find the most probable values of observed angles closing the horizon at station A using method of differences. **[5]**

A = 120°5'58.9"

B = 88°45'16.1"

C = 72°55'30.7"

D = 78°13'17.3"

P.T.O.

- b) Define : i) spherical excess, ii) accidental errors and systematic errors, iii) independent and conditioned quantity, and iv) weight [8]
- c) Explain the method of normal equations to find out the most probable value of a quantity. [5]

OR

- Q6)** a) Explain the following in relation with triangulation survey : [5]
- i) Weight of an observation
 - ii) Station adjustment
- b) Following observations are taken at station O so as to close the horizon.[8]
- AOB = $85^{\circ}15'15''$ Weight = 2
- BOC = $100^{\circ}15'15''$ Weight = 3
- COD = $95^{\circ}17'20''$ Weight = 4
- DOA = $79^{\circ}12'13''$ Weight = 2
- c) Explain the principle of least squares method. [5]

- Q7)** a) Define relief displacement. Derive an expression for the same. [5]
- b) Define : [5]
- i) Isocentre,
 - ii) Exposure Station,
 - iii) Flying height and
 - iv) Tilt and tip
- c) The scale of an aerial photograph is 1cm = 160 m & the size of the photograph is 20 cm × 20 cm. If the longitudinal overlap is 65 % and side overlap is 35 %, determine the number of photographs required to cover an area of 232 sq.Km. [6]

OR

- Q8)** a) Enlist and explain the applications of photogrammetry. [5]
- b) A line AB of length 2 Km scales 10 cm on a vertical photograph; the focal length of camera is 20 cm. If the terrain is flat, determine the flying height. [5]

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

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

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

Longitudinal overlap = 60 %

Side overlap = 30 %

- Q9) a)** Calculate the difference in level between two points M & N and the elevation of the point M from the following observation : [8]

- i) Horizontal distance MN = 4100 m
- ii) Angle of depression from M to N = $2^\circ 10' 10''$
- iii) Height of instrument at M = 1.48 m
- iv) Height of signal at N = 4.30 m
- v) Coefficient of refraction = 0.07
- vi) Radius of the earth = 6371 Km
- vii) RL of N = 612.50 m

- b) Explain how centre line of tunnel is marked on the surface and how this centre line is transferred from surface to the underground. [8]

OR

- Q10)a)** It is required to determine the elevation of a station O. Observations were made to three stations A, B and C already fixed and of known elevations. The following data was recorded.

Inst. Stn	Stn obs.	Ht. of inst.	Distance (m)	Ht. of signal	Vertical angle
O	A	1.50	3600	5.6	$1^\circ 1' 20''$
	B		4700	4.1	$-53' 00''$
	C		5000	4.9	$-34' 10''$

- b) Describe the procedure for determining centre line length of bridge and procedure for location of bridge piers while setting out a bridge. [8]



[6180]-402

T.E. (Civil)

PROJECT MANAGEMENT AND ENGG. ECONOMICS
(2015 Pattern) (Semester - II) (301008)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

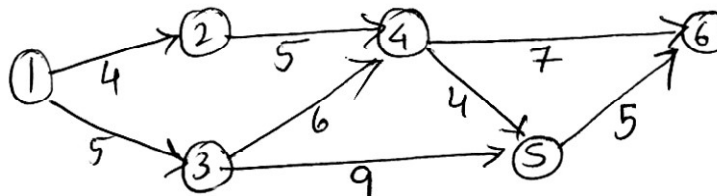
- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary.

Q1) a) Write a short note on :

[4]

- i) Management by objective
- ii) Salient features of an arrow type network diag.

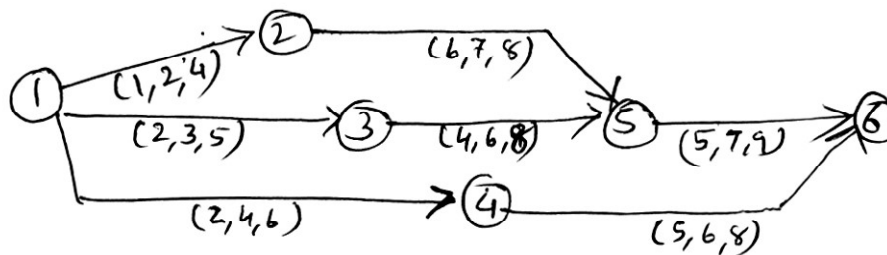
b) Find out project duration, Highlight critical path and tabulate total float for the network diag. Shown below. [6]



OR

Q2) a) What is meant by project break down? Explain with help of example. [4]

b) Find out project duration and tubulate slack of each event, Hight light critical path. [6]



P.T.O.

- Q3)** a) What are the objectives of material management? Explain role of material manager to achieve them. [5]
- b) What points should be considered while preparing site layout? Draw site layout of construction site you visited. [5]

OR

- Q4)** a) Define EOQ and Derive expression for it. [5]
- b) What are the causes and types of accidents? [5]

- Q5)** a) Explain resource allocation methods and their significance in manpower planning. [5]
- b) What is updating of network diag? Explain in necessity. [5]
- c) The activities and required duration of small work are shown in table underneath. Review of work was taken after 10 days and the following conditions exist. Draw updated network diag and what will be change in project duration? [8]

- i) Act. 1-2 and 2-4 was completed as originally planned.
- ii) Act. 2-3 and Act. 3-5 delayed drastically and requires 5 and 6 more days resp. for their completion.
- iii) Act. 4-5 and Act. 5-6 is in progress and both requires 8 more days for their completion.
- iv) Act. 6-7 yet to start and time required for completion is still appears to be accurate.
- v) Act. 5-7 will require 8 days in place of 6 days for its completion.

Activity	1-2	2-3	2-4	3-5	4-5	5-6	5-7	6-7
Duration, Days	4	6	5	2	1	4	6	6

OR

- Q6)** a) Write down about the various softwares used for planning and management of construction projects. [5]
- b) What do you know about cost performance index and schedule performance index? Explain EVA concept. [5]

- c) For the work consisting of four activities with data given in table below, find out the following : [8]

- i) Normal project period and cost.
- ii) Project cost if project period is to be crashed for 2 days and draw time grid diag for the same.

Activity	Normal time (Days)	Crash time (Days)	Normal cost (Rs.)	Crash cost (Rs.)
1-2	4	2	4000	4200
2-3	5	3	3000	7500
2-4	7	2	3600	6000
3-4	4	2	5000	10000

- Q7)** a) "Construction sector is one of the big sector influence on economic health of country", comment. [6]
- b) How to calculate simple and compound interest? What is the difference between the simple interest and compound interest payable if MS. Mansi deposited Rs. 2000 in bank for 5 yrs. at the rate of 7 p.c.p.a. [6]
- c) Explain demand and supply curve and factors affecting on it. [4]

OR

- Q8)** a) Define cost, price and value with the help of suitable example. [6]
- b) Explain law of diminishing marginal utility and law of substitution with help of suitable example. [6]
- c) Ms. Namrata bought a refrigerator for 20000, she paid tax of Rs. 2000 and Rs. 200 for transport. If she sold it to a customer for Rs. 25500, what was the percentage profit or loss? [4]

- Q9)** a) What are the different types of appraisals required to undertake any project? Explain any one in detail. [6]
- b) Write a short note on (Any two) : [6]
- i) Pay back period
 - ii) ARR method
 - iii) IRR method
- c) The cost of the project Rs. 10 lac. Annual cash inflows for the next 4 yrs. in Rs. 200000/yr. What is the Payback Period for the project at discount rate of 8%? [4]

OR

- Q10) a)** What are the methods of capital budgeting? Explain NPV method. From the following details, suggest which project is to be accepted using NPV method. Company expect return of 10%. **[8]**

	Life	Initial cost (Rs.)	Annual incomes in (Rs.) every yr.				
			1	2	3	4	5
Project A	4 yr	300000	100000	150000	220000	310000	-
Project B	5 yr	400000	200000	140000	230000	410000	250000

- b)** Write a short note on (any two) : **[8]**
- i) DPR
 - ii) Break even analysis
 - iii) Role of PMC



Total No. of Questions : 12]

SEAT No. :

P-8802

[Total No. of Pages : 2

[6180]-403

T.E. (Civil)

FOUNDATION ENGINEERING
(2015 Pattern) (Semester - II) (301009)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary and mention it clearly.
- 5) Use of non-programmable calculator is allowed.

Q1) What are the various methods of soil exploration techniques? Explain any one of the techniques for Civil Engineering project. [6]

OR

Q2) Discuss the factors affecting quality of samples. Enlist merits and demerits of wash boring technique. [6]

Q3) Determine the ultimate bearing capacity of a strip footing, 1.5m wide with its base at a depth of 1m, resting on a dry sand stratum. Take dry unit weight of soil = 17 kN/m³, $\phi = 38^\circ$ and $c' = 0$, $N_q = 60$ and $N_\gamma = 75$. [6]

OR

Q4) Describe the types of shallow foundation and discuss the selection criteria of a foundation. [6]

Q5) Define : [7]

- a) Contact pressure
- b) Differential settlement

How differential settlement can be reduced?

OR

P.T.O.

Q6) A soil sample 20 mm thick takes 20 minutes to reach 20% consolidation. Find the time taken for a clay layer 6 m thick to reach 40% consolidation. Assume double drainage in both cases. [7]

- Q7)** a) Enlist the types of pile foundation according to function. [5]
b) Write a note on 'micropiles'. [6]
c) What is negative friction? Describe for single pile & pile group? [6]

OR

- Q8)** a) Write a note on 'caisson disease'. [5]
b) Enlist the advantages and disadvantages of drilled piers. [6]
c) Draw a sketch of floating caisson and discuss the steps during its construction. [6]

- Q9)** a) Draw a neat sketch of double under reamed pile and name various components. [5]
b) Explain 'pre loading technique' of soil improvement. [6]
c) Explain 'swelling pressure test' with a neat sketch. [6]

OR

- Q10)** a) Explain the engineering problems associated with black cotton soil. [5]
b) Write a note on 'RC Diaphragm' method. [6]
c) Enlist any four uses of cofferdams and explain earth fill cofferdam. [6]

- Q11)** a) What is liquefaction? Explain in detail. [6]
b) Write a note on i) Magnitude of earthquake and ii) Intensity of earthquake. [6]
c) Enlist the types of geosynthetics and explain any two with their applications in the field. [5]

OR

- Q12)** a) Enlist the measures taken for earthquake resistant construction. [5]
b) Enlist the advantages of geosynthetics over conventional materials [6]
c) Write note on 'geosynthetic applications in waste disposal'. [6]



Total No. of Questions : 12]

SEAT No. :

P-8803

[Total No. of Pages : 6

[6180]-405

T.E. (Civil Engineering)

STRUCTURAL DESIGN - II

(2015 Pattern) (Semester - II) (301010)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10 and Q.11 or Q.12.
- 2) Figures to the right indicate full marks.
- 3) Use IS 456-2000 and non-programmable calculator is allowed.
- 4) Neat figures must be drawn wherever necessary.
- 5) Mere reproduction of IS code as answer will not be considered.
- 6) Assume suitable data if required.

Q1) Explain in short Various Design Philosophies for design of RC Structures.[6]
OR

Q2) Using stress and strain diagrams for a balanced singly reinforced section as per WSM, derive the design constants (k = Neutral axis constant, j = Lever arm constant, and Q = Moment of resistance constant). Use M20 grade of concrete and Fe 415 grade steel. [6]

Q3) A doubly reinforcement beam section is 250 mm wide and 450 mm deep up to center of tensile reinforcement. It is reinforce with 2 bars of 16 mm diameter as compression reinforcement at effective cover of 50 mm and 4 bars of 25 mm diameter as tensile reinforcement. Use M20 concrete and Fe250 reinforced steel. Calculate moment of resistance of the section. [8]

OR

Q4) Calculate moment of resistance of the section for following details. [8]

$b = 230 \text{ mm}$

$d = 450 \text{ mm}$

$A_{st} = 4-16 \text{ mm dia.}$ Use LSM, M20 and Fe415.

Q5) Design a cantilever slab for effective span of 1.2 m subjected to floor finish of 2 kN/m^2 and live load 3 kN/m^2 . Draw details of reinforcement. Use M20 and Fe500. (Use LSM) [8]

P.T.O.

OR

Q6) Design a simply supported slab for a room with clear inner size $3\text{ m} \times 7\text{ m}$. The slab is supported by beams of width 230 mm along all the edges. Slab subjected to floor finish of 1 kN/m^2 and live load 4 kN/m^2 . Draw details of reinforcement. Use M20 and Fe500. (Use LSM) **[8]**

Q7) a) A reinforced concrete beam of rectangular cross section of width 250 mm and overall depth 480 mm is subjected to a factored shear force of 150 kN. The grade of concrete, main reinforcement and stirrups are M20, Fe415 and Fe250 respectively. Main reinforcement are 4 no's 16 mm dia. bar.

Take effective cover = 30 mm. Design shear reinforcement using 8 mm dia stirrups. **[8]**

b) Design reinforcement such that there is not flexure collapse for given combination of load.

$M_u = 80\text{ kNm}$, $T_u = 40\text{ kNm}$ and $V_u = 60\text{ kN}$.

The dimension of the beam are 300 mm x 500 mm and effective cover = 40 mm. Take M25, concrete and Fe415 steel. **[8]**

OR

Q8) Design a continuous beam ABCD ($AB=BC=3.25$ & $CD=DE=3.5\text{ m}$) for flexure and shear using IS code method for following data. Use M20 and Fe415.

a) Dead load = 18 kN/m (Excluding self weight)

b) Live load = 12 kN/m

Show details of reinforcement in L-section and cross section at continuous support and at mid span. **[16]**

Q9) Continuous RC beam ABCD of rectangular section is simply supported at A and D and continuous over support B and C. Span $AB = 4\text{ m}$, $BC = 6\text{ m}$ and $CD = 6\text{ m}$. The beam carries dead load of 24 kN/m^2 (including its self-weight) and Live load of 20 kN/m^2 . The beam supports 120 mm slab on both sides. Calculate design moment for span BC and support C after 20 % redistribution of moments by considering proper load case. Design span BC and support C for flexure only. Draw the reinforcement details. Use M20 and Fe500. **[16]**

OR

Q10) Design a short axially loaded short column and its footing for a residential apartment G+2 with floor to floor height 3.20 m which carries working load of 800 kN. Assume SBC of soil as 200 kN/m². Use M20 and Fe500. **[16]**

Q11) Design a short RC column and its footing subjected to working axial load of 750 kN, along with a working moment of 90 kNm about an axis bisecting the depth. The unsupported length of column is 4.5m. Assume column-end are fixed. Grade of concrete is M20 and steel as Fe500. Take SBC of strata as 210 kN/m². **[16]**

OR

Q12) Design a bi-axial rectangular short column by limit state method with material M25 & Fe500 to carry a working load of 900 kN. Working moment of 90 kNm about major axis bisecting the depth of column and 20 kNm about minor axis bisecting the width of column. The unsupported length of column about major and minor axis is 3.6 m & 3.2 m. The column is fixed at one end and hinged at the other. Show detailed design calculations and reinforcement details. **[16]**

