Hall Ticket Number :										

R-14

Code: 4G571

IV B.Tech. I Semester Supplementary Examinations November 2018

Operations Research

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Solve the following LPP:

Minimize $Z= 4x_1+3x_2+x_3$

Subject to $x_1+2x_2+4x_3 \geq 12$

$3x_1+2x_2+x_3 \geq 8$

$x_1 , x_2 , x_3 \geq 0$ 10M

b) Discuss the various phases in solving an OR problem 4M

OR

2. Solve the following LP problem graphically:

Minimize $Z=6x_1-4x_2$

Subject to the constraints:

$2x_1+3x_2 \geq 30$

$3x_1+2x_2 \leq 24$

$x_1+x_2 \geq 3$ and $x_1, x_2 \geq 0$ 14M

UNIT–II

3. Find the optimal solution for the following transportation problem

		Destination				
		D_1	D_2	D_3	D_4	Supply
Origin	O1	11	13	17	14	250
	O2	16	18	14	10	300
	O3	21	24	13	10	400
	Demand	200	225	275	250	950

14M

OR

4. A machine operator processes five type of items on his machine each week and must choose a sequence for them. The set-up cost per change depends on items presently on the machine and the setup to be made according to the following table. If he processes each type of item once and only once in each week, how should he sequence the items on his machine in order to minimize the total set-up cost?

	To item					
		A	B	C	D	E
From item	A	-----	4	7	3	4
	B	4	-----	6	3	4
	C	7	6	-----	7	5
	D	3	3	7	-----	7
	E	4	4	5	7	-----

14M

UNIT–III

5. The following failure rates have been observed for a certain type of light bulb. The replacement of an individual bulb on failure cost Rs 1.25. The cost of group replacement is 80paise per bulb. Determine the better one among the individual and group replacement policies.

End of the week	1	2	3	4	5	6	7
Probability failure to date	0.05	0.15	0.25	0.46	0.68	0.88	1.00

14M

OR

6 Solve the following game

		Player B			
		I	II	III	IV
Player A	I	6	8	3	13
	II	4	1	5	3
	III	8	10	4	12
	IV	3	6	7	12

14M

UNIT–IV

7. a) Vehicles are passing through a toll gate at the rate of 70 per hour. The average time to pass through the gate is 45 seconds. The arrival rate and service rate follow poisson distribution. There is a complaint that the vehicles wait for a long duration. The authorities are willing to install one more gate to reduce the average time to pass through the toll gate to 35 seconds if the idle time of the toll gate is less than 9% and the average queue length at the gate is more than 8 vehicles, check whether the installation of the second gate is justified? 10M

b) What are the assumptions of the basic inventory model? How does each affect the model? 4M

OR

8. a) What are the objectives that should be fulfilled by an inventory control system? 4M

b) A company uses annually 24,000 units of raw material which costs Rs.1.25 per unit. Placing each order costs Rs.22.50 and the carrying cost is 5.4% per year of the average inventory. Find the economic lot size and the total inventory cost (including cost of material). Should the company accept the offer made by the supplier of a discount of 5% on the cost price on a single order of 24,000 units? 10M

UNIT–V

9. a) State the advantages and limitations of simulation 4M

b) Discuss briefly various types of simulation models 10M

OR

10. Solve the following linear programming problem by dynamic programming:

Max $Z=3x_1+x_2$

Subject to constraints

$2x_1+x_2 \leq 6$

$X_1 \leq 2$

$X_2 \leq 4$ and $x_1, x_2 \geq 0$ 14M

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Hall Ticket Number :										

R-14

Code: 4G574

IV B.Tech. I Semester Supplementary Examinations November 2018

Automation and Robotics

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. Explain the various types of automation systems with respect to features and configurations. Also explain their relative position with respect to product variety and production volume. 14M

OR

2. a) A 20-station transfer line is divided into two stages of 10 stations each. The ideal cycle time of each stage is 1.2 minute. All of the stations in the line have the same probability of stopping is 0.005. We assume that the downtime is constant when a breakdown occurs, T_d = 8.0 minute. Using the upper-bound approach, compute the line efficiency for the following buffer capacities: (i) b = 0, (ii) b = 10. 10M

   b) Enlist the reasons for a down time in automated production line. 4M

UNIT–II

3. What is need for line balancing in assembly processes? Explain the factors which may improve the line performance beyond that what the line balancing algorithms provide. 14M

OR

4. The table below defines the precedence relationship and element times for a new model toy (a) construct the precedence diagram for this job. (b) If the ideal cycle time = 1.1 minute, repositioning time = 0.1 minute and uptime proposition is assumed to be 1.0, what is the theoretical minimum No. of workstations required to minimize the balance delay under the assumption that there will be one worker per station? (c) Use the ranked positional weights method to assign work elements to the stations. (d) Compute the balance delay for your solution.

Work element	1	2	3	4	5	6	7	8	9	10
Time to perform work element, Te (min)	0.5	0.3	0.8	0.2	0.1	0.6	0.4	0.5	0.3	0.6
Immediate Predecessors	–	1	1	2	2	3	4,5	3,5	7,8	6,9

14M

UNIT–III

5. a) Explain the different types of grippers. 7M

   b) Explain the components of the robotic system. 7M

OR

6. What is robotics? Explain different types of robot configurations. Explain the features of each type with applications. 14M

UNIT–IV

7. Explain the Langrange-Euler formulation for a 2 degree of freedom robot. 14M

OR

8. a) Explain briefly about manipulator path control motions. 5M

   b) What are homogeneous transformations in robot kinematics? For a vector 20 i + 25 j + 10 k, perform a translation by a distance of 8 units in x direction, 7 