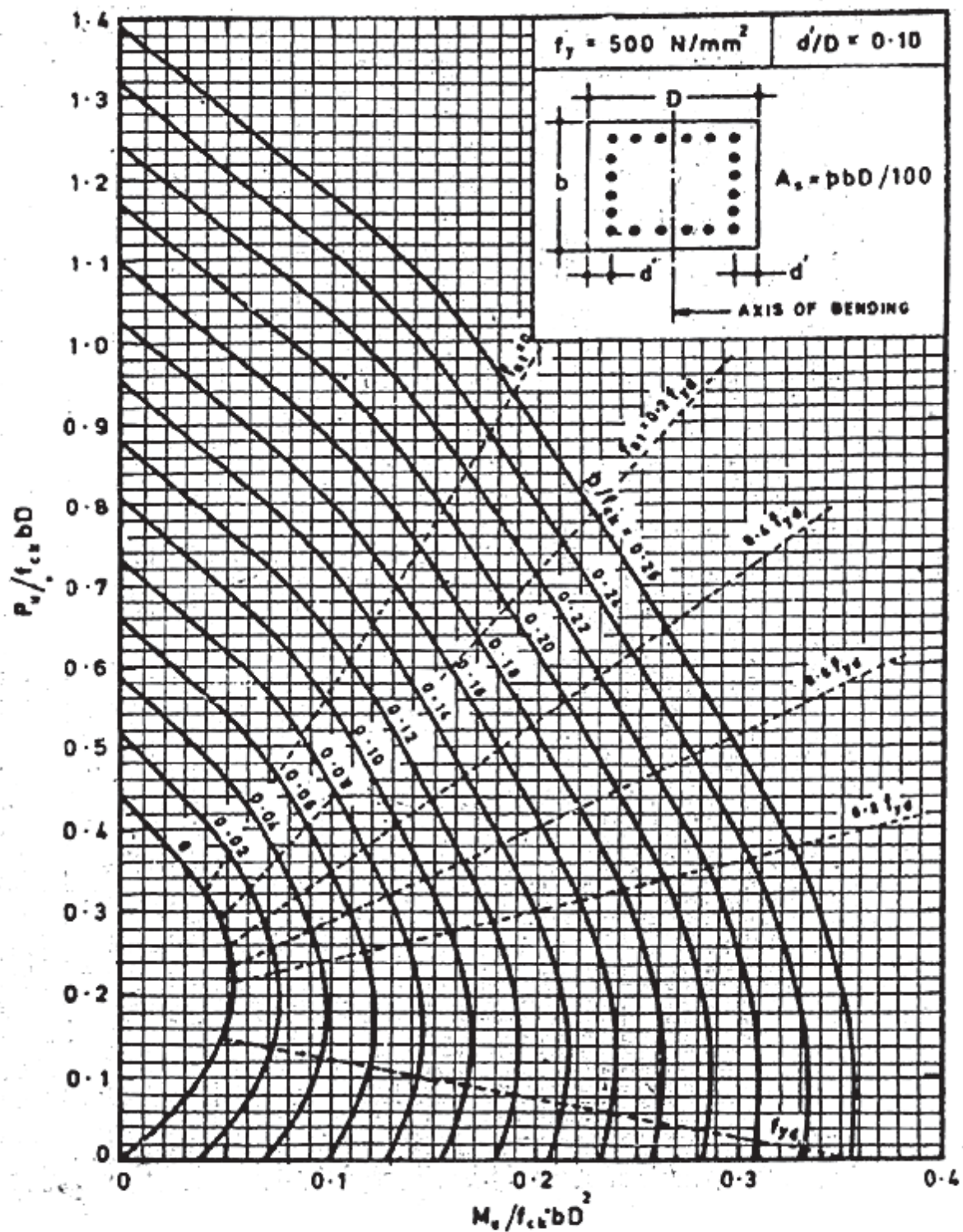


Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

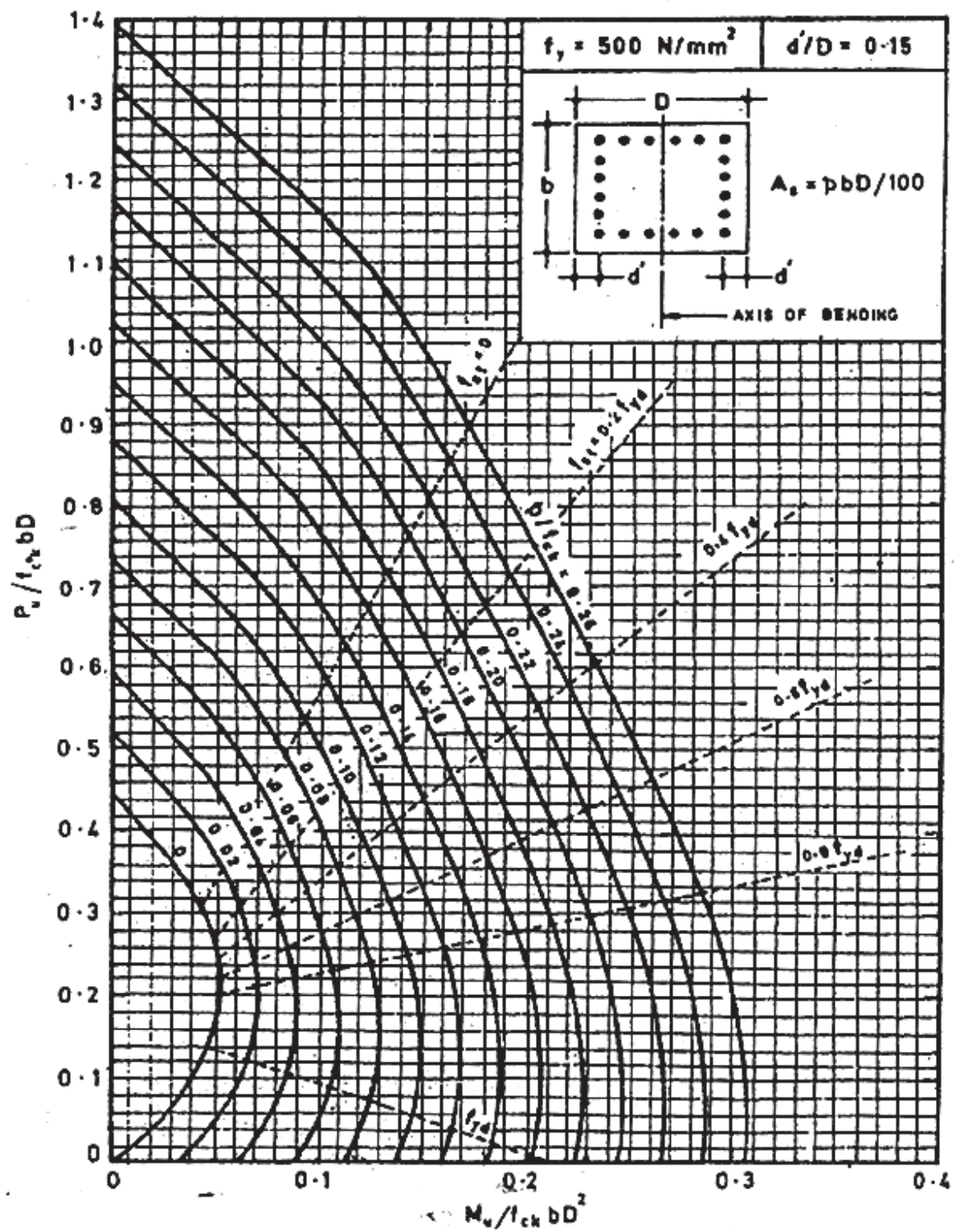


Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

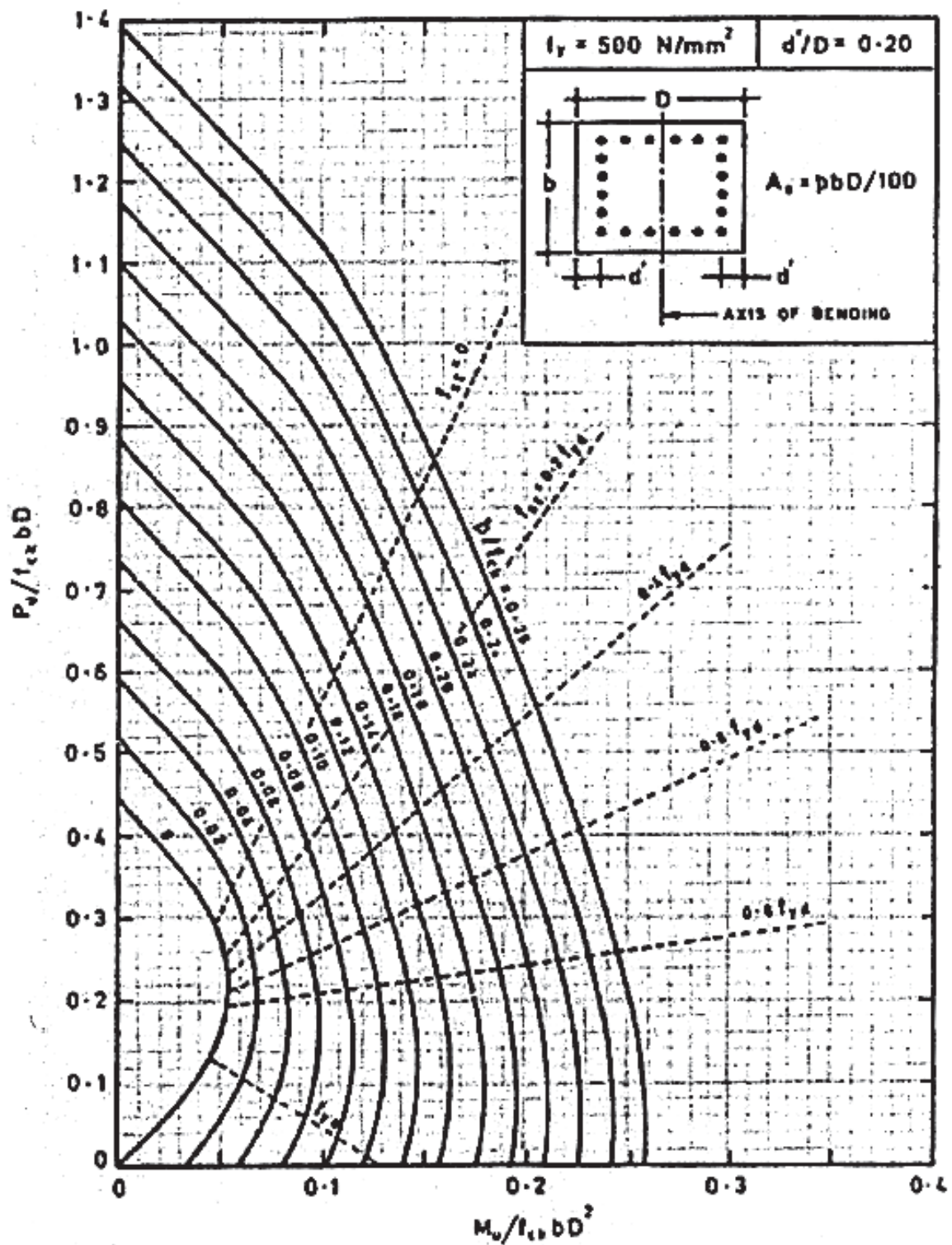


Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides



Total No. of Questions : 10]

SEAT No. :

P-8804

[Total No. of Pages : 3

[6180]-406

T.E. (Civil)

ENVIRONMENTAL ENGINEERING-I
(2015 Pattern) (Semester - II) (301011)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) Describe with neat sketch the composting of solid waste. [6]
b) Illustrate remedial measures for control of noise pollution. [4]

OR

- Q2)** a) State and explain various physical characteristics of water. [6]
b) Write Indian standards for the quality of potable water as per IS 10500 with appropriate units: [4]
i) Nitrate
ii) Colour
iii) Iron and
iv) Turbidity

- Q3)** a) Enlist various demands of water for a city and explain any one demand in detail with typical values. [6]
b) Define design period and state factors affecting the design period. [4]

OR

- Q4)** a) What is Aeration of water? State objectives of aeration. Also draw cross section for circular type cascade aerator. [6]
b) Write short note on Tube settler. [4]

P.T.O.

Q5) a) A water treatment plant is to treat a design discharge of 50 MLD. It has paddle flocculator 22m long, 12m wide and 3m deep. It is fitted with 3 horizontal shafts to which revolving paddles are attached which rotate at 1.5 rpm. Each shaft supports 4 paddles which are 11 m long, 20cm wide and centered at 1.5m from the shaft. Assuming mean velocity of flow of water as 30% of paddle velocity, temperature of water as 15 °C and $C_d = 1.8$ determine [8]

- i) Difference in velocity between paddle and water
- ii) Mean velocity gradient
- iii) flocculation time

b) Describe various methods of feeding coagulant. [8]

OR

Q6) a) Define and explain the following terms: [8]

- i) detention period
- ii) flow through velocity
- iii) settling velocity
- iv) surface loading

b) Explain the under drainage system of rapid sand filter and mention the general rules for design of such system. [8]

Q7) a) Explain various minor methods for disinfection of water. [8]

b) Chlorine usage in the treatment of 30000 m³/day of water is 10 kg/day the residual chlorine after 10 minute of contact is 0.15 mg/l calculate the dose in mg/l and chlorine demand of the water. Also calculate the quantity of bleaching powder and sodium hypochlorite required per month, if used separately for disinfection of water. The bleaching powder contains 30% of available chlorine and sodium hypochlorite contains 95% of available chlorine. [8]

OR

Q8) a) Explain lime soda process for removing the hardness of water. What are its advantages and disadvantages? [8]

b) What is zeolite? How it is generated? Explain zeolite process with appropriate reactions. [8]

- Q9)** a) State and explain various methods of distribution with neat sketches. [9]
- b) What is rain water harvesting? State its need. Also explain rooftop rain water harvesting with neat sketch. [9]

OR

- Q10)** a) The designed demand of a town is 6 MLD. It is pumped into an elevated service reservoir at uniform rate from 6am to 10 am and 6pm to 10pm. The variations in consumption of water are as below:

Period	6am -10am	10am- 6pm	6pm -10pm	10pm-2am	2am-6am
Consumption as a percentage of designed demand	35%	15%	25%	10%	15%

Determine the balancing Reserve. [9]

- b) Describe with neat sketches the storage and distribution reservoirs. [9]



Total No. of Questions : 10]

SEAT No. :

P-8805

[Total No. of Pages : 3

[6180]-407

T.E. (Civil)

**HYDROLOGY AND WATER RESOURCES
ENGINEERING**

(2015 Pattern) (Semester - I) (301001)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) How knowledge of hydrology useful in designing civil engineering or other projects. [6]
- b) Write a note on sub- surface irrigation with neat sketch state advantages and disadvantages of sub surface irrigation. [4]

OR

- Q2)** a) For a drainage basin of 600 km² , isohyets drawn for a storm gave the following data [5]

Isohyetal (Interval) (cm)	15-12	12-9	9-6	6-3	3-1
Inter-isohyetal Area (Km ²)	92	128	120	175	85

Estimate the average depth of precipitation over the catchment

- b) An irrigable canal has gross command area of 60000 hectares out of which 70 % is irrigable. The intensity of kharif and rabbi season is 25% and 50 % respectively. Find discharge required at the end of canal if duty at its head is 850 hectares/cumec for kharif season and 1800 hectares/cumec for rabbi season. [5]

Time factor = 0.9

Capacity factor = 0.8

P.T.O.

- Q3) a)** State and explain any two methods of revenue collection from farmers. [4]
- b) Derive an expression for discharge from a well fully penetrating unconfined aquifer. [6]

OR

- Q4) a)** Derive the formula to calculate discharge of a well in a confined aquifer. [6]
- b) What are the various factors affecting duty. [4]

- Q5) a)** What is hydrograph? Explain all the parts of the typical hydrograph. Explain fern shaped catchment. [8]
- b) Given below are the ordinates of 6-h unit hydrograph for a catchment. Calculate the ordinates of the DRH due to a excess rainfall of 3.5 cm occurring in 6 h. [10]

Time(h)	0	3	6	9	12	15	18	24	30	36	42	48	54	60	69
Uty ordinate (m ³ /s)	0	25	50	85	125	160	185	160	110	60	36	25	16	8	0

OR

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

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

Surface runoff resulting from the storm is equivalent to 20 cm of depth over the catchment. Determine [10]

- i) Average infiltration, and
- ii) Average rate of infiltration.

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

OR

Q8) a) What is reservoir sedimentation? What is the significance of trap efficiency? Explain with neat sketch. [8]

b) What are various reservoir losses. What are various measures to control these losses. [8]

Q9) a) Explain Global Water Partnership. (GWP). [8]

b) Write a note on ancient system of water distribution which still exist in North Maharashtra. [8]

OR

Q10) a) Draw a neat section for lift irrigation scheme and state various components of lift irrigation scheme. Explain various design steps in lift irrigation system. [8]

b) What is water logging? Explain tile drain method and also state formula for spacing of tile drains. [8]



Total No. of Questions : 10]

SEAT No. :

P-8806

[Total No. of Pages : 3

[6180]-408
T.E. (Civil)
STRUCTURAL DESIGN - I
(2015 Pattern) (Semester - I) (301003)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to right indicates full marks
- 4) Assume Fe410 and $F_y = 250 \text{ N/mm}^2$ steel and $f_{ub} = 400 \text{ N/mm}^2$ for bolts if not specifically given in the problem
- 5) Use of electronic pocket calculator, IS 800-2007 and Steel Table are permitted.
- 6) Assume suitable data if necessary.

- Q1) a)** Explain why longer leg of angle section connected to gusset plate is preferred over its shorter leg in case of use in tension member. **[3]**
- b) Determine tensile load carrying capacity of 2 ISA150×75×8 mm connected to gusset plate of 10 mm thickness with 6-20mm diameter bolts at pitch of 60 mm and end distance of 30 mm. Assume angle are placed on either side of gusset plate. The longer leg is connected to gusset plate. **[7]**

OR

- Q2) a)** Classify following sections **[3]**
- i) ISMB 400 @ 61.5 kg/m
 - ii) ISHB 350 @ 67.4 kg/m
 - iii) ISA 60×60×8 mm @ 7 kg/m
- b) Two ISA 80×80×8 mm are used as a strut in a roof truss. Length of member between intersections is 3m. Determine load carrying capacity of the section. Assume angles are placed on either side of gusset plate and welded connection is used. Thickness of gusset plate is used as 10 mm. **[7]**

- Q3) a)** Explain the function of base plate in column footing. Describe various types of column footings with neat diagram. **[4]**
- b) Design a cross section of a column for axial factored load of 500 kN using suitable I - section. Height of column is 5.5 m and it is held in position at both ends and in direction at bottom end. **[6]**

P.T.O.

OR

Q4) Design a gusseted base to carry axial working load of 2000 kN. The column consists of ISMB450 along with cover plate of 350×18 mm at each flange. Concrete in pedestal is of M20 grade. [10]

Q5) Design a laterally supported steel beam section to support a roof of a building with following details -

- i) Width of end support = 150mm
- ii) Clear span of beam = 6.5 m
- iii) Factored imposed load = 18 kN/m
- iv) Factored dead load = 45 kN/m
- v) The depth of beam is restricted to 400 mm

ISWB 350 @ 56.9 kg/m section is available for use. Give checks for strength and serviceability. [16]

OR

Q6) Determine working uniformly distributed load ISMB 400 @ 61.5 kg/m section can carry over effective span of 3 m as a beam. The load acting on the beam is due to combination of imposed load and dead load. The compression flange of the beam is laterally unsupported throughout the span. Apply usual checks. [16]

Q7) a) Explain beam to beam and beam to column bolted framed connection with diagrams. [5]

- b) A beam carrying factored uniformly distributed load of 70 kN/m at the span of 6 m is to be connected to the flange of column. The beam section is ISMB 400 @ 61.5 kg/m and the column is ISHB 250 @ 54.7 kg/m. Design double plated welded framed connection. [12]

OR

Q8) A simply supported welded plate girder of span 28 m is subjected to factored uniformly distributed load of 100 kN/m and central concentrated load of 400 kN. The compression flange of girder is restrained throughout the span. Design an economical section of a plate girder and apply usual checks. Design connection between the flange and web. Also design end bearing stiffener. Draw diagrams showing requisite details. [17]

Q9) Design a gantry girder to be used for carrying electrical operated crane with following details : **[17]**

- i) Span of gantry girder = 6 m
- ii) Span of crane girder = 16 m
- iii) Crane capacity = 200 kN
- iv) Self-weight of crane girder excluding trolley = 180 kN
- v) Weight of crab + motor = 50 kN
- vi) Minimum hook approach = 1.2 m
- vii) Wheel spacing of crane = 3 m
- viii) Self-weight of rails above gantry girder = 0.3 RN/m

OR

Q10) Figure 10 shows truss to be used for industrial building situated at Pune. Spacing of the truss is 3.5 m. It is covered with AC sheets roofing material. Assume $k_1 = 1$, $k_2 = 1$ and $k_3 = 1$ for wind speed calculations. Design an angle section purlin for the truss. Determine panel point dead load, panel point imposed load and panel point wind load and show them with the help of diagram. **[17]**

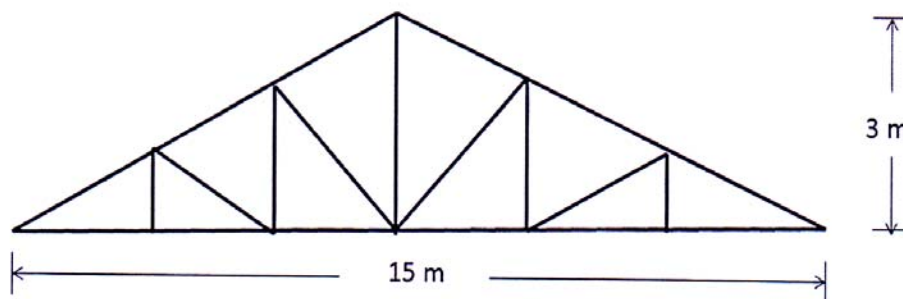


Figure 10



[6180]-409

T.E. (Civil Engineering)

STRUCTURAL ANALYSIS - II

(2015 Pattern) (Semester - I) (301004)

Time : 2½ Hours]

[Max. Marks : 70

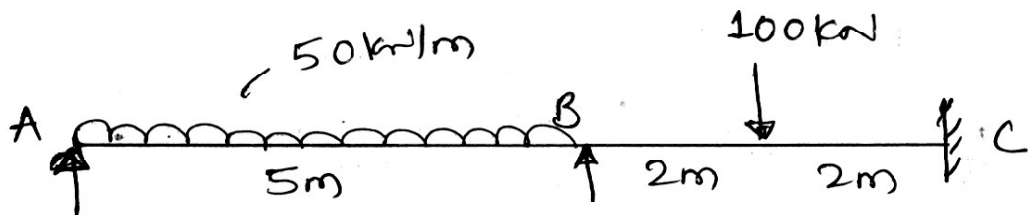
Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.

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

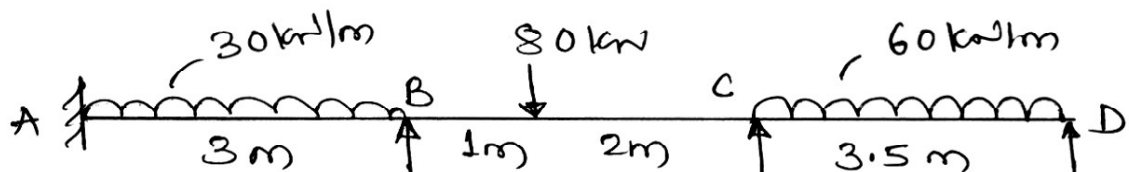


b) Analyse the continuous beam by flexibility Matrix method. Draw BMD. [10]



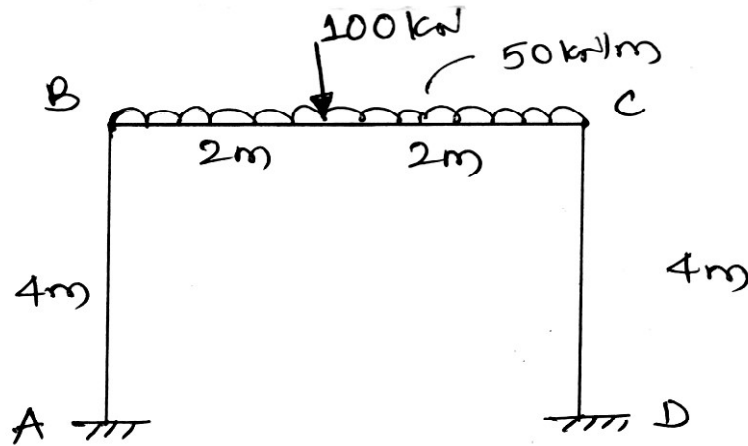
OR

Q2) a) Analyse the continuous beam by Moment Distribution Method. Draw BMD. [10]



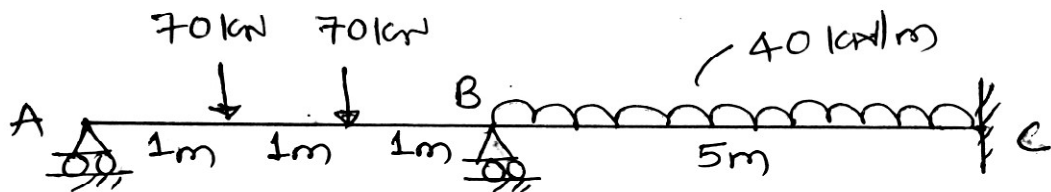
P.T.O.

- b) Analyse the frame by slope Deflection method. Draw BMD. [10]



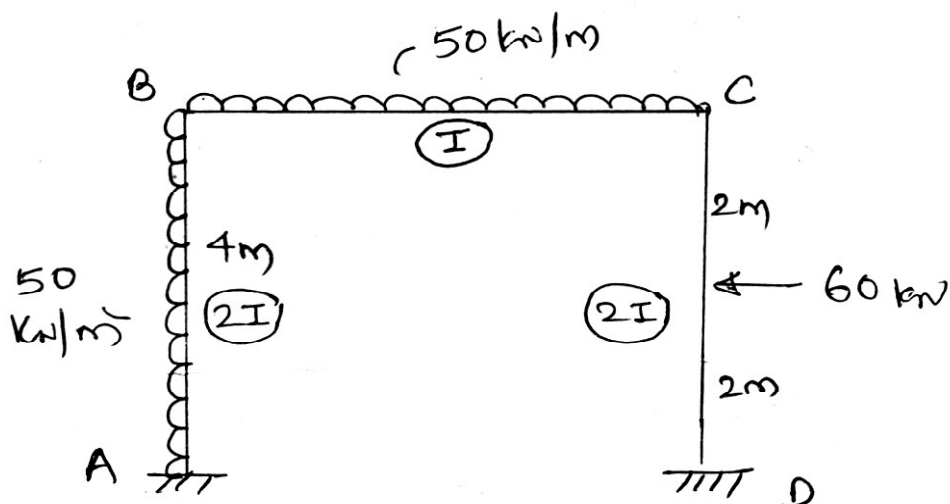
The beam BC carries udl on entire span = 50 KN/m and point load at the centre 100 KN.

- Q3) Analyse the continuous beam by stiffness matrix method. Draw SFD & BMD. [16]

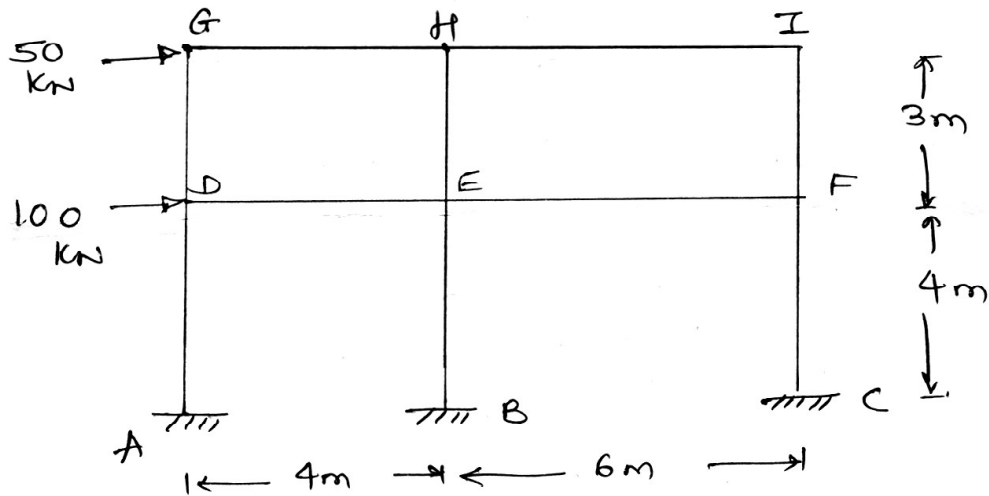


OR

- Q4) Analyse the frame by stiffness matrix method. Draw SFD & BMD. [16]



- Q5) a)** Determine approximate values of axial forces, shear forces and moments in the members of the frame by cantilever method. [12]



- b) A simply supported beam of span 'L' carries an uniformly distributed load of ' ω ' KN/m. Determine maximum deflection. Take 5 nodes. [6]

OR

- Q6) a)** Analyse the frame shown for Q.5 a) by Portal method. Draw SFD & BMD. [12]

- b) A cantilever beam of span 1m is subjected to a point load of 80KN at its free end. Determine the deflection at free end. Take 3 nodes. [6]

- Q7) a)** Explain following terms. [8]

- i) Subparametric element
- ii) CST
- iii) Isoparametric element
- iv) Nodes

- b) Explain shape function and properties of shape function. [8]

OR

- Q8) a)** Explain principal of minimum potential energy. [8]

- b) Derive shape function for a CST element in terms of natural co-ordinate system. [8]



Total No. of Questions : 8]

SEAT No. :

P-8808

[Total No. of Pages : 3

[6180]-410

T.E. (Civil)

FLUID MECHANICS - II

(2015 Pattern) (Semester - I) (301005)

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

Q1) a) With a neat sketch of an unsymmetrical airfoil discuss the following terms. [6]

- i) Airfoil
- ii) Chord
- iii) Angle of attack

b) Explain the velocity distribution in open channel flow. Discuss the effect of shape and roughness of channel on velocity distribution in channel flow. [6]

c) For most economical rectangular channel section, prove that [6]

- i) Depth of flow is half the base width
- ii) Hydraulic radius is half the depth of flow

OR

Q2) a) With a neat sketch derive an expression for time required to empty a hemispherical tank. [6]

b) A rectangular channel has a width of 8 m and the discharge through it is 19 m³/s at a section where depth of flow is 1.5m. Find the specific energy of flowing water, critical velocity, minimum sp. energy and the type of flow. [6]

c) Derive an expression for initial depth and sequent depth of hydraulic jump. [6]

P.T.O.

- Q3)** a) Derive an expression for the work done per second by the jet on an inclined flat plate moving in the direction of jet. [8]
- b) A jet of water having velocity of 20 m/s strikes a curved plate which is moving with a velocity of 10 m/s. The jet makes an angle of 20° with the direction of motion of vane at inlet and leaves at an angle of 130° to the direction of motion of vane at the outlet. [9]

Calculate :

- i) Vane angles so that water enters and leaves the vane without shock.
- ii) Work done per second per unit weight of water striking the vane per second.

OR

- Q4)** a) In case of centrifugal pump, explain the following terms : [8]
- i) Mechanical efficiency
 - ii) Manometric efficiency
 - iii) Volumetric efficiency
 - iv) Overall efficiency
- b) For a head of 15 m and speed of impeller 800rpm, a centrifugal pump discharges 400 lit/sec. The inner and outer diameter of impeller are 200 and 400 mm respectively. The vanes are bent at 40° to the tangent at exit. The flow area remains 0.06 m^2 from inlet to outlet. Calculate [9]
- i) Manometric efficiency of pump
 - ii) Vane angle at inlet

- Q5)** a) With a neat sketch, discuss the components of a hydropower plant. [8]
- b) For a Pelton wheel, the head provided is 26 m, the bucket speed is 8 m/s and discharge is $0.5 \text{ m}^3/\text{s}$. If the bucket deflects through an angle of 160° , calculate the work done by the jet per second on the runner and hydraulic efficiency. Assume coeff. of velocity = 0.98. [10]

OR

- Q6)** a) Discuss in detail the classification of turbines. [8]
b) Define a hydropower plant. Discuss in detail the classification of hydropower plants. [10]

- Q7)** a) With usual notations, derive the dynamic equation of Gradually Varied Flow. [8]
b) What are various methods of GVF computation? Explain any one in detail. [9]

OR

- Q8)** a) Write a note on classification of GVF flow profiles. [8]
b) A rectangular channel 6 m wide conveys a discharge of $14 \text{ m}^3/\text{s}$. It has bed slope of 1 in 2000. If depth of flow at a section is 2.6 m, determine how far u/s or d/s of the section the depth would be within 10% of normal depth? Take 2 steps and assume Manning's $n = 0.025$. [9]



Total No. of Questions : 12]

SEAT No. :

P-8809

[Total No. of Pages : 2

[6180]-411

T.E. (Computer Engineering)

DESIGN AND ANALYSIS OF ALGORITHMS

(2015 Pattern) (Semester - II) (310250)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data, if necessary

- Q1)** a) Explain different Characteristics of Algorithm? [4]
b) Write short note on Algorithm as a technology? [3]

OR

- Q2)** a) Compare between definiteness and effectiveness of an algorithm. [4]
b) Explain the importance of algorithm in computing with example. [3]

- Q3)** a) Explain Tail recursion with suitable example. [5]
b) Differentiate between $O(1)$ and $O(n)$. [2]

OR

- Q4)** a) Which are the features of Functional model? [2]
b) Write and Explain Huffman algorithm with example. [5]

- Q5)** a) Explain elements of Dynamic programming. [2]
b) Explain branch and bound method with example. [4]

OR

- Q6)** a) Write Short note on : [2]
i) Simulated Annealing ii) Tabu Search
b) Compare chain matrix multiplication with normal matrix multiplication. [4]

P.T.O.

- Q7)** a) Explain NP and NP-hard problems. [5]
b) Prove that vertex cover problem is NP-complete. [6]
c) Define P, NP, NP-hard, NP-complete. [6]

OR

- Q8)** a) Differentiate between deterministic and non-deterministic algorithms. [5]
b) State and explain NP hard (Any Two) (each carry equal marks) : [6]
i) Hamilton cycle
ii) Scheduling problem
c) What is NP complete problem? Explain steps to prove that problem is NP-complete. [6]

- Q9)** a) Discuss aggregate & accounting method for amortised analysis. [8]
b) Explain Dijkstra's algorithm with its complexity analysis. [8]

OR

- Q10)** a) Write a short note on time-space trade-off? [8]
b) Write a short note on randomised algorithms. [8]

- Q11)** a) What is string matching? Explain Robin karp algorithm with example. [9]
b) Explain distributed breadth first search algorithm for 1D partitioning. [8]

OR

- Q12)** a) Write the analysis of multithreaded algorithms with an example. [9]
b) Write and explain naïve string matching algorithm. [8]



Total No. of Questions : 10]

SEAT No. :

P-8810

[Total No. of Pages : 3

[6180]-412

T.E. (Computer Engineering)

SYSTEMS PROGRAMMING AND OPERATING SYSTEM

(2015 Pattern) (Semester - II) (310251)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Attempt-questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10,*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Assume suitable data, if necessary.*

- Q1)** a) Write and explain algorithm for macro definition processing. [6]
b) What is use of symbol and literal and how assembler processes symbols and literals in design of two pass assembler? [4]

OR

- Q2)** a) Draw and explain flowchart for design of direct linking loader. [6]
b) Write and explain advanced macro facilities. [4]

- Q3)** a) Explain LEX in detail and write LEX program to count number of words, white spaces, digits and lines in the input file. [6]
b) What is use of GEST and RLD in design of Direct Linking Loader? [4]

OR

- Q4)** a) Explain single pass assembler and concept of Table of incomplete instructions. [6]
b) Compare interpreter and compiler in detail. [4]

P.T.O.

- Q5)** a) Consider the following set of processes, with the length of the CPU-burst time given in milliseconds :

Process	Burst Time	Arrival Time	Priority
P1	10	0	3
P2	2	1	0
P3	5	3	3
P4	2	2	1
P5	4	2	2

What is the turnaround time and waiting time of each process for FCFS, SJF pre-emptive, a non pre-emptive priority (a smaller priority number implies a higher priority), and RR (quantum = 2) scheduling. Which algorithm is having shortest Avg. waiting time. [10]

- b) What is deadlock and Explain four necessary conditions to happen a Deadlock. [6]

OR

- Q6)** a) Explain deadlock avoidance algorithms with example. [10]

- b) What is operating system? Explain functions of operating system. [6]

- Q7)** a) What is virtual memory management? Explain address translation in paging system for virtual memory. [6]

- b) Consider the following page reference string : [12]

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

How many page faults would occur for the following replacement algorithms, assuming three, four frames?

- i) LRU replacement
- ii) FIFO replacement
- iii) Optimal replacement

OR

- Q8)** a) Explain following terms : [8]
i) Fragmentation. ii) Thrashing.
iii) Belady's anomaly. iv) TLB
- b) Explain types of fragmentation and explain following memory allocation algorithms [10]
i) First Fit
ii) Best Fit
iii) Worst Fit

- Q9)** a) Explain disk scheduling algorithms in detail. [10]
b) Explain free space management. [6]

OR

- Q10)** Write a short note on following : [16]
a) Directory Structure
b) Allocation Methods
c) Direct Memory Access
d) I/O Buffering



Total No. of Questions : 10]

SEAT No. :

P-8811

[Total No. of Pages : 2

[6180]-413
T.E. (Computer Engineering)
EMBEDDED SYSTEMS & INTERNET OF THINGS
(ES And IoT)
(2015 Course) (Semester - II) (310252)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer any five questions Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) Assume Suitable data wherever necessary.*
- 3) Figures to the right indicate full marks.*
- 4) Draw neat & labelled diagram wherever necessary.*

Q1) a) What is embedded system? Explain any real application of embedded system. **[5]**

b) Explain the ARM features and register set of it. **[5]**

OR

Q2) a) Explain the steps involved in the IoT system design methodology. **[5]**

b) Compare REST-based communication and WebSocket communication API. **[5]**

Q3) a) What is SCADA? What are the different blocks of SCADA. **[5]**

b) Explain the IoT Level-5 with suitable diagram. **[5]**

OR

Q4) a) Draw and explain block diagram of an IoT device. Justify need of each component. **[5]**

b) Draw and Explain the Four pillars of IoT. **[5]**

Q5) a) Explain the Modbus protocol. **[6]**

b) What is BACnet? Explain the different layers function. **[6]**

c) Why Zigbee technology is popular in IoT than WiFi and Bluetooth. **[4]**

OR

P.T.O.

- Q6)** a) Explain 802.15.4 protocol in details. [6]
 b) What are the different key elements of M2M architecture? [6]
 c) What are the different challenges in IoT Standardization. [4]

- Q7)** a) What is Web of Things (WoT)? What are the two pillars of the web? Explain in brief. [6]
 b) Explain SCADA Middleware Standards in brief. [6]
 c) Explain Cloud of Things Architecture. [5]

OR

- Q8)** a) What is OSGi: The Universal Middleware? [6]
 b) Explain RFID middleware standards? [6]
 c) Write short note on WoT and Business Intelligence. [5]

- Q9)** a) Describe the use of Amazon Kinesis and Amazon SQS for IoT. [6]
 b) Write short note on: [6]
 i) Amazon Auto Scaling ii) Xively Cloud for IoT
 c) Explain python web application framework-Django. [5]

OR

- Q10)** a) Explain WAMP and its key concepts with diagram. [6]
 b) Explain in brief Django architecture and framework. [6]
 c) Design Smart Irrigation based on followings. [5]
 i) Define process specification for APM IoT system
 ii) Domain model of APM IoT system
 iii) Information model of APM IoT system
 iv) Controller service of APM IoT system



Total No. of Questions : 10]

SEAT No. :

P-8812

[Total No. of Pages : 2

[6180]-414

T.E. (Computer Engineering)
SOFTWARE MODELING AND DESIGN
(2015 Pattern) (Semester - II) (310253)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain SDLC with Rational Unified Process (RUP). [5]
b) Explain include and extend relationship in use case model with example. [5]

OR

- Q2)** a) Explain 4+1 View Architecture of UML. [5]
b) Draw Use Case diagram for ATM system by considering cash withdrawal scenario. [5]

- Q3)** a) Draw a sequence diagram for Online Shoppe System. [5]
b) Explain the elements of a class diagram with example. [5]

OR

- Q4)** a) Why is a class diagram important in static modeling? How is it different from an object diagram? [5]
b) Draw Class Diagram for College Library Management System. [5]

- Q5)** a) Explain synchronous communication pattern in client server architecture. [8]
b) Explain the broker pattern for service oriented architecture. [8]

OR

P.T.O.

- Q6)** a) Explain the component based software architecture in detail. [8]
b) Explain the real time software architecture. [8]

- Q7)** a) Explain factory pattern with its intent, motivation and implementation. [8]
b) Explain observer pattern with suitable class diagram including subject and observer. [8]

OR

- Q8)** a) Explain proxy pattern with its intent, motivation and implementation. [8]
b) Explain Behavioral Design Pattern with example. [8]

- Q9)** a) Why testing is important? List different testing methods. [6]
b) What is integration testing? Explain its types in details. [6]
c) What is system testing? Explain with different types of testing. [6]

OR

Q10) Write a short note on (Any 3) : [18]

- a) Performance testing
- b) Scenario testing
- c) Unit testing
- d) Acceptance testing



Total No. of Questions : 10]

SEAT No. :

P-8813

[Total No. of Pages : 2

[6180]-415
T.E. (Computer Engineering)
WEB TECHNOLOGY
(2015 Pattern) (Semester - II) (310254)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

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

- Q1)** a) What is JSON? Why to use JSON over XML?. [5]
b) What are the DTDs? Explain how do they work?. [5]

OR

- Q2)** a) What are the strengths of XML technology? Also list the limitations of using XML. [5]
b) List and discuss any three HTTP commands. [5]

- Q3)** a) Create simple JSP pages which will demonstrates use of implicit "request" object. [5]
b) What is JavaScript? How to validate any sample login form using JavaScript? [5]

OR

- Q4)** a) Explain with example how to access values of textfield of form using JavaScript. [5]
b) List and brief the various directives in JSP? [5]

- Q5)** a) Write a sample code in PHP to demonstate use of various loops supported in PHP Language. [8]
b) What is purpose of XMLHttpRequest in AJAX? List out and explain in brief AJAX processing steps. [8]

OR

P.T.O.

- Q6)** a) Explain server side include in PHP with sample example code. [8]
b) What is an associate arrays in PHP? Explain it with the help of simple PHP code. [8]

- Q7)** a) Draw and explain neat diagram which depicts MVC to the struts architecture. [8]
b) What is AngularJS? Write various features of AngularJS. Also list and explain advantages and disadvantages of AngularJS. [8]

OR

- Q8)** a) Write sample AngularJS application which can demonstrate use of different type of expressions, [8]
b) What is use of controller in AngularJS? Explain significance of \$ scope while using controller. [8]
- Q9)** a) Specify the different types of EJB interfaces? Decide and explain various aspects while deciding type of interface can be considered. [9]
b) Write a short notes on following : [9]
i) REST
ii) JSF
iii) Bootstrap

OR

- Q10)a)** Draw and explain architecture of EJB. Write different benefits of using EJB. [9]
b) Write a short note on following [9]
i) Spring
ii) NodeJS
iii) SOAP



[6180]-416
T.E. (Electrical)
POWER SYSTEM - II
(2015 Pattern) (Semester - II) (303146)

Time : 2½ Hours]

[Max. Marks : 70

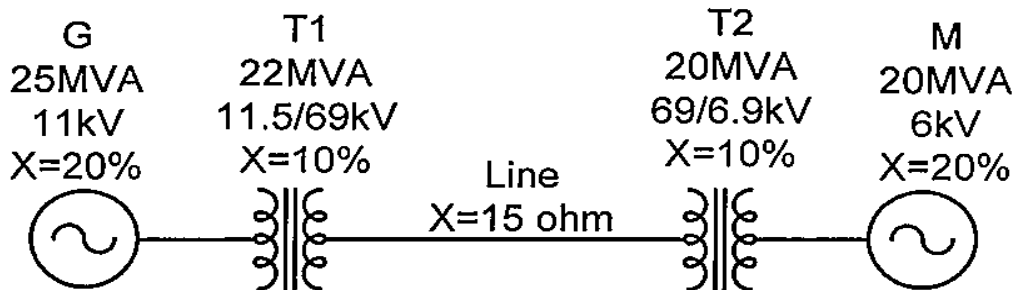
Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

- Q1) a)** Prove that complex power $S = \bar{V} \times \bar{I}^*$. [7]
- b) What do you mean by “Right of Way” in transmission system? Compare this term in EHVAC and HVDC transmission system. [3]

OR

- Q2) a)** Take base MVA=20MVA and base kV=6kV on motor load and draw per unit diagram to these base values. [7]



- b) What are the methods to improve surge impedance loading? [3]
- Q3) a)** A power of 12000MW is required to be transmitted over a distance of 1000km. At voltage level of 750kV at 50Hz. The average values of line parameters are as given below: [7]

System voltage(kV)	750
r (Ω/phase/km)	0.0136
x (Ω/phase/km)	0.272

P.T.O.

Determine

- i) Possible number of circuits required with equal magnitude of sending and receiving end voltages with 30 degree phase difference.
 - ii) The current transmitted per phase
 - iii) Total line losses in percentage of power handling capacity.
- b) State the advantages of per unit system in power system analysis. [3]

OR

- Q4) a)** Determine the unknown elements from following Y_{BUS} matrix [7]

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

- b) When HV transmission line is unloaded, the voltage regulation is negative. State statements are true or false with justification. [3]

- Q5) a)** Two 11kv, three phase 3MVA generators having sub-transient reactance of 15% operates in parallel. The generator is connected to transmission line through a transformer of 6MVA 11/22kV with leakage reactance of 5%. Choose the base MVA=6MVA and base kV =11kV on generator, convert circuit into per unit diagram. Determine fault MVA and fault current in kA, if the three phase fault is on (i) HT side (ii) LT side of transformer.[9]
- b) What are the different types of current limiting reactor? With circuit diagram, elaborate operation of each type. [8]

OR

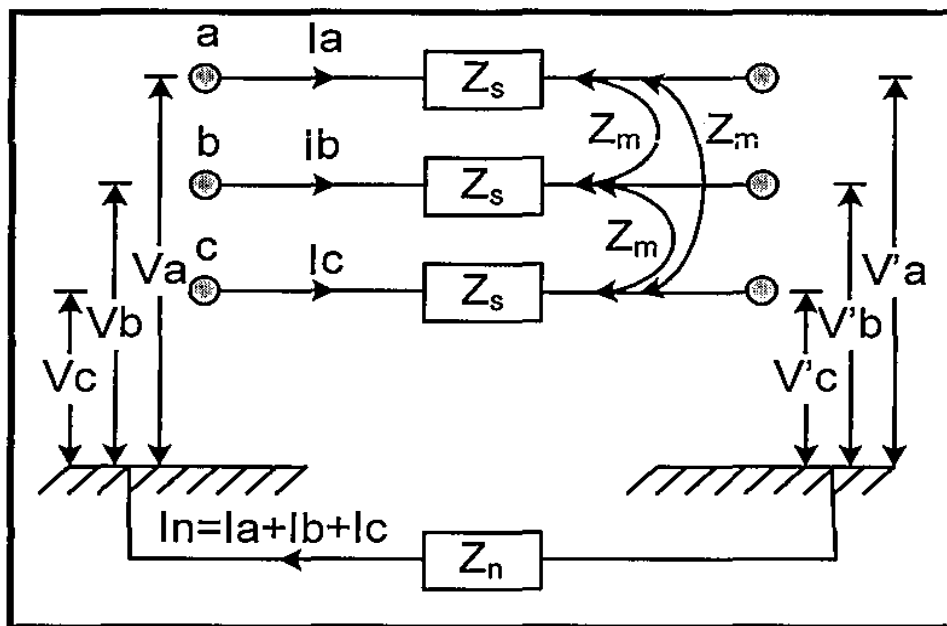
- Q6) a)** A 10 MVA, 6.6 kV, 3-phase star-connected alternator having a reactance of 20% is connected through a 5 MVA, 6.6 kV/33 kV transformer of 10% reactance to a transmission line having a resistance and reactance per conductor per kilometre of 0.2Ω and 1Ω respectively. Fifty kilometres along the line, a short-circuit occurs between the three conductors. Find the current fed to the fault by the alternator. Choose generator ratings are as base values. [9]

b) State whether following statements are true or false with justification [8]

- i) In case of three phase fault at the terminal of an unloaded alternator, the sub transient state current is smaller than transient & steady state current.
- ii) In case of three phase fault at the terminal of an unloaded alternator, the sub transient time constant is smaller than transient and steady state time constant.

Q7) a) A three phase 100MVA synchronous generator with line to line voltage of 11kV is subjected to a line to ground fault. The sequence reactance are $x_1 = j0.3pu$, $x_2 = j0.1pu$ and $x_0 = j0.05pu$. If the generator neutral is grounded through a reactance of $x_n = j0.05pu$, determine fault current and fault voltages. Also determine line currents and phase voltages of other phases if the fault is on phase a. [9]

b) An unsymmetrical loaded transmission line is given in following figure. show that $Z_0 = Z_s + 2Z_m + 3Z_n$ and $Z_1 = Z_2 = Z_s - Z_m$ [8]



OR

Q8) a) Across a star connected symmetrical impedance load of 10Ω and a neutral impedance of $(10/3)\Omega$, an unbalanced three phase supply with $V_a = 220\angle 0^\circ$ volts, $V_b = 200\angle -110^\circ$ volts and $V_c = 180\angle 110^\circ$ volts is applied. Determine the line currents using symmetrical components. [9]

- b) In case of LLG fault show that fault current [8]

$$\tilde{I}_f = \frac{-3E_{a1}Z_2}{Z_1Z_2 + Z_2Z_0 + Z_0Z_1}$$

- Q9) a)** Compare HVDC and EHVAC transmission system based on following points with due justification. [8]

- i) Insulation requirement
- ii) Power transfer capability
- iii) Conductor size
- iv) Short circuit fault level

- b) Write short note on “Constant current control in HVDC lines” [8]

OR

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

- i) Monopolar HVDC link
- ii) Bipolar HVDC link

- b) Draw the complete single line diagram of HVDC system showing all components and elaborate any three components in detail. [8]



Total No. of Questions : 8]

SEAT No. :

P-9227

[Total No. of Pages : 2

[6180]-418

T.E. (Electrical)

UTILIZATION OF ELECTRICAL ENERGY

(2015 Pattern) (Semester - II) (303148)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.

- Q1)** a) Draw electric circuit diagram used in Air Conditioner and explain in brief. [9]
- b) Explain with neat diagram Ajax Watt Furnace. [9]

OR

- Q2)** a) A 20 kW, 230V and 1ph resistance oven employs Nichrome wire as heating element. If the wire temperature is to be 1200°C and that of the charge 500°C. Estimate the diameter and length of the wire. The ρ of Nichrome alloy is $109 \times 10^{-8} \Omega m$. Assume k and e of the element is 0.57 & 0.9 respectively. [10]
- b) Compare Resistance and Arc welding. [8]

- Q3)** a) State and explain laws of Illumination. [9]
- b) Explain feeding and sectioning arrangement in traction substation. [9]

OR

- Q4)** a) Write a short note on flood lighting scheme. [9]
- b) Sketch the various arrangements of current collecting devices used in electric Locomotive. [9]

P.T.O.

- Q5)** a) What is Specific energy consumption? State the factors affecting on it. [8]
b) Sketch a simplified Trapezoidal speed time cure and derive the expression for Maximum speed. [8]

OR

- Q6)** a) Write a short note on Anti-collision system. [6]
b) A train weighing 210 tons is accelerated up a 1.5% gradient with an acceleration of 1.3 km/hr/sec. Determine the minimum adhesive weight of locomotive for this purpose if the coefficient of adhesion is 0.25. Assume train resistance as 55 N/T and rotational inertia of 9 %. [10]
- Q7)** a) An electric train uniformly accelerated at 6.5 km/hr/sec for 25 sec on a level track, braked at 6 km/hr/sec. the free running period for is 11 min and stop time of 6 min. Draw speed time curve and calculate distance between stations, average speed and schedule speed. [10]
b) Explain Series-parallel transition process with suitable diagram. [8]

OR

- Q8)** a) An electric train has an average speed of 48 km/hr on level track between stops 1600 m apart. It is accelerated at 1.7 km/hr/sec and braked at 3.3 km/hr/sec. Draw the speed time curve for the run and show all the timings. Estimate specific energy consumption of the train. Take tractive resistance as 70 N/T and rotational inertia of 12%. [10]
b) Write a short note regenerative braking in traction. [8]



Total No. of Questions : 8]

SEAT No. :

P8816

[Total No. of Pages : 2

[6180]-419

T.E. (Electrical)

DESIGN OF ELECTRICAL MACHINES

(2015 Pattern) (Semester-II) (303149)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain the different modes of heat dissipation. [6]
b) Derive the expression for output equation of three phase transformer. [6]
c) Explain the mechanical forces developed under short circuit condition. Also state the measure to overcome this effect. [8]

OR

- Q2)** a) Explain the procedure to calculate the no load current in case of three phase transformer. [6]
b) Derive the expression for the condition of transformer design for minimum cost in term of total cost of iron and total cost of copper for three phase transformer. [6]
c) What are the different types of windings used in a transformer? Explain any two types of transformer windings. [8]

- Q3)** a) Derive the output equation of three phase induction motor with usual notations. [8]
b) Explain the design of any two types of AC winding. [8]

OR

- Q4)** a) Discuss various factors considered for choice of specific electrical and specific magnetic loading of three phase induction motor. [8]
b) Explain the various factors in detail which play a major role while deciding the number of stator slots. [8]

P.T.O.

Q5) a) What are factors considered when estimating the length of the air gap of induction motor? Why the length of the air gap should be as small as possible? [8]

b) A 11KW, 220 V, 3 Phase, 6 pole, star connected squirrel cage induction motor has the following data: number of stator slots = 54, number of conductors in each stator slot = 9, number of rotor bars = 64, efficiency = 0.86, power factor = 0.85, current density = 5A/mm². Find bar current, end ring current, area of bar, area of end ring, Assume rotor mmf as 85% of stator mmf. Assume suitable data if required. [8]

OR

Q6) a) State rules for selecting the combinations of number of rotor slots and stator slots for three phase squirrel cage induction motor. [8]

b) Estimate the main dimensions for three phase, 50Hz, 10Kw, 400V, 4 pole squirrel cage induction motor. Assume full load efficiency of 0.85, full load p.f. of 0.9 and winding factor 0.96 The specific magnetic loading is 0.6wb/m² and the specific electric loading=22000A/m. Take rotor peripheral speed as 25 m/s at synchronous speed. [8]

Q7) a) Explain the procedure to calculate the no load current of a three phase induction motor. [10]

b) Define and explain short time rating, continuous rating of electrical machines. [8]

OR

Q8) a) State and explain the different types of leakage fluxes that exist in a induction motor. [10]

b) Explain the mmf calculation for air gap, stator teeth, stator core, rotor teeth and rotor core. [8]



Total No. of Questions : 11]

SEAT No. :

P8817

[6180]-420

[Total No. of Pages : 3

T.E. (Electrical)

**ENERGY AUDIT AND MANAGEMENT
(2015 Course) (Semester - II) (303150)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.*
- 2) Figures to the right indicate full marks.*
- 3) Assume suitable data if necessary.*
- 4) Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.*
- 5) Question No. 11 is compulsory.*

Q1) Discuss the reforms took place in Indian energy sector. **[6]**

OR

Q2) Explain short term and long term policies adopted in Indian for strengthening energy sector. **[6]**

Q3) What is energy policy? What is the importance of energy policy? Give standard format of energy policy. **[7]**

OR

Q4) Explain duties and responsibilities of energy manager. **[7]**

Q5) What is meant by load curve manipulation? Explain daily, weekly and monthly load curve manipulation techniques. **[7]**

OR

Q6) Explain role of tariff for energy management. Give appropriate examples. **[7]**

P.T.O.

- Q7)** a) Compare preliminary audit with detailed energy audit. [6]
- b) With suitable example explain Sankey diagram and its use in energy audit. [6]
- c) Use Cusum technique to calculate energy saving in a process industry. The fixed energy consumption is 70kWh per month and the production related energy consumption is 1.8 time the monthly production. The production data and recorded energy consumption data is given below. Estimate energy saved. [6]

Month	Monthly production(MT)	Energy Recorded (kWh)
Apr. 2018	100	280
May. 2018	125	340
June. 2018	157	380
July. 2018	134	355
Aug. 2018	148	374
Sept. 2018	172	390
Oct. 2018	165	390
Nov. 2018	177	395

OR

- Q8)** a) Explain in detailed auditing phase and post audit phases in energy management. [9]
- b) Obtain best fit straight line satisfying most of the data points obtained during data analysis. Use least square method to get expression of straight line. The data points are given below. [9]
- (10, 250); (25, 400); (30, 450); (32, 470) and (40, 520).

- Q9)** Attempt any two from following. [16]
- a) What is Cogeneration? Explain types of cogeneration systems with suitable examples.
- b) Explain energy conservation options in lighting systems.
- c) Explain how power electronic converters used in motor and drive system help in energy savings.
- d) Discuss energy saving options in heating systems.

OR

- Q10)a)** Judge economic feasibility of replacing old burnt 37.5kW motor with premium efficiency motor of same rating. Use following data for calculation for calculation of payback period. Take average cost of electricity as Rs. 7.5/kWh and demand charges of Rs. 350/KVA/month.[8]

Description	Old motor	New motor
Rating	37.5kW	37.5kW
Efficiency	85%	93%
PF	0.8 lagging	0.89 lagging
Operating hours	7500 Hrs	7500 Hrs
Cost of Motor	-	Rs. 150000
Resale value	Rs. 20000	-

- b) Discuss criteria for financial appraisal of investment. [8]

- Q11)a)** Calculate Net Present Value for investment of Rs. 1000000. The cash flows for six years are Rs. 150000, Rs. 200000, Rs. 200000, Rs. 250000, Rs. 250000 and Rs. 300000. Take discount factor as 10%. Is this investment is economical? [8]

- b) i) Explain time value of Money. [8]
 ii) Explain Internal Rate of Return.



Total No. of Questions : 10]

SEAT No. :

P8818

[Total No. of Pages : 2

[6180]-421

T.E. (Electrical Engineering)

ADVANCED MICROCONTROLLER AND ITS APPLICATIONS

(2015 Pattern) (Semester - I) (303141)

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 stack memory organization and program counter in detail. [5]
b) Write assembly language program to add two 16 bit numbers placed at address 40H, 41H and 140H, 141H store upper byte and lower byte of the result in 51 and 50H location respectively. [5]

OR

- Q2)** a) Explain Direct addressing mode and immediate addressing mode in detail, with suitable example. [4]
b) Write assembly language program to blink LED connected to RDO continuously. [6]

- Q3)** a) Explain following instruction with suitable example [6]
DECFSZ f, d, a
MULWF f, a
IORLW k
b) Explain Integer and float data types in detail. [4]

OR

- Q4)** a) Write C program to glow LED connected to RB1, if status on RB2 pin is high and LED should be off if status on RB2 pin is low. [5]
b) Write C program to generate square wave on RC1 of 200Hz using Timer0. Assume crystal frequency of 10MHz. [5]

- Q5)** a) Write C program to measure time period of square wave applied at CCP1 pin using capture mode of pic18f458. Use timer3 and crystal frequency of 10 MHz. [8]
b) Explain steps of program compare mode of CCP1 module in pic18f458. [8]

OR

P.T.O.

- Q6)** a) Explain DC motor speed control using PWM of CCP1 module with the help of suitable diagram. [8]
- b) Write a steps to generate square using compare mode of PIC18F458 using timer3. [8]

- Q7)** a) Draw interfacing diagram of 16×2 LCD with 8 bit mode, Explain role of RS, R/W, E and V_{EE} in interfacing LCD to microcontroller. [8]
- b) Write C program to continuously transmit character 'Y' serially . Let the Baud rate be 9600 and crystal frequency of 10MHz. [9]

OR

- Q8)** a) Write C program to receive data serially and transfer it to PORTB. Let the Baud rate be 9600 and crystal frequency of 10MHz. [8]
- b) Discuss steps in executing an timer interrupts in PIC18F458. [9]

- Q9)** a) Explain interfacing of Relay and opto-isolator to PIC18F458 with the help of suitable diagram. [8]
- b) Explain Voltage measurement using ADC of PIC18F458. Transfer the converted sample onto PORT B and PORT C. [9]

OR

- Q10)a)** Write the programming steps to use ADC with interrupts. [8]
- b) Write C program to interfacing LM 35 for temperature measurement using PIC18F458. Transfer the converted sample onto PORT C and PORT D. [9]



Total No. of Questions : 8]

SEAT No. :

P8819

[6180]-422

[Total No. of Pages : 2

T.E. (Electrical)

ELECTRICAL INSTALLATION MAINTENANCE & TESTING

(2015 Pattern) (Semester - I) (303144)

Time : 2 ½ 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) Use of Calculator is allowed.
- 5) Assume Suitable data if necessary.

- Q1) a)** Compare 3-phase, 4-wire A. C. underground system with 3-phase 3-wire system on the basis of volume required for the conductor material. Clearly state the assumptions made. **[8]**
- b) State and explain Kelvin's law. State limitations of Kelvin's law. **[6]**
- c) Write short note on thermography concept with respect to maintenance of transformer. **[6]**

OR

- Q2) a)** A single phase distributor has a resistance of 0.2Ω and reactance of 0.3Ω . At mid-point 'a' the current is 100 A, at 0.6 lagging p.f w.r.t voltage 'Va' at 'a'. At far end the voltage 'Vb' is 240 Volts and current is 100 Amp, at 0.8 p.f. lagging. Find supply voltage 'Vs' and phase angle between Vs and Vb. **[8]**
- b) State different types of maintenance strategies. Explain Breakdown and preventive maintenance. **[6]**
- c) State the objectives of Neutral Earthing. **[6]**
- Q3) a)** How transformer oil gets contaminated? With suitable block diagram explain the reconditioning process of transformer oil. **[10]**
- b) Explain various abnormal conditions and causes of failure of induction motor. **[8]**

OR

P.T.O.

- Q4) a)** How degree of polymerization and partial discharge measurement is used for condition monitoring of transformer? **[10]**
- b)** What is signature analysis? How it is used for condition monitoring of induction motor? **[8]**

- Q5) a)** Explain general rules for commercial and residential wiring work. **[8]**
- b)** What are the essentials of estimating and costing? How cable sizing is to be decided for particular application? **[8]**

OR

- Q6) a)** While estimating, how price catalogue, labour rates and schedule of rates are correlated? **[8]**
- b)** State the general factors that should be considered in estimation of HT and LT lines. **[8]**

- Q7) a)** Explain IE Act and Statutory Regulations with respect to electrical safety. **[8]**
- b)** List out various objectives of Electrical safety. **[8]**

OR

- Q8) a)** State the factors on which severity of electric shock depends. **[8]**
- b)** Write a short note on: **[8]**
- i) Different hazardous area and its effects on human body.
 - ii) Danger arising due to failure of Insulation of the equipment.



Total No. of Questions : 8]

SEAT No. :

P8820

[6180]-423

[Total No. of Pages : 2

T.E. (Electrical)

ELECTRICAL MACHINES - II

(2015 Pattern) (Semester - I) (303142)

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

- Q1) a)** With neat diagram, explain construction of 3 phase alternator. **[6]**
- b) A 1200 kVA, 3300V, 50 HZ, 3 phase star connected alternator has effective armature resistance of 0.25Ω per phase. A field current of 40 Amp produces a short circuit of 200A and an open circuit emf of 1100V line to line. Calculate the voltage regulation at **[7]**
- i) Full load 0.8 pf lag
 - ii) Full load 0.8 pf lead.
- c) Describe the phenomenon of hunting in synchronous motor? Explain How it can be reduced? **[7]**

OR

- Q2) a)** A 10 HP, 400V, star connected 3 phase synchronous motor has full load efficiency of 85% and has synchronous reactance of 10Ω per phase. Calculate the minimum current and corresponding induced emf line value for full load condition. Neglect armature resistance. **[6]**
- b) Explain the ZPF method for determining voltage regulation of alternator. **[7]**
- c) A 3 phase, 1000 KVA, 2300V, star connected salient pole alternator has direct axis reactance of 1.95Ω and quadrature axis reactance of 1.40Ω . Calculate voltage regulation at full load 0.6 pf lag. Neglect armature resistance. **[7]**
- Q3) a)** With neat diagram explain stator side speed control methods of 3 phase Induction motor. **[8]**
- b) Explain operation of 3 phase induction motor as an induction generator state advantages & application of induction generator. **[8]**

OR

P.T.O.

- Q4) a)** Compare variable reluctance stepper motor with permanent magnet stepper motor. [8]
- b)** With neat diagram explain construction and working of Linear Induction motor. [8]

- Q5) a)** Discuss various modifications to be made in the design of d.c. series motor so as to make it work satisfactorily on a.c supply [8]
- b)** With neat diagram explain- [8]
- i) Conductively compensated ac series motor
 - ii) Inductively compensated ac series motor

OR

- Q6) a)** Draw the circle diagram of plain A.C. series motor. Describe how to find motor input, motor output and speed scale. [8]
- b)** A Universal motor has resistance of 30Ω and inductance of $0.5H$. When connected to d.c. supply of $250V$, it takes 0.8 amp and runs at 2000 rpm. Determine the speed and power factor when connected to $250V$, 50 Hz a.c. supply and taking same current of 0.8 amp. [8]

- Q7) a)** A 230 V, 900 watts, 2 pole, 50 Hz single phase induction motor has following parameters

$$R_1 = 2.2\Omega, X_1 = 3\Omega, R_2^1 = 3.8\Omega, X_2^1 = 2.1\Omega \text{ total magnetizing reactance, } X_m = 86\Omega$$

Calculate, current, input power, power factor and efficiency at 6% slip. Draw equivalent circuit & show all the terms in it Neglect losses. [10]

- b)** With neat diagram, explain double revolving field theory. Hence draw torque speed characteristics of single phase induction motor. [8]

OR

- Q8) a)** With suitable circuit diagram, explain no load test and block rotor test on capacitor start induction motor. How equivalent circuit parameters are obtained from these tests. [10]
- b)** With neat diagram, explain construction and working of capacitor start induction motor. [8]



Total No. of Questions : 10]

SEAT No. :

P8821

[6180]-424

[Total No. of Pages : 2

T.E. (Electrical)

INDUSTRIAL AND TECHNOLOGY MANAGEMENT

(2015 Course) (Semester - I) (311121)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Write a short note on management of Technology. **[5]**

b) Describe in detail of demand forecasting. **[5]**

OR

Q2) a) Describe any two types of business organizations its characteristics, advantages and disadvantages. **[5]**

b) Write a short note on law of Diminishing Marginal Utility. **[5]**

Q3) a) What is Pareto Analysis and when it is used. **[5]**

b) Write a short note on Importance of technology at various levels. **[5]**

OR

Q4) a) Write a short note on Poka Yoke. **[5]**

b) Write a short note on Ishikawa Diagram and its use. **[5]**

Q5) a) What is price, capital, Debit and Credit. **[4]**

b) What do you mean by market Research. **[6]**

c) Write a short note on online marketing. **[6]**

OR

Q6) a) What are the different methods of selling. **[4]**

b) Define Financial management. Explain in brief. **[6]**

c) Explain **[6]**

i) Debit

ii) Credit

iii) Profit

iv) Loss statement

P.T.O.

- Q7)** a) Explain theory X and theory Y of motivation. [6]
b) Explain maslow theory of need hierarchy. [6]
c) Write a short note on [4]
i) HR planning
ii) Recruitment

OR

- Q8)** a) Explain [6]
i) Norming
ii) Storming
iii) Forming
iv) Performing
b) Explain motivation. Also explain Human Resource Management. [6]
c) Explain qualities of Good Leadership. [4]

- Q9)** a) Write a short note on trade mark laws. [6]
b) Write a short note on Intellectual property rights. [6]
c) What are the qualities an entrepreneur should have. [6]

OR

- Q10)** a) Explain different forms of IPR? [6]
b) Write a short note on copy & trademark. [6]
c) Explain Government policies & incentives. [6]



Total No. of Questions : 10]

SEAT No. :

P8822

[Total No. of Pages : 3

[6180]-425
T.E. (Electrical)
POWER ELECTRONICS
(2015 Course) (Semester - I) (303143)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 Q.7 or Q.8 and Q.9 or Q.10.
- 2) Figures to the right indicate full marks.

Q1) a) What is complementary impulse commutation? Describe this commutation with circuit diagram. **[5]**

b) Explain operation of step up chopper with input voltage, output voltage and output current waveforms. State the assumptions made. **[5]**

OR

Q2) a) Draw a circuit diagram illustrating the protection of anode and gate circuit of thyristor. Describe briefly the functions of various components used. **[5]**

b) A step up/ setp down chopper has input voltage of 220 V and output voltage of 660 V. If the conducting time of thyristor-chopper is 120 μ s, compute the pulse width of output voltage. In case pulse width of load voltage is increased here times its pervious width for constant frequency operation, calculate the new value of average output voltage. **[5]**

Q3) a) Draw and explain output and transfer characteristics of IGBT. **[5]**

b) A single phase fullly controlled bridge rectifier is operated with resistive load of 10 Ω , the input voltage is 230V. For the firing angle $\alpha = 60^\circ$, calculate average load voltage, RMS load voltage, average and RMS load current, Form factor and Ripple factor. **[5]**

OR

P.T.O.

- Q4) a)** Draw and explain Dynamic characteristics of MOSFET. [5]
- b) Explain working of single phase half controlled asymmetrical converter with RL load & firing angle of 30° Draw output voltage and current waveforms. [5]

- Q5) a)** Explain working of three phase fully controlled converter with RL load & firing angle of 90° Draw output voltage and current waveforms. Derive expression for average output voltage and rms voltage. What is the requirement of the circuit for continuous conduction? [10]
- b) Draw a neat diagram to explain TRIAC as a light dimmer switch with output voltage waveforms. [6]

OR

- Q6) a)** Explain operation of single phase ac voltage regulator with output voltage and current waveforms for RL Load. Write expression for rms output voltage. What is the condition for firing angle for output voltage control? [10]
- b) A three phase full converter is operating with resistive load of 10Ω . For the firing angle $\alpha = 75^\circ$, calculate average load voltage, RMS load voltage, Form factor and Ripple factor. Assume supply voltage to be 415V and frequency 50 Hz. [6]

- Q7) a)** Explain various PWM techniques used in inverters. How sinusoidal PWM is used for harmonic elimination? [8]
- b) Explain with neat circuit diagram working of single phase full bridge voltage source inverter connected to RL load. Draw output voltage and current waveforms and comment on need of feedback diodes. [8]

OR

- Q8)** a) Explain Multiple pulse modulations with necessary waveforms. Why multiple pulse modulation is better than single pulse modulation? [8]
- b) Compare current source inverter and voltage source inverter. [8]

- Q9)** a) Explain casceded multilevel inverter using 3 H-bridges connected to V input supply. Draw output voltage waveforms. What are its advantages? [10]
- b) List different voltage control methods inverter. Explain Pulse width modulation technique in detail. [8]

OR

- Q10)**a) With the help of neat circuit diagram and waveforms, explain the operation of three phase MOSFET based voltage source inverter with resistive load (180° conduction mode). [10]
- b) Write short note on Flying capacitor multilevel inverter. [8]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages :2

P8823

[6180]-426

T.E. (E&TC)

POWER ELECTRONICS

(2015 Pattern) (Semester-II) (304186)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain static characteristics of SCR, Why silicon is prefer for SCR manufacturing? [7]
- b) Draw & Explain static characteristics of MoSFET [7]
- c) Draw and explain the single phase bridge Inverter for R-L load [6]

OR

- Q2)** a) The trigger circuit of a thyristor has a source voltage of 12v and the load line has slope of -120v per ampere. The min. gate current to turn on the SCR is 20 mA, Compute: Source resistance required in the gate current circuit, The trigger voltage and trigger current for an average gate power dissipation of 0.7 watts [7]
- b) Explain importance of latching & holding current of SCR & draw Gate characteristics of SCR [6]
- c) Draw & explain about Single phase Full converter with RL load with waveform. [7]

- Q3)** a) Explain step up chopper and drive the equation for O/P Voltage [8]
- b) A dc chopper has a resistive load of 15 W and input voltage $V_S = 200V$. When chopper is ON, its voltage drop is 2 volts and chopping frequency is 10 kHz. If the duty cycle is 75%, Determine the average output voltage and the chopper on time. [8]

OR

P.T.O.

- Q4)** a) Explain the working single phase full wave AC voltage controller with R load, derive RMS output voltage equation [8]
- b) Input to the step up chopper is 200 V. The output required is 600 V. If the conducting time of thyristor is 200 μ s, compute Chopping frequency, If the pulse width is halved for constant frequency of operation, find the new output voltage. [8]
- Q5)** a) What is SLR full bridged DC-DC converter, explain through circuit, its uses & application [8]
- b) Explain working of ON line Ups & OFF line UPS, State five specifications of UPS [8]

OR

- Q6)** a) Explain Voltage & frequency control methods for 3 Phase induction motor drive [8]
- b) A 3-pulse cycloconverter feeding a single-phase load of 230 V, 40 A at a power factor of 0.8 lagging. Calculate the Power factor of the supply current. [8]
- Q7)** a) Draw & explain Stepper Motor with Drive using IC Drivers: [9]
- b) Explain the operation of step down SMPS; Draw the diagram using PWM IC LM 3524. [9]

OR

- Q8)** a) Draw and Explain about the over voltage & current protection of Power circuit. [9]
- b) Draw & explain the working of rechargeable LED lamp or panel with driver circuit [9]



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 3

P8825

[6180]-428

T.E. (E & TC)

DIGITAL COMMUNICATION

(2015 Pattern) (Semester - I) (304181)

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

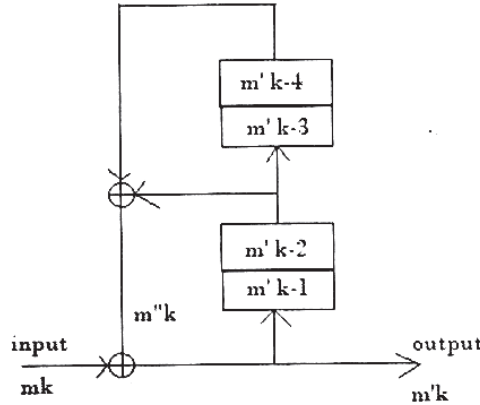
- Q1)** a) Compare DM, ADM, PCM and DPCM. [6]
- b) Explain AT & T Hierarchy multiplexing system. [7]
- c) A wide sense stationary random processes $X(t)$ is applied to input of an LTI system with impulse response $h(t) = 3 \cdot e^{-2t} 4(t)$. Find the mean value of output $Y(t)$ of system if $E[X(t)] = 2$. [7]

OR

- Q2)** a) In a delta modulator system, the voice signal is sampled at a rate of 64 KHz, Signal amplitude is 1 volt max. [7]
- i) Determine minimum value of step size to avoid slope overload distortion
- ii) Determine granular noise power No., if voice signal BW is 3.5KHz
- iii) Assuming signal is sinusoidal, calculate signal power (SO) and SNR. Assuming that voice signal amplitude is uniformly distributed in the range $(-1, 1)$, determine signal Power (SO) and SNR.

P.T.O.

- b) A Scrambler is shown in figure, design the corresponding Unscrambler. Find the scrambled sequence at the output of scrambler, if input sequence is : 1010110. Verify the designed Unscrambler. [7]



- c) Explain Narrow band Noise. Represent Narrow band noise in term of in-phase and Q phase components. [6]

- Q3)** a) Derive the expression for error Probability of Matched filter. [8]
 b) A received signal is either $+2V$ or $-2V$ held for a time T . the signal is corrupted by WGN of PSD 10^{-4} Volts²/Hz. If the signal is processed by an integrator and dump receiver, what is minimum time T during which the signal must be sustained if the probability of error is $\leq 10^{-4}$. Use table of error function. [8]

OR

- Q4)** a) Show that impulse response of matched filter is the time reverse and delayed version of input signal. [8]
 b) A polar NRZ signal is applied at input of matched filter of amplitude $+A$ & $-A$ of duration T for binary 1 and 0 respectively. Obtain impulse response of matched filter and sketch it. [8]

- Q5)** a) Describe QAM in Detail. [9]
 b) Binary Data is transmitted using PSK at a rate 3 Mbps over a RF link having BW = 10 MHz. Find signal power required and receiver input so that error probability less than or equal 10^{-4} Assume Noise PSD = 10^{-10} watts/Hz and $Q(3.71) = 10^{-4}$. [9]

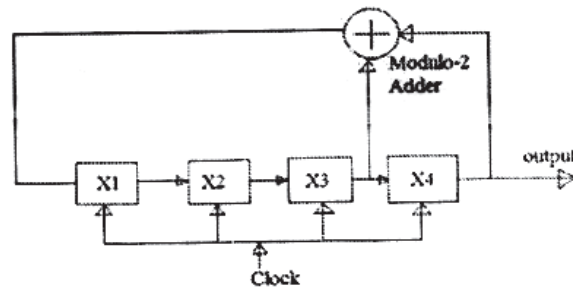
OR

Q6) a) Compare parameters of : ASK, FSK, BPSK, QPSK, M-ary PSK, and QAM. [9]

b) Explain M-ary PSK system with Constellation diagram, in details. [9]

Q7) a) Explain performance parameters of DSSS system, in detail. [8]

b) Consider a fast FSSS with binary FSK, two hops /symbol of 2 bits and PN sequence generator, with output X_4 . The period of the PN sequence is 15 with initial value $X_4, X_3, X_2, X_1 = 1100$ with binary message 010010010000. The message is transmitted. The length of PN sequence per hop is 3. Find PN sequence and plot the output frequency for output message. [8]



OR

Q8) a) The information bit duration in DS-BPSK SS system is 4msec. while the clipping rate is 1MHz. Assuming an average error probability of 10^{-5} , calculate the jamming margin. Interpret the result. Given: $Q(4.25) = 10^{-5}$. [8]

b) Compare Slow and Fast FHSS. Give applications of FHSS. [8]



Total No. of Questions : 8]

SEAT No. :

P8826

[Total No. of Pages : 3

[6180]-429

T.E. (E & TC)

ELECTROMAGNETICS

(2015 Pattern) (Semester - I) (304183)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1) a)** Derive expression for $\vec{E}$ at a point P on positive Z axis due to infinite surface charge distribution placed in XY plane. [8]
- b) Derive an expression for spherical plate capacitor. [8]
- c) Find the components of the magnetic field which traverse from medium 1 to 2, Z = 0 plane is the interface having $\mu_{r1} = 2.5$ and $\mu_{r2} = 4$, Given that $\vec{H} = -30\hat{a}_x + 50\hat{a}_y + 70\hat{a}_z$ V/ m. [4]

OR

- Q2) a)** A infinite line from $-\infty$ to 0 along Z - axis carries a uniform charge distribution to 100nC/m. Find $\vec{E}$ at (0, 0, 2). [8]
- b) Given $V = 10y(x^3 + 5)$ volt, Find $\vec{E}$ at surface $y = 0$, show that surface $y = 0$ is an equi-potential surface and if surface $y = 0$ is a conductor find total charge in region $0 < x < 2$, $y = 0$, $0 < z < 1$, $\epsilon = \epsilon_0$ and $V > 0$ on region outside conductor. [8]
- c) Derive the expression for Amperes circuital Law. [4]

P.T.O.

Q3) a) State and Prove Poynting theorem. What is the significance of the Poynting vector in a static electromagnetic field? [8]

b) Find K so that each of the following pairs of fields satisfy maxwells equations. Given $\mu = 10^{-5}$, $\epsilon = 4 \times 10^{-9}$ F/ m, $\sigma = 0$, $\rho_v = 0$. [8]

i) $\bar{D} = 6\hat{a}_x - 2y\hat{a}_y + 2z\hat{a}_z$ nC/m² & $H = Kx\hat{a}_x - 10y\hat{a}_y - 25z\hat{a}_z$ A/m

ii) $\bar{E} = (20y - Kt)\hat{a}_x$ V/ m and $\bar{H} = (y + 2 \times 10^6 t)\hat{a}_z$ A/m

OR

Q4) a) Derive Maxwells equation in differential and integral form for time varying and free space. [8]

b) Define conduction current and conduction current density and derive current continuity equation. [8]

Q5) a) A lossless transmission line with characteristic impedance 50 ohm is 30 m long and operates at 2MHz. The line is terminated with a load of $(60 + j40)\Omega$. If phase velocity is $0.6c$, where c is the speed of light then by using smith chart find, [8]

i) Reflection co-efficient

ii) The SWR

iii) The input impedance

b) State the primary and secondary constants of transmission line and derive expression for characteristic impedance and propagation constant in terms primary constants. [8]

OR

Q6) a) Characteristic impedance of a transmission line is 2040 ohms at a frequency of 800 Hz and propagation constant is $0.054 \angle 87.9^\circ$. Determine primary constants. **[8]**

b) Explain the phenomenon of reflection and reflection co-efficient. State the significance of reflection co-efficient. **[8]**

Q7) a) Define Depth of penetration and derive the expression for depth of penetration for good conductors and derivation of velocity and wavelength in terms of depth of penetration for good conductors. **[10]**

b) A 10GHz plane wave travelling in free space has an amplitude $E_x = 10$ V/m. Find velocity in free space, wavelength, phase shift and intrinsic impedance. **[8]**

OR

Q8) a) Explain the concept of polarization in uniform plane waves and explain its types. **[10]**

b) Find the transmission co-efficient for 10 V/m plane wave of frequency 3MHz incident from the free space (medium 1) normal to the surface of material (medium 2) having $\epsilon_r = 4$, $\mu_r = 1$, $\sigma = 10^3$ S/m. **[8]**



Total No. of Questions : 8]

SEAT No. :

P8827

[Total No. of Pages : 2

[6180]-430
T.E. (E & TC)
MICROCONTROLLERS
(2015 Pattern) (Semester - I) (304184)

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

- Q1)** a) Draw and explain RAM structure of 8051 microcontrollers. **[4]**
b) Draw well labeled TMOD register of 8051 microcontroller and configure it in mode 0 for timer 1. Write a program to generate square wave on pin 2 of port 3. **[8]**
c) Illustrate 8051 architecture with suitable, well labeled block diagram. **[8]**

OR

- Q2)** a) Draw a diagram for keyboard interfacing with 8051 microcontroller and explain the logic of key pressed and key detection with help of algorithm or flowchart. **[8]**
b) Interface 8 LEDs to PORT P2 in common cathode configuration and write a program to blink all LEDs alternately and continuously. Draw the circuit diagram and explain it. **[8]**
c) Explain the flag register of 8051 Microcontroller with the suitable example. **[4]**

- Q3)** a) Which are the various oscillator options present in PIC microcontroller? Enlist and explain each of them with neat diagrams. **[8]**
b) Draw the T0CON structure of PIC microcontrollers and write the steps to program the Timer 0 in 16 bit mode. **[8]**

OR

P.T.O.

- Q4) a)** Draw and explain RAM memory Organization of PIC microcontroller. What is access bank in PIC? How is it derived? [8]
- b)** Explain the following instructions of PIC 18: [8]
- i) ADDWF f, d, a
 - ii) MOVFF fs, fd
 - iii) MULLW k
 - iv) BNZ n

- Q5) a)** Draw and explain structure of ADCON0 register of PIC microcontroller. [8]
- b)** Draw an Interfacing diagram of LED with any one of IO pin of PIC microcontroller and write an embedded C program to blink this LED. Create the delay subroutine by using timer 0. [8]

OR

- Q6) a)** Draw interfacing diagram of PIC microcontroller with computer and write a program to serially transmit “YES” from microcontroller to computer. [8]
- b)** Demonstrate Serial Peripheral Interface with help of suitable diagram. Compare between SPI and I2C. [8]

- Q7) a)** Design PIC 18f4xxx system to interface LED and buzzer and relay and key S1. Write program in C language such that when key S1 is pressed LED and buzzer will on and when S2 is pressed Relay will on. [12]
- b)** Enlist the features of ADC module of PIC microcontroller. [6]

OR

- Q8) a)** Write a C program which will read the temperature from LM35 connected to RA2 pin of PIC18F ADC and display it on LCD connected to port D. Draw the interfacing diagram for same. (Only call subroutine to Display()). [12]
- b)** Explain with suitable diagram, a home protection system using PIC 18FXX in brief. [6]



[6180]-431

T.E. (Information Technology)
THEORY OF COMPUTATION
(2015 Pattern) (Semester-I) (314441)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

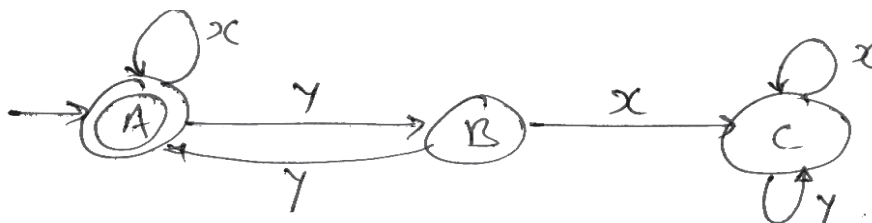
- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume suitable data if necessary.

- Q1)** a) Design FA that accepted of all strings over the alphabet $\{0, 1\}$ such that the third symbol from the right is '1'. [5]
- b) Show that the context free languages are closed under union, concatenation and kleen star. [3]
- c) Discuss application of RE. [2]

OR

- Q2)** a) For the following CFG. Find regular expression and FA that define the same language: [5]
- $S \rightarrow aB \mid bA$
 $A \rightarrow aB \mid a$
 $B \rightarrow bA \mid b$
- b) Design a mealy machine for binary input sequence such that, if the sequence ends with 100 the output is '1' otherwise '0'. [5]

- Q3)** a) Construct regular expression for the following FA using Arden's Theorem. [5]



- b) Define a formal definition of CFG? Is the language $L \{a^n b^m \mid n \neq m\}$ context free? If yes write CFG defining the above language. If no, prove it. [5]

OR

P.T.O.

Q4) a) Find GNF for the given grammar: [6]

$S \rightarrow AA \mid 0$

$A \rightarrow SS \mid 1$

b) Let Grammar

$S \rightarrow aB \mid bA$

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

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

For the string 'aaabbabbba' find a

i) Left most derivation

ii) Right most derivation

iii) Parse tree [4]

Q5) a) Construct a PDA that accepts all palindrome strings over $\Sigma = \{a, b\}$. Show acceptance by empty stack and final state. [8]

b) Design post machine that checks if the given string contains well formed parentheses. [8]

OR

Q6) a) Construct a PDA a equivalent to the following CFG: [8]

$S \rightarrow 0BB, B \rightarrow 0S \mid 1S \mid 0$. Test whether 010^4 is in PDA

b) Construct a deterministic PDA acceptance by empty stack recognizing the following language :

$L = \{x \in (ab)^* \mid \text{number of a's more than number of b's}\}$ [8]

Q7) a) Design a Turing machine for concatenation of two strings over input $\{a, b\}$. Retain original numbers as well as store result after number separated by blank. Simulate the working of the TM for the input string [9]

i) abba

ii) aabba [9]

b) Construct a TM to compute $L = \{a^n b^{2n} \mid n > 0\}$.

Simulate working of TM for the input

i) abb

ii) aabbbb

OR

Q8) a) Construct a TM to compute the following functions: [9]

$L = \{\log_2 n\}$ where n is any binary number & a perfect power of 2.

Simulate the working of the TM for the input

i) $n = 1000$

ii) $n = 100$

b) Design a TM to recognize following language : [9]

The set of string with an equal numbers of a's and b's

Simulate the working of the TM for the input

i) ababba

ii) aaabb

Q9) a) Prove that following is undecidable.

$A_{TM} = \{(M, w) \mid \text{the TM } M \text{ accepts } w\}$ [9]

b) Explain the Turing reducibility with example. [7]

OR

Q10) a) If L is a recursive language over Σ , show that $\bar{L}$ ($\bar{L}$ is defined as $\Sigma^* - L$) is also recursive. [9]

b) Explain complexity class P, NP and Differentiate between NP complete and NP hard. [7]



Total No. of Questions : 10]

SEAT No. :

P8829

[Total No. of Pages : 3

[6180]-432

T.E. (Mechanical)

REFRIGERATION & AIR CONDITIONING

(2015 Pattern) (Semester-II) (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 is allowed.*

- Q1)** a) Explain with schematic refrigeration system for ice plant. [6]
b) Explain: Ozone depletion potential. [4]

OR

- Q2)** a) Explain the function of four components used as a replacement of compressor in a vapour absorption system. [4]
b) A simple saturated VCC using R-22 refrigerant of capacity 15 TR has condenser and evaporator temperatures are 40°C and 0°C. Calculate the followings: [6]
i) Refrigerant mass flow rate
ii) Power consumption
iii) COP. Take C_p of R-22 vapour as 0.67 kJ/kg.K.

Sat. Temp	h_f	h_g	S_f	S_g
°C	kJ/kg	kJ/kg	kJ/kgK	kJ/kgK
40	249.08	415.95	1.67	1.6995
0	200	405.36	1.0	1.7518

- Q3)** a) Explain with P-h diagram actual VCC. [4]
b) In an aqua ammonia VAS, heat is supplied to generate by condensing steam at 2 bar. The evaporator is maintained at 5°C. Assuming the ambient temperature as 30°C. Calculate the COP and mass of steam required for a plant of capacity of 20TR. Take saturation temperature at 2 bar as 120°C and enthalpy of evaporation as 2200 kJ/kg. [6]

OR

P.T.O.

- Q4)** a) Explain why the multi staging is required? [2]
b) Explain with schematic and P-h diagram multi evaporator system with single compressor and multiple expansion valve. Also write the equations for refrigerating effect, compressor power and COP. [8]

- Q5)** a) Explain with neat sketch adiabatic mixing of two air streams. [6]
b) Obtain the following properties of moist air at 36°C DBT and 20°C WBT under a total pressure of 760 mm Hg without using psychrometric chart. [10]
i) Partial pressure of water vapour
ii) Relative humidity
iii) Specific humidity
iv) Vapour density
v) Enthalpy of air per kg of dry air

OR

- Q6)** a) Explain the factors affecting human comfort. [6]
b) A building has the following calculated cooling loads: [10]
RSH gain = 310 kW, RLH gain = 100 kW.
The space is maintained at the following conditions:
Room DBT 25°C, Room RH = 50%.
Outdoor air is at 38°C and 50% RH. And 10% of mass of air supplied to the building is outdoor air.
If the air supplied to the space is not to be at a temperature lower than 18°C. Find:
i) minimum amount of air supplied to space in m³/s
ii) Mass flow rates of return air and outdoor air.
iii) State of air entering the cooling coil.
iv) Capacity of the cooling coil.
v) ADP of the cooling coil.

- Q7)** a) Explain with neat sketch summer air conditioning system. [6]
b) Explain with neat sketch evaporative condenser. [6]
c) Explain with neat sketch working of dry expansion type evaporator. [6]

OR

- Q8)** a) Explain with sketch variable air volume system. [6]
b) Explain with neat sketch flooded evaporator. [6]
c) Explain with neat sketch working of screw compressor. [6]

- Q9)** a) Explain pressure losses due to friction and dynamic losses in duct. [8]
b) A rectangular duct, $0.15 \text{ m} \times 0.12 \text{ m}$ is 20m long and carries a standard air at the rate of $0.3 \text{ m}^3/\text{s}$ having density 1.2 kg/m^3 . Calculate the total pressure required at inlet of the duct in order to maintain the flow and air power required. Take $f=0.005$. [8]

OR

- Q10)** a) Explain with schematic air handling unit. [6]
b) A circular section main duct of 1.2 m diameter carries air flowing at the velocity of 600 m/min. This duct has three branch ducts receiving equal air volumes at equal intervals. Each interval duct has a friction loss of 1.2 mm of water & a static pressure of 4 mm of water is required at each branch. Calculate the velocities & diameters of second & third length so as to have static regain just enough to overcome the frictional loss in the succeeding length of main duct upto the next branch. The static regain factor is 0.6. Draw the simple sketch of above duct system. [10]



Total No. of Questions : 12]

SEAT No. :

P8830

[Total No. of Pages : 4

[6180]-433

T.E. (Mechanical/Automobile)

NUMERICAL METHODS AND OPTIMIZATION

(2015 Pattern) (Semester - II) (302047)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10 and Q.11 or Q.12.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of programmable calculator is not permitted.
- 5) Assume suitable data, if necessary.

Q1) Moment at point in a cantilever carrying a uniformly distributed load is

$M = \frac{PL^2}{2}$, where P is intensity of UDL and L is distance. If error in calculation of P is 0.02kN/m and L is 0.05m, find the error in calculation of M at L=5m and P=3kN/m. **[6]**

OR

Q2) Find a root of $3x + \sin(x) - e^x = 0$ using Newton Raphson Method using initial guess of 2.0 upto 3 decimal place accuracy. **[6]**

Q3) What is Partial Pivoting for solving simultaneous equations? Explain advantages and limitations of the same with respect to Gauss Elimination and Gauss-Seidal Methods. **[6]**

OR

Q4) Solve the following simultaneous Eqⁿs by Gauss-Seidal Method upto 3 iterations: **[6]**

$$3x_1 - 0.1x_2 - 0.2x_3 = 7.85$$

$$0.1x_1 + 7x_2 - 0.3x_3 = -19.3$$

$$0.3x_1 - 0.2x_2 + 10x_3 = 71.4$$

P.T.O.

Q5) Write a short note on the following:

[8]

- a) Slack Variable
- b) Artificial Variable
- c) Surplus Variable
- d) Standard form of the LP Problem

OR

Q6) a) Find (x_1, x_2) graphically in order to maximize $f(x_1, x_2) = 400x_1 + 600x_2$, subject to **[5]**

$$x_1 + x_2 \leq 16$$

$$\frac{x_1}{28} + \frac{x_2}{14} \leq 1 \text{ and } x_1 \geq 0, x_2 \geq 0$$

$$\frac{x_1}{14} + \frac{x_2}{24} \leq 1$$

b) Write a short note on Simulated Annealing. **[3]**

Q7) a) Use the Runge-Kutta method of order four and with $h = 0.1$ to find an approximate solution of $\frac{dy}{dx} = x^2 + y$ at $x = 0.1, 0.2$ and 0.4 . Given that $y = -1$ when $x = 0$. **[8]**

b) Using the Laplace equation $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0$ with respect to the grid and boundary conditions as shown in Figure Q7b, calculate temperatures T_1, T_2, T_3, T_4 . **[10]**

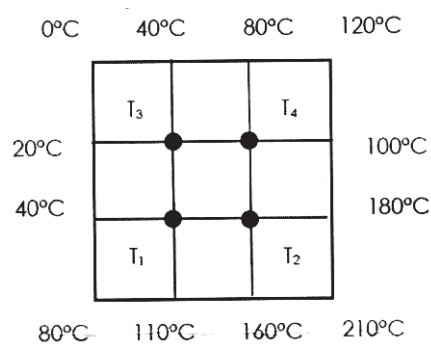


Figure Q7b

OR

Q8) a) Using Taylor series method, find, correct to 4 decimal places, the value of $y(0.1)$, given $\frac{dy}{dx} = x^2 + y^2$ and $y(0) = 1$. [8]

b) A steel plate of $300\text{mm} \times 300\text{mm}$ has its four sides held at $100, 80, 50$ and 0°C , as shown in Figure Q8b. Calculate the steady state temperature distribution at interior points (temperatures T_1, T_2, T_3, T_4) assuming a grid size of 100mm . [10]

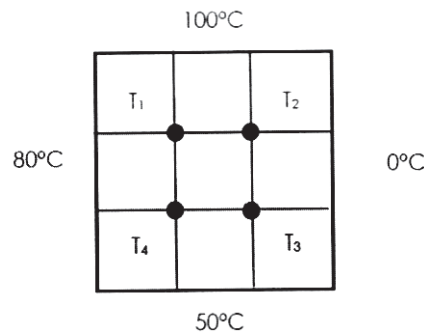


Figure Q8b

Q9) a) The following table gives the results of measurement of electrical conductivity ' k ' of glass at temperature $\theta^\circ\text{C}$. [8]

k	98	132	156	193	226	250
θ	0.004	0.018	0.029	0.051	0.073	0.090

If $k = a \cdot e^{b\theta}$, find the values of ' a ' and ' b '.

b) Find $e^{-0.75}$ from the following table using Newton's forward formulae: [8]

x	1.00	1.25	1.50	1.75	2.00
$y = e^x$	0.3679	0.2865	0.2231	0.1738	0.1353

OR

Q10)a) Fit a parabola, by the method of least squares, to the following data and find the equation: [8]

x	1	2	3	4	5
y	5	12	26	60	97

b) From the data given below, find the value of x when $y = 13.5$. [8]

x	93.0	96.2	100.0	104.2	108.7
y	11.38	12.80	14.70	17.07	19.91

- Q11)a)** When a train is moving at 30m/s brakes are applied. The speed V of train in m/s after t seconds is given below: **[8]**

t (seconds)	0	10	20	30	40	50	60
V (m/s)	35.0	31.2	23.8	19.4	11.6	4.3	0

Find the distance moved by the train before coming to stand-still using Trapezoidal and Simpson's $1/3^{\text{rd}}$ rule.

- b) Evaluate $\int_0^{\pi/2} \int_0^{\pi/2} \sin(x+y) dx dy$ by using Trapezoidal rule and compare with actual integration using the range on x and y - directions in 2 equal parts. **[8]**

OR

- Q12)a)** Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Simpson's $3/8^{\text{th}}$ rule and compare with actual integration using the range on x - directions in 6 equal parts. **[8]**

- b) Find the integration $\int_0^2 (x^2 - 3x + 2) dx$ using Gauss Legendre Two-Point formulae. **[8]**



Total No. of Questions : 10]

SEAT No. :

P8831

[Total No. of Pages : 3

[6180]-434

**T.E. (Mechanical/Automobile)
MANUFACTURING PROCESS - II
(2015 Pattern) (Semester - II) (302051)**

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 and Q.9 or Q.10.
- 2) Figures to the right indicate full marks.
- 3) Use of electronic pocket calculator is allowed.
- 4) Assume suitable data, if necessary.

- Q1)** a) Differentiate between Multi-spindle and Gang Drilling machine. **[4]**
- b) In orthogonal cutting of a 60 mm diameter MS bar on a lathe machine with a cutting tool having Rake angle = 15° , Cutting speed = 100 m/min, Feed = 0.2 mm/rev, Cutting Force = 150N, Feed force = 50 N, Chip thickness = 0.3 mm, Calculate: **[6]**
- i) Chip thickness ratio,
 - ii) Shear Plane angle,
 - iii) Coefficient of friction
 - iv) Cutting power,
 - v) Chip flow velocity,
 - vi) Shear Force.

OR

- Q2)** a) Explain with neat sketch straddle milling and T-slot milling operations. **[4]**
- b) How do you define tool life? Explain the parameters that control the tool life. What is the role of cutting fluids? **[6]**
- Q3)** a) A cylindrical grinding operation is to be carried out at a cutting speed of 25 m/min with depth of cut 0.05 mm. The diameter of the work is 60 mm and 500 mm long. The total stock to be removed is 0.30 mm. The width of the grinding wheel is 70 mm. Determine the machining time for finish grinding operation. **[4]**
- b) Explain various types of broaches with sketch. **[6]**

OR

P.T.O.

Q4) a) Explain the terms loading, glazing, truing and dressing in terms of grinding wheel. **[4]**

b) Index 69 divisions by compound indexing using following Brown and Sharp Index Plates: **[6]**

Plate No :1 : 15, 16, 17, 18, 19, 20.

Plate No : 2 : 21, 23, 27, 29, 31, 33.

Plate No : 3 : 37, 39, 41, 43, 47, 49.

Q5) a) Explain the working set-up and principle of ECM in detail with neat sketch. **[8]**

b) Discuss the need of non-conventional machining processes. Classify NCM processes based on type of energy source used. **[8]**

OR

Q6) a) Write a note on micro-machining. State and one application of following NCM processes: **[8]**

i) EDM,

ii) AJM,

iii) ECM,

iv) LBM

b) Draw resistance-capacitance relaxation circuit for EDM and discuss the effect of variation with resistance, mean current, capacitance and spark gap on MRR with appropriate graphs. **[8]**

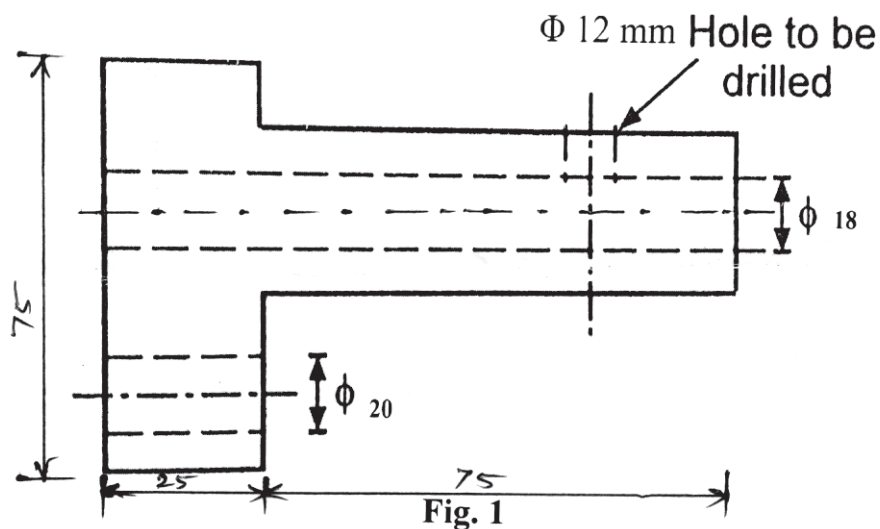
Q7) a) Differentiate between absolute and incremental positioning system in CNC. **[8]**

b) Explain following codes: G90, G02, G63, G41, M05, M06, M11, M30. **[8]**

OR

- Q8) a)** Explain the meaning of every word written in the following programming line: G01 G94 X30 Z-16 M03 T01 F6 M00. [8]
- b) Explain difference between open loop and close loop system. [8]

- Q9) a)** Differentiate between Jigs and Fixtures. [6]
- b) Draw a drill jig for drilling hole of size 12 mm as shown in Fig. 1 below. Use appropriate locators, clamping devices and drill bushes. [12]



OR

- Q10)a)** Explain design principles of Jigs and fixtures. [6]
- b) List out main elements of Jigs and Fixtures. [6]
- c) Apply 3-2-1 principle to a rectangular block and explain with sketch. [6]



Total No. of Questions : 10]

SEAT No. :

P8832

[Total No. of Pages : 5

[6180]-435

T.E. (Mechanical)

DESIGN OF MACHINE ELEMENTS-II

(2015 Pattern) (Semester-II) (302048)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer five questions from following.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Use of programmable calculator is not permitted.*
- 6) *Assume suitable data if necessary.*

Q1) a) Write advantages and disadvantages of helical gear over spur gear. **[4]**

b) The following data is given for a pair of spur gear with 20° full depth involute teeth number of teeth on pinion = 24, number of teeth on gear=56, pinion rotates at 1200 rpm, Module 3 mm, Service Factor =1.5, Face width 30 mm. Both gear are made of steel material Ultimate tensile strength=600N/mm². By using velocity factor is in account Find. **[6]**

- i) Beam strength,
 - ii) Velocity factor,
 - iii) Rated power if Factor of safety 1.5,
- Assume, Lewis form factor 0.337.

$$C_v = 3/3 + V$$

OR

Q2) a) A helical gear pair with 20° full depth involute tooth profile consist of 18 teeth pinion meshing with 36 teeth gear. The pinion and gear is made of steel with ultimate tensile strength 800 N/mm², the module is 6 mm while the face width is 10 × module while helix angle 23°. The surface hardness of pinion & gear is 300 BHN. **[4]**

Calculate

- i) Beam strength
- ii) Wear strength

P.T.O.

Use following Data-

- Factor of safety - 2
- pinion speed - 1440 rpm
- Lewis form factor - $Y=0.484-2.87/Z$
- Velocity factor - $V=\frac{5.6}{5.6+\sqrt{V}}$

b) Give classification of gear. Write a note on standard gear tooth systems.[6]

Q3) a) Draw free body diagram of helical gear with component of tooth forces along with their direction. Assume pinion rotates in clockwise direction when seen from left and is below the helical gear. Also assume pinion having right hand thread. [4]

b) A bearing is subjected following work cycle, Radial load of 4.45 kN at 150 rpm for 30% of time, radial load of 6.675 kN at 600 rpm for 10% of time radial load of 2.225 kN at 300 rpm for remaining cycle. The inner race is rotated and load are steady. Find expected life of bearing in hours by considering dynamic load carrying capacity. [6]

OR

Q4) a) Differentiate between straight bevel with hypoid bevel gear. [4]

b) A cylindrical roller bearing is subjected to a radial load of 8000N. The expected life of bearing with 90% reliability is 15000hrs. The application factor is 1.5 If shaft rotates at 1500 rpm calculate dynamic rating of bearing. Assume radial load factor unity. [6]

Q5) a) Explain self locking of worm gear: [2]

b) A pair of worm and worm wheel is designated as 1/40/10/04. Input speed of worm is 1000 rpm. The worm wheel is made of sand cast phosphor bronze and worm is made of case harden carbon steel 14 C6. The gear box has effective surface area of 0.25m² with overall heat transfer coefficient is 25 W/m²°K. The permissible temperature of lubricating oil is 45°C. and coefficient of friction is 0.035 and normal pressure angle is 20°. Determine input power rating based on [14]

- Beam strength
- Wear strength
- Thermal consideration

Assume following data,

Table-1

Worm	Worm wheel
Speed factor strength - 0.27 at 1000 rpm	Speed factor strength - 0.51 at 25 rpm
Bending Stress factor - 28.2	Bending Stress factor - 7
Speed factor for Wear - 0.145	Speed factor for Wear - 0.35
Surface stress factor - 4.93	Surface stress factor - 1.06
Zone factor - 1.143	

OR

Q6) a) Derive the equation for Efficiency of worm and worm gear drive. **[4]**

b) A pair of worm gear designated as 3/60/10/6 transmit 05 kW power at 1440 rpm supplied to worm shaft. The coefficient of friction is 0.1 and pressure angle is 20° . Assume worm is above the worm gear and rotates clockwise direction when viewed from left. Assume worm is left hand. Determine components of tooth forces and find efficiency of drive. Also draw free body diagram showing the direction of components of tooth forces. **[12]**

Q7) a) A single V-belts is to be used to transmit a power from an electric motor running at 2800 rpm to a machine at 700 rpm. The centre distance between input and output shaft is 800 mm. The sheave groove angle is 38° and the coefficient of friction between the belt and sheave is 0.5. The density of belt material is 110 kg/m^3 and allowable tensile stress for the belt material is 1.75 N/mm^2 . If the cross sectional area of each belt is 600 mm^2 , determine. **[12]**

- i) The pulley pitch diameter
- ii) Maximum power that the belt can transmit
- iii) The required initial tension in each belt

b) Explain the procedure for the selection of Chain from manufacturer's catalogue. **[4]**

OR

- Q8) a)** Discuss stresses in wire rope. [4]
b) What is polygonal action in roller chain drive? How to control it? [4]
c) It is required to select the flat open belt drive for compressor running at 720 rpm which is driven by 25 kW at 1440 rpm motor. Take Centre distance between pulleys 3000 mm. Select a flat belt for the drive by using the following data; [8]

Load correction factor = 1.3;

$$\text{For HI-SPEED belt, Corrected kW rating} = \frac{0.0118 \times v}{5.08}$$

Std pulley diameter; 250, 280, 315, 355, 400, 450, 500, 560, 630, 710, 800, 900, 1000 (mm);

Arc of contact correction factor;

Θ	120	130	140	150	160	170	180
F_d	1.33	1.26	1.19	1.13	1.08	1.04	1.00

Standard width of belt;

No of ply	Standard width of belt, (b) (mm)
4	40, 44, 50, 63, 76, 90, 100, 112, 125, 152
5	76, 100, 112, 125, 152

- Q9) a)** Following data is given for 360° hydrodynamic journal bearing, [6]
 • Radial load - 6.5 kN
 • Journal speed - 1200 rpm
 • Journal diameter - 60 mm
 • Journal length - 60 mm
 • Minimum oil film thickness - 0.009 mm
 The fit between journal & bearing is H₇e₇ for which,
 Hole diameter - 60
 Shaft Diameter - 60
 Specify the velocity of lubricating oil for given journal bearing.
b) State assumptions made in Petroff's equation, Derive petroff's equation [8]
c) Compare Hydrodynamic Bearing with Hydrostatic bearing. [4]

OR

Q10)a) The following data is given for a 360° hydrodynamic bearing: **[12]**

Journal diameter = $50_{-0.119}^{-0.080}$

Bearing diameter = $50_{+0.000}^{+0.039}$

Bearing length = 50 mm

Journal speed = 1500 rpm

Radial load = 5kN

The bearing is machined on a lathe from bronze casting, while the steel journal is hardened and ground. The surface roughness (c.l.a.) values for turning and grinding are 3.2 and 0.8 microns respectively. For thick film hydrodynamic lubrication, the minimum film thickness should be six times the sum of surface roughness values for the journal and bearing. Determine quality and quantity of the lubricant required.

Table-2 Dimensionless Parameters for Full Journal bearings

l/d	h_0/c	ϵ	S	$(r/c)f$	$Q/rcnsl$	Q_s/Q	P_{max}/p
1	0.03	0.97	0.00474	0.514	4.82	0.973	6.579
	0.1	0.9	0.0188	1.05	4.74	0.919	4.048
	0.2	0.8	0.0446	1.70	4.62	0.842	3.195
	0.4	0.6	0.121	3.22	4.33	0.680	2.409
	0.6	0.4	0.264	5.79	3.99	0.497	2.066
	0.8	0.2	0.631	12.8	3.59	0.280	1.890
	0.9	0.1	1.33	26.4	3.37	0.150	1.852

b) Write the assumptions and final Reynold's equation for 2-D flow and explain the significance of each term in it? **[6]**



Total No. of Questions : 8]

SEAT No. :

P8833

[Total No. of Pages : 3

[6180]-436

T.E. (Mechanical /Mechanical S/W)

MECHATRONICS

(2015 Pattern) (Semester - II) (302050)

Time : 2½ Hours]

[Max. Marks : 70

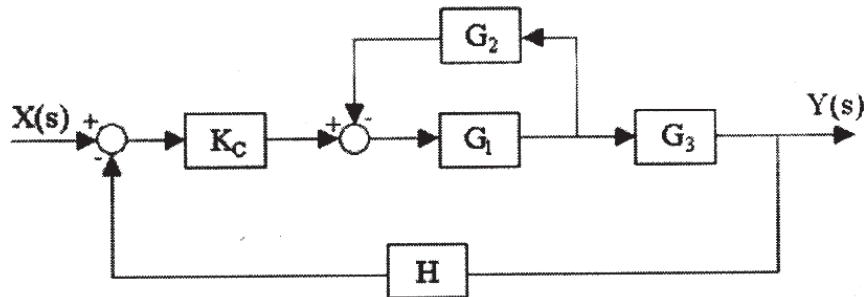
Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn whenever necessary.
- 4) Make suitable assumption whenever necessary.

Q1) a) Explain different types of dynamic characteristics of measurement systems such as: **[6]**

- i) Response time
- ii) Rise time
- iii) Settling time

b) Reduce the block diagram shown in below and determine the transfer function of the system. **[7]**



c) Discuss in brief, the role played by the following four elements in a Mechatronic system: **[7]**

- i) Actuator
- ii) Sensor
- iii) Signal Conditioner

OR

P.T.O.

- Q2)** a) Draw a suitable sketch and explain the working of Electromagnetic Flow Sensor. [6]
- b) Draw a suitable block diagram and discuss the application of Mechatronics in Anti-lock braking in four-wheel automobiles. [7]
- c) What is a 4-bit DAC, if it has a V_{ref} of 0-10 V. The binary input is 1 1 1 0. Find the analog output voltage. [7]
- Q3)** a) List the criterion for selection of PLC, explain any three criterions in detail. [8]
- b) Explain with block diagram Architecture of Programmable Logical Controller. [8]

OR

- Q4)** a) One open tank is installed in the plant of which liquid level is to be controlled. When level reaches the Level Low, Outlet flow is blocked and inlet flow is allowed until high level is achieved. And when Level High is detected, outlet flow is allowed and inlet flow is blocked. Develop the PLC ladder for liquid level control in the tank. [8]
- b) Explain in detail function of Counters in PLC Programming. [8]
- Q5)** a) Using suitable diagram, explain transient response specifications for second order system. [10]
- b) Explain stability analysis using Routh-Hurwitz criterion and test the system stability whose characteristics equation is : $S^3 + 4S^2 + S + 16 = 0$. [8]

OR

Q6) a) Explain the building blocks of a translational mechanical system and derive the equation for same system. **[10]**

b) A second order system is subjected to unit step input. The transfer function is $25 / (S^2 + 6S + 25)$. Find its rise time, peak time, peak overshoot and settling time. **[8]**

Q7) a) Compare P controller with D controller. **[5]**

b) Explain the features of PID controller. **[6]**

c) In proportional controller, the gain is 4%. The output voltage range is 0 -10 V. The input voltage span 4 - 12 V. Determine the value of gain. **[5]**

OR

Q8) a) Explain the proportional control mode. State its characteristics. **[5]**

b) Explain the working of PID control in parallel form using suitable block diagram. **[6]**

c) Explain derivative control mode. State its characteristics. **[5]**



Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

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

- Q1)** a) Explain the importance of preferred. Series in engineering and find numbers of R10 basic series from 1 to 10. **[4]**
- b) The frame of a hydraulic press consisting of two identical steel plates is shown in Fig.1. The maximum force P acting on the frame is 20 kN. The plates are made of steel 45C8 with tensile yield strength of 380 N/mm^2 . The factor of safety is 2.5. Determine plate thickness. **[6]**

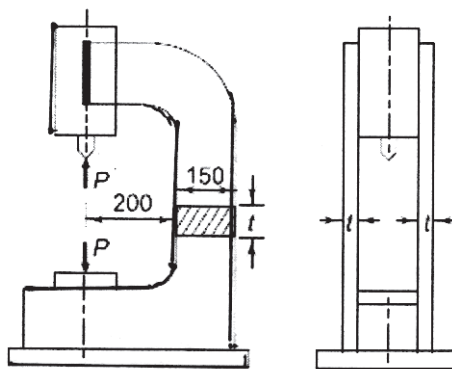


Figure 1.

OR

- Q2)** The layout of a transmission shaft carrying two pulleys A and B is shown in Fig. 2. Power is supplied to the shaft by means of a vertical belt on the pulley A, which is then transmitted to the pulley B carrying a horizontal belt. The ratio of belt tension on tight and slack side is 3:1. The limiting value of tension in the belts is 2.7 kN. The shaft is made of plain carbon steel 40C8 ($S_{ut} = 650 \text{ N/mm}^2$ and $S_{yt} = 380 \text{ N/mm}^2$) The pulleys are keyed to the shaft. Determine the shaft diameter according to the ASME code if $k_b = 1.5$ and $k_t = 1$. **[10]**

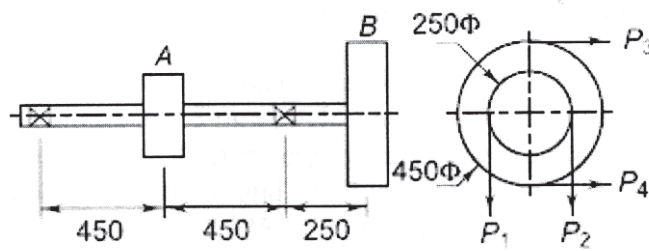


Figure 2

- Q3)** A cantilever beam made of cold drawn steel 40C8 ($S_{ut} = 600 \text{ N/mm}^2$ and $S_{yt} = 380 \text{ N/mm}^2$) is shown in Fig. 3. The force 'P' acting at the free end varies from -50 N to $+150 \text{ N}$. The expected reliability is 90% and the factor of safety is 2. The notch sensitivity factor at the fillet is 0.9. Determine the diameter 'd' of the beam at the fillet cross-section. Assume surface finish, size, reliability and theoretical stress concentration factors are 0.77, 0.85, 0.897 and 1.44 respectively. **[10]**

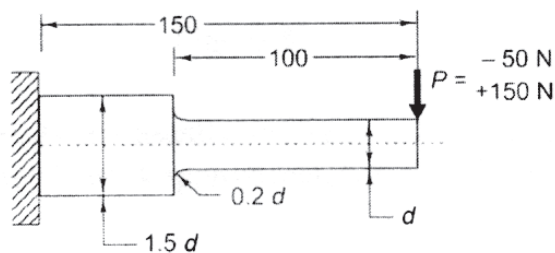


Figure 3

OR

- Q4) a)** Derive stress equations for flat key with suitable figure. [4]
- b)** The work cycle of a mechanical component subjected to completely reversed bending stresses consists of the following three elements: [6]
- $\pm 350 \text{ N/mm}^2$ for 85% of time
 - $\pm 400 \text{ N/mm}^2$ for 12% of time
 - $\pm 500 \text{ N/mm}^2$ for 3% of time
- The material for the component is 50C4 ($S_{ut} = 660 \text{ N/mm}^2$) and the corrected endurance limit of the component is 280 N/mm^2 . Determine the life of the component.

- Q5) a)** Derive an expression for maximum efficiency of the square threaded screw. [6]
- b)** A double-threaded power screw, with ISO metric trapezoidal threads is used to raise a load of 300 kN. The nominal diameter is 100 mm and the pitch is 12mm. The coefficient of friction at the screw threads is 0.15. Neglecting collar friction, calculate; [12]
- torque required to raise the load;
 - torque required to lower the load; and
 - efficiency of the screw.

OR

- Q6) a)** Explain self-locking and overhauling conditions of the screw. [6]
- b)** A machine vice as shown in Fig.4 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 coefficient 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]
- the clamping force developed between the jaws; and
 - the overall efficiency of the clamp

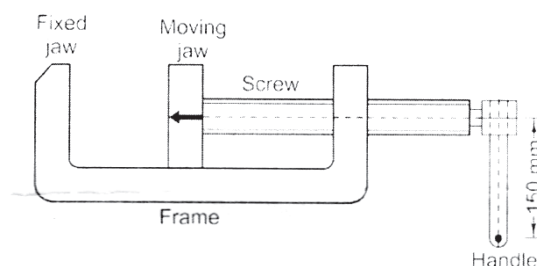


Figure 4

- Q7) a)** Prove that, the threads are equally strong in failure by shear and failure by tension if the height of nut is approximately 0.4 times the nominal diameter of bolt [4]
- b)** The structural connection shown in Fig. 5 is subjected to an eccentric force P of 10 kN with an eccentricity of 500 mm from the CG of the bolts. The centre distance between bolts I and 2 is 200 mm, and the centre distance between bolts I and 3 is 150 mm. All the bolts are identical. The bolts are made from plain carbon steel 30C8 ($S_{yt} = 400 \text{ N/mm}^2$) and the factor of safety is 2.5. Determine the size of the bolts. [12]

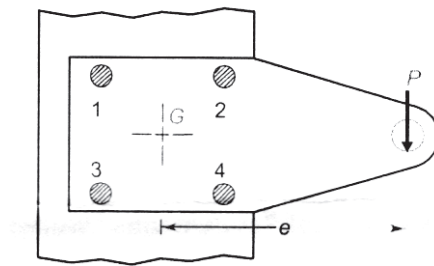


Figure 5

OR

- Q8) a)** Explain any two types of fillet joints with suitable sketch [4]
- 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. 6. 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]

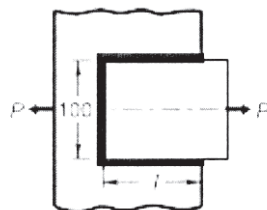


Figure 6

- Q9) a)** Explain various types of end styles for helical compression spring. **[4]**
- 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/mm² and modulus of rigidity of 81370 N/mm². The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring and calculate: **[12]**
- 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; and
 - viii) Actual spring rate

OR

- Q10)a)** Explain with neat sketch nipping of leaf spring **[4]**
- b)** A concentric spring is used as a valve spring in a heavy duty diesel engine. It consists of two helical compression springs having the same free length and same solid length. The composite spring is subjected to a maximum force of 6000 N and the corresponding deflection is 50 mm. The maximum torsional shear stress induced in each spring is 800 N/mm². The spring index of each spring is 6. Assume same material for two springs and the modulus of rigidity of spring material is 81370 N/mm². The diametral clearance between the coils is equal to the difference between their wire diameters. Calculate: **[12]**
- i) The axial force transmitted by each spring;
 - ii) Wire and mean coil diameters of each spring;
 - iii) Number of active coils in each spring.



Total No. of Questions : 10]

SEAT No. :

P8835

[Total No. of Pages : 3

[6180]-438

T.E. (Mechanical /Automobile)

HEAT TRANSFER

(2015 Pattern) (Semester - I) (302042)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve Q. No 1 or Q. No 2, Q. No 3 or Q. No 4, Q. No 5 or Q. No 6, Q. No 7 or Q. No 8 and Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam data, is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) What is the physical significance of thermal diffusivity? [4]
- b) Two rods A and B of equal diameter and equal length, but of different materials are used as fins. The both rods are attached to a plain wall maintained at 160°C while they are exposed to air at 30°C. The end temperature of rod A is 100°C, while that of rod B is 80°C. If the thermal conductivity of rod A is 380 W/m.K, calculate the thermal conductivity of rod B. These fins can be assumed as short with end insulated. [6]

OR

- Q2)** a) A plane wall of thickness 0.1m and thermal conductivity 25 W/m.K having uniform volumetric heat generation of 0.3 MW/m³, is insulated on one side, while the other side is exposed to a fluid at 92°C. The convection heat transfer coefficient between plane wall and fluid is 500 W/m². K. Determine the maximum temperature in the plane wall. [6]
- b) Explain the electrical analogy of the heat transfer with the help of a thermal network. [4]

- Q3)** a) Derive an expression for temperature variation during quenching of a billet by lumped system analysis method. Also derive expression for instantaneous rate of heat transfer from the billet and total amount of heat transfer from time 0 to t. [7]
- b) Adequate pressure is required to join two surfaces of thermal composite slab. Explain. [3]

OR

P.T.O.

- Q4) a)** Explain the significance of time constant of thermocouple. [4]
b) Explain why an insulated small diameter wire has a higher current carrying capacity than a non-insulated or bare wire. [6]

- Q5) a)** Explain the mechanism of natural convective heat transfer from a heated vertical tube of diameter D and height H . Show the development of velocity and thermal boundary layer. [8]
b) A circular tube 50 mm diameter carries water at a rate of 2 kg/s. Determine the length of tube required to heat water from 30°C to 50°C, if the wall temperature of tube is maintained at 90°C. Use following properties of water at 40°C and the correlation : [8]

$$\rho = 992.2 \text{ kg/m}^3, \quad k_f = 0.634 \text{ W/m.K}, \quad C_p = 4.174 \text{ kJ/kg.K}$$

$$\mu = 6.531 \times 10^{-4} \text{ kg/m.s}$$

$$N_{uD} = 0.023 \text{ Re}_D^{0.8} \text{ Pr}^{0.4}.$$

OR

- Q6) a)** Explain physical significance of : Nusselt No., Grashoff No., Reynolds No. and Prandtl No. [12]
b) State clearly the difference between forced convection & natural convection? [4]

- Q7) a)** Explain the following : [9]
 i) Planck's distribution law,
 ii) Wien's displacement law,
 iii) Kirchhoff's law of radiation.
b) A thermocouple used to measure temperature of gas flowing through a duct indicates a temperature of 500°C. The temperature of the duct wall is 100°C. If emissivity of junction is 0.5 and film coefficient of heat transfer is 250 W/m²K. Find the true gas temperature. [7]

OR

- Q8) a)** Derive an expression for a rate of radiation heat exchange when a radiation shield is inserted between two large parallel plates. [8]
b) Calculate the following quantities for an industrial furnace (blackbody) emitting radiation at 2650 K. [8]
 i) Spectral emissive power at wavelength 1.2μm,
 ii) Wavelength at which the emissive power is maximum,
 iii) Maximum spectral emissive power,
 iv) Total emissive power,
 v) Total emissive power of the furnace if it is treated as gray and diffuse with an emissivity of 0.9.

- Q9) a)** Derive the standard expression for effectiveness in terms of capacity ratio and number of transfer units (NTU) for Counter flow tube in tube heat exchanger. Reduce the same for Evaporator and Condenser. [8]
- b) An oil cooler for an automobile lubrication system has to cool 1200 kg/hr of oil ($C_p = 2.07 \text{ kJ/kg } ^\circ\text{C}$) from 93°C to 40°C by using a cooling water flow of 1000 Kg/hr at 32°C . Give your choice for parallel flow or counter flow Heat exchanger with reasons. Also calculate the surface area of heat exchanger if $U = 54 \text{ W/m}^2\text{K}$. [10]

OR

- Q10)a)** Explain the various regimes of pool boiling curve, with neat diagram.[10]
- b) Write short notes on : [8]
- i) Drop wise condensation,
 - ii) Fouling of heat exchangers and its effect on performance.



Total No. of Questions : 10]

SEAT No. :

P8836

[6180]-439

[Total No. of Pages : 4

T.E. (Mechanical) (Automobile)
THEORY OF MACHINES - II
(2015 Pattern) (Semester - I) (302043)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain the following terms : **[4]**

- i) Pitch circle
 - ii) Pitch point
 - iii) Module
 - iv) Circular pitch
- b) Two 20 involute spur gears have module of 8 mm. Gear ratio 2.5, speed of gear wheel 120 rpm, number of teeth on gear wheel 80. The addendum is such that the path of approach and path of recess on each side are 40% of maximum possible length each. Determine the addendum for pinion and the wheel. Also determine the length of arc of contact. Does the interference occur? **[6]**

OR

Q2) a) The following data relate to two spiral gears in mesh. **[5]**

Shaft angle = 90° , Centre distance = 160 mm (approx.), Normal circular pitch = 8 mm, Gear ratio = 3, Friction angle = 5° , for maximum efficiency of drive determine.

- i) Spiral angles of teeth.
 - ii) No. of teeth.
 - iii) Exact center distance.
- b) A two thread worm drives a 30-teeth worm gear. The worm has $14\frac{1}{2}$ teeth with 19 mm pitch and 50 mm pitch diameter $\mu = 0.05$. If the worm rotates at 1000 rpm determine : **[5]**
- i) The helix angle of the worm.
 - ii) Speed of worm gear.
 - iii) Centre distance.
 - iv) Efficiency of the set.

P.T.O.

Q3) Explain the following terms with help of a neat sketch:

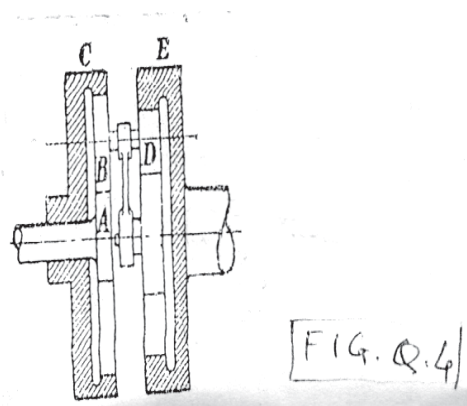
[10]

- a) Simple Gear Train.
- b) Compound gear train.
- c) Reverted gear train.
- d) Bevel Epicyclic gear Train.

OR

Q4) In the epicyclic gear train shown in fig. Q.4. the driving wheel A has 14 teeth and the fixed annular wheel C, 100 teeth; the ratio of the tooth numbers in wheels E and D is 98:41. If 25 kW at 1200 rpm is supplied to wheel A, determine the speed and the sense of rotation of E and fixing torque required at C.

[10]



Q5) It is required to set out the profile of a cam for the following motion: **[16]**

- a) Follower to move outward through and angular displacement of 20 during 90 of cam rotation;
- b) Follower to dwell for 45 of cam rotation;
- c) Follower to return to its original position of zero displacement in 75 of cam rotation;
- d) Follower to dwell for the remaining period of the revolution of the cam. The distance between the pivot centre and the follower roller centre = 70 mm. Roller diameter is 20 mm, minimum radius of cam = 100 mm. Location of the pivot point is 70 mm to the left and 60 mm above the axis of rotation of the cam.

The motion of the follower is to take place with simple harmonic motion during outstroke and with uniform acceleration and retardation during the return stroke, the acceleration being 3/5 times retardation.

Determine the maximum angular velocity and acceleration during outstroke of the follower if speed of rotation is 1200 rpm.

OR

- Q6) a)** What is cam jump phenomenon? Derive the expression for jump velocity for the eccentric cam operating flat face follower. **[10]**
- b)** What is polynomial curve cam? Derive an expression for displacement, velocity and acceleration for 2-3 polynomial D-R-D cam. **[6]**

- Q7) a)** Explain the following terms related to synthesis problem. **[4]**
- i) Function generation.
 - ii) Body guidance.
- b) i)** Determine the Chebyshev spacing for function $y=2x^2-x$ for the range $0 \leq x \leq 2$ where four precision points are required. **[12]**
- ii)** For these precision points, determine ϕ_2, ϕ_3, ϕ_4 and ψ_2, ψ_3, ψ_4 , if $\Delta \phi = 45^\circ$ and $\Delta \psi = 90^\circ$.

OR

- Q8) a)** Explain the following terms; **[6]**
- i) Type synthesis.
 - ii) Number Synthesis.
 - iii) Dimensional synthesis.
- b)** Using Freudenstein equation, design a four bar mechanism to generate the function $y=x^{1.4}$ for an interval in x from 1 to 4. The input link is to start from 30° and is to have a range of 90° , the output link is to start from 90° and is to have a range of 90° . Use three point Chebyshev spacing. Take length of fixed link as 50 mm. **[10]**

- Q9) a)** Describe cone variators used to transmit the power between parallel, non-parallel and intersecting shaft axes. **[6]**
- b)** The mass of turbine rotor of a ship is 3500 kg. It has a radius of gyration of 45 cm and a speed of 3000 rpm clockwise, when looking from the stern. Estimate the gyroscopic couple and its effects upon the ship under the following two conditions: **[12]**
- i) When the ship is steering to the left in a curve of 100 m radius at a speed of 36 km/hr.
 - ii) When the ship is pitching in a simple 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.

OR

Q10)a) Discuss in brief continuously variable transmission. **[6]**

b) A four-wheel automobile with rear engine has the following data: **[12]**

Effective diameter of each wheel = 650 mm,

Polar mass moment of inertia of each wheel = 2.5 kg-m².

Mass moment of inertia of engine rotating parts = 1.3 kg-m².

Gear ratio of engine to back axle = 4 : 1

Mass of the vehicle = 2000 kg,

Height of centre of gravity of vehicle above road = 600 mm.

And it is located equidistant from all the wheels.

The track width of the vehicle = 1.5 m.

The engine axis is parallel to the rear axle and the crank shaft rotates in the same direction of the wheels.

Determine the limiting speed of the vehicle while negotiating a curve with 100 m radius so that the entire wheels maintain contact with the road.



Total No. of Questions : 10]

SEAT No. :

P8837

[6180]-440

[Total No. of Pages : 3

T.E. (Mechanical Engineering)

TURBO MECHINES

(2015 Pattern) (Semester - I) (302044)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.
- 2) Figures to the right indicate full marks.
- 3) Use of non-programmable figure wherever necessary.
- 4) Draw neat and suitable figure wherever necessary.
- 5) Use of steam table is permitted.

Q1) a) A jet of water moving with 'V' m/s strike at center of a curved vane which is moving with 'u' m/s. If the outgoing jet makes an angle θ with the incoming jet, prove that: **[6]**

i) Maximum efficiency - $\eta_{\max} = (1 + \cos\theta)$

ii) Blade speed $u = V/3$

b) Derive the relation for force exerted by jet of water on inclined fixed plate in the direction of jet. **[4]**

OR

Q2) a) Define turbo machine. Explain salient features of turbo machines. **[4]**

b) A 7.5 cm diameter of jet having velocity of 30m/s strikes a flat plate, the normal of which is inclined at 45° to axis of jet. Find the normal force exerted on the plate, work done and efficiency of the system. **[6]**

Q3) a) Two jets strike the buckets of a Pelton wheel, which generates shaft power of 15450 kW. The diameter of each jet is given as 200 mm. If the net head on the turbine is 400 m, find the overall efficiency of the turbine. Take $C_v = 1.0$. **[6]**

b) Derive an expression for Unit Discharge and Unit Power and state their significance. **[4]**

OR

P.T.O.

Q4) a) A reaction (Francis) turbine runs at 450 rpm under head of 120 m. Its diameter at inlet is 120 cm and flow area is 0.4m^2 . The angles made by the absolute and relative velocities at inlet are 20° and 60° respectively with the tangential velocity. **[6]**

Determine:

- i) Volume flow rate
 - ii) Hydraulic Power developed
 - iii) Hydraulic efficiency. Assume no whirl at outlet.
- b)** Compare Impulse and Reaction Turbines. **[4]**

Q5) a) Derive an expression for diagram efficiency of single stage Impulse Turbine. Obtain the Condition for Maximum efficiency & its value. **[8]**

- b)** In a single stage impulse turbine the mean diameter of the blade ring is 1 m and the rotational speed is 3000 rpm. The steam is issued from the nozzle at 300 m/sec and nozzle angle is 20° . The blades are equiangular. If the friction loss in the blade channel is 19% of the kinetic energy corresponds to relative velocity at the inlet to the blades. What is the power developed in the blading when the axial thrust on the blades is 98 N. Solve the problem graphically. **[8]**

OR

Q6) a) Enumerate the energy losses in steam turbine. **[6]**

- b)** A 50% reaction turbine (with symmetrical velocity triangle) is running at 400 rpm has the exit angle of blades as 20° and the velocity of the steam relative to the blades at the exit is 1.35 times the mean blade speed. The steam flow rate is 8.33 kg/s and at a particular stage the specific volume is $1.381\text{ m}^3/\text{kg}$. Calculate for the stage: **[10]**

- i) A suitable blade height, assuming the rotor mean diameter 12 times the blade height.
- ii) The diagram work.

Q7) a) Define the maximum suction lift. State the expression to calculate it. What factors affect its value? **[6]**

- b)** Following data relates to centrifugal pump: Eye and rim diameter = 10 cm and 20 cm respectively, outer width = 1.25 cm, vane angle at outer rim = 25° , speed = 3000 rpm, constant flow velocity = 3 m/s, manometric efficiency = 78% and overall efficiency = 72%. Determine: **[12]**

- i) Inlet vane angle
- ii) Discharge
- iii) Manometric head and
- iv) Shaft Power
- v) Mechanical efficiency.

OR

Q8) a) Derive an expression for rise in pressure through impeller of a centrifugal pump. [6]

b) Power input to centrifugal pump is 50 kW at the shaft while running the pump at 1440 rpm. The impeller tip diameter is 30 cm and the blade width at the tip is 1.5 cm. The water flow rate is 110 lit/s. The vacuum gauge reading at the suction flange is - 20 cm of mercury and at the delivery flange the pressure gauge reading is 370 kPa. The blade outlet angle is 65° . Calculate: [12]

- i) Theoretical head
- ii) Ideal head
- iii) Hydraulic efficiency
- iv) Mechanical efficiency
- v) Overall efficiency
- vi) Specific speed of the pump

Assume radial entry and constant flow velocity.

Q9) a) Explain slip and pre whirl, surging and choking in rotary compressor. [8]

b) A centrifugal compressor delivers $10 \text{ m}^3/\text{s}$ of air when running at 10000 rpm. The air is drawn in at 1 bar and 300K and delivered at 4 bar. The isentropic efficiency is 80%. The blades are radial at outlet and constant flow velocity is 64m/s. The outer dia. of the impeller is twice the inner dia. and slip factor may be taken as 0.9. Calculate: [8]

- i) Temperature of air at outlet of impeller
- ii) Power required driving the compressor
- iii) Impeller diameters at inlet and outlet
- iv) Impeller blade angle at inlet
- v) Diffuser blade angle at inlet

OR

Q10)a) Explain pressure coefficient, flow coefficient and work input factor. [8]

b) Represent and explain process involved in axial flow compressor on h-s diagram and derive an expression for isentropic efficiency and stage pressure ratio. [8]



Total No. of Questions : 9]

SEAT No. :

P8838

[6180]-441

[Total No. of Pages : 3

T.E. (Mechanical/Automobile)
METROLOGY & QUALITY CONTROL
(2015 Course) (Semester - I) (302045)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Assume suitable data, if necessary.*

- Q1) a)** Explain any 5 sources of errors in engineering measurements. **[5]**
- b) Explain the term “Calibration”. Why it is required to be carried out for any instrument? What is meant by “Traceability”? **[5]**

OR

- Q2) a)** What is a comparator? Explain with a neat sketch, the principle & construction of a “Solex Pneumatic Comparator”. **[5]**
- b) Explain Taylor’s principle of Gauge Design. What is a “Limit gauge”, “Feeler gauge” & “Wire gauge”. **[5]**

- Q3) a)** Explain various types of errors in screw threads. **[5]**
- b) M20×2.5 plug screw gauge was checked for effective dia. using Floating carriage micrometer & readings taken were as follows. **[5]**
- i) Diameter of standard cylinder = 18.001 mm.
 - ii) Micrometer readings over standard cylinder with two wires of same diameter = 15.6420 mm.
 - iii) Micrometer readings over the plug screw gauge with two wires of same diameter = 15.2616 mm.
 - iv) Best size wires were used for the measurement.
- Calculate the Best wire size & The effective diameter of screw gauge.

OR

P.T.O.

- Q4) a)** What is a “Machine Vision System”? Explain with a neat labelled sketch, how a machine vision system can be used for ensuring that no empty or half filled cough syrup bottles will leave the packaging line in a pharma industry. [5]
- b)** What is meant by “Constant Chord”? Calculate the “Constant chord length” & it’s distance below the tooth tip for a gear of module 5mm & pressure angle - 20°. [5]
- Q5) a)** Define Quality as stated by quality Gurus-Juran, Deming, Taguchi & Crosby. Brand ‘A’ & Brand ‘B’ of Washing powders are costing Rs.40/kg & Rs.120/kg respectively. Which brand is a quality product? Explain your answer with the help of definition of quality as given by one of the “Quality Guru”. [6]
- b)** What is meant by “Cost of Quality” & Value of Quality”? What is the relation between them? Explain with the help of a graph. [6]
- c)** What is meant by “Quality of Design” & “Quality of Conformance”? [4]

OR

- Q6) a)** Explain the role & responsibilities of top management, supervisory staff & workers in making a “Quality Product”. [6]
- b)** List 7 old Quality control tools. Explain any two tools, with example. [6]
- c)** Explain the concept of “Quality Circle”, bringing out their - origin, functioning, structure & advantages. [4]
- Q7) a)** What is “Variability”? Explain its causes with example. [6]
- b)** A subgroup of 4 items is taken from the manufactured items & sizes were recorded. After 20 subgroups, the values of $\sum \bar{X}$ & $\sum R$ were found to be $\sum \bar{X} = 350$ & $\sum R = 8.5$. The specification limits for the part are 17.5 ± 0.23 mm. Assuming that the process is in control & is normally distributed, what conclusion would you draw about the ability of the process to produce items within specified limits?
(Given - $d_2 = 2.059$ for subgroup size of 4) [6]
- c)** What is meant by “Process capability”? What is index C_p & C_{pK} ? Explain with the help of sketch of a normal distribution Curve. [4]

OR

- Q8)** a) Draw “Operating characteristics” Curve & explain “Producer’s risk, consumer’s risk, AQL & LTPD”. [6]
- b) Calculate sample size & AOQ for single sampling plan, using following data- [6]
- i) Probability of acceptance of 0.5% defectives in a lot is = 0.525
 - ii) Lot size = 10,000 units
 - iii) Acceptance number = $C = 1$
 - iv) Total no. of defectives = $np = 1.6$
 - v) Defectives found in the sample are not to be replaced
- c) Explain with the help of flow chart Single sampling plan & Double sampling plan. [4]

Q9) Write short notes on (Any three) [18]

- a) JIT
- b) Five S
- c) Kaizen
- d) TPM
- e) Kanban
- f) Six Sigma



Total No. of Questions : 10]

SEAT No. :

P-9360

[Total No. of Pages : 2

[6180]-1001

T.E. (Computer Engineering)

EMBEDDED OPERATING SYSTEMS

(2012 Pattern) (Semester - II) (310250)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, Q.No. 7 or Q.No. 8, Q.No. 9 or Q.No. 10.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.

Q1) a) What are the qualities of Good RTOS? [5]

b) List and explain non-preemptive scheduling algorithms. [5]

OR

Q2) a) What are real-time systems? Explain different types of real-time systems? [5]

b) Write an assembly language program for ARM to add numbers 1 to 10. [5]

Q3) a) Name and explain different components of bootstrap loader. [5]

b) What is tool chain with respect to Linux embedded development environment? [5]

OR

Q4) a) Explain the reasons for the growth of Embedded Linux. [5]

b) What is cross development environment for Linux? [5]

Q5) a) What is journaling? Give the names of two file systems where it is used. [6]

b) What are the different file systems used for embedded Linux? [6]

c) Write a note on MTD subsystem [5]

OR

P.T.O.

- Q6)** a) How DHCP/BOOTP Protocols are useful for embedded Linux development? [6]
b) How MTD utility is useful for target boards? How to enable and use MTD services? [6]
c) How to build device drivers in Embedded Linux? [5]

- Q7)** a) What is remote debugging? How it is done? [6]
b) Explain interfacing of BBB with Stepper motor. [6]
c) Write a short note on Embedded Graphics APIs viz. OpenVG and OpenGL ES. [5]

OR

- Q8)** a) Discuss the challenges faced by developer while debugging Linux kernel code. [6]
b) What is GDB debugger? Explain its role in Linux kernel debugging. [6]
c) Explain in detail Embedded Graphics Processing. [5]

- Q9)** a) Explain the different steps involved in porting Linux to the embedded/target board. [8]
b) What are real-time processes? Which latency periods affect their performance? [8]

OR

- Q10)** a) Explain the role of Zygote, system server in embedded android. [8]
b) Explain the following terms with respect to embedded android : [8]
i) Launcher
ii) Activity manager
iii) DalvicVM



Total No. of Questions : 10]

SEAT No. :

P9362

[6180] - 1002

[Total No. of Pages : 2

T.E. (Computer Engineering)

**PRINCIPLES OF CONCURRENT AND DISTRIBUTED
PROGRAMMING**

(2012 Pattern) (Semester - II) (310249)

Time : 2 ½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Write short note on basic user interface elements in GUI model. **[6]**

b) What is the structure of a LEX file? **[4]**

OR

Q2) a) What are the dependency relationships between two tasks? **[6]**

b) What is the structure of a YACC file? **[4]**

Q3) a) What do you mean by Persistence of IPC objects? Explain. **[6]**

b) Explain the streaming Multiprocessor. **[4]**

OR

Q4) a) Write a note on Flynn's classification. **[6]**

b) Define Speed up with respect to parallel algorithms. **[4]**

Q5) a) What is DCE? Explain it along with its components. **[10]**

b) What are the major issues of designing a Distributed OS? **[8]**

OR

P.T.O.

Q6) a) What are various models used in distributed computing environment? **[10]**

b) Explain the following terms with respect to operating system : **[8]**

i) System image.

ii) Fault Tolerance Capability.

Q7) a) Explain requirements for Paravirtualized Xen Guest Domains. **[8]**

b) What Is Virtualization? Explain types of virtualization. **[8]**

OR

Q8) a) Explain the virtualization caveats. **[8]**

b) What is Xen domain? Also explain hypervisor. **[8]**

Q9) a) List and explain cloud computing services. **[8]**

b) How CPUs and GPUs are different? **[4]**

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

- CUDA threads
- CUDA blocks

OR

Q10)a) Write a program in CUDA for quick sort. **[8]**

b) Explain global memory in CUDA. **[4]**

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

- CUDA grids
- CUDA Kernels



Total No. of Questions : 10]

SEAT No. :

P9363

[6180]-1003

[Total No. of Pages : 2

T.E. (Computer Engineering)
DATA COMMUNICATION AND WIRELESS SENSOR
NETWORK
(2012 Pattern) (Semester - I) (310243)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) a) Explain Framing. Detail the methods of framing. (fixed and variable size framing). **[6]**

b) How does Virtual Private Network work? Write applications of VPN. **[4]**

OR

Q2) a) 'In Adaptive delta modulation quantization error increases as slope error reduces' State true or false with proper justification. **[6]**

b) Explain sensor network organization and tracking? **[4]**

Q3) a) Explain in detail with algorithm the working of Go-Back-N ARQ protocol. **[6]**

b) Describe the working of Piconet. **[4]**

OR

Q4) a) Ten thousand reservation stations are available for use of single slotted ALOHA channel. The average station has 18-reservation request per hour. A slot has 125 microseconds. What is approximate channel load? **[6]**

b) How hidden station and exposed station problem affects the communication in wireless network. Explain in brief. **[4]**

Q5) a) Describe how does STEM protocol provide solution to idle listening problem? Explain STEM-B and STEM-T. **[10]**

b) Write a note on Schedule based protocols and Contention based protocols. **[6]**

OR

P.T.O.

- Q6)** a) Explain S-MAC protocol for WSN in detail. [8]
b) LEACH, is a TDMA based MAC protocol integrated with clustering and routing - justify. Also, explain with diagram the organization of LEACH rounds. [8]

- Q7)** a) Explain data dissemination, gathering, and detail about flooding technique in wired and wireless adhoc networks. [8]
b) Explain in detail Attribute based routing with an example attribute value event record. [8]

OR

- Q8)** a) List out the routing challenges and design issues in WSN. [6]
b) What is the main objective behind designing SPIN routing protocol for WSN? Also, discuss its various deficiencies. [10]

- Q9)** a) Explain the role of every sensor node in information driven sensor querying (IDSQ) method. [8]
b) Explain the Impact of anchor placement and discuss how a node with unknown position can directly communicate with anchors. [8]
c) Explain ZigBee IEEE standard. [2]

OR

- Q10)a)** How the design of Sensor Operating System (SOS) different from traditional operating system? List the issues in designing OS for WSN.[7]
b) Comparison of Tiny OS with other OS like MATE, MAGNET and MANTIS. [7]
c) “In future, WSNs are expected to be integrated into the “Internet of Things”. Justify the statement. [4]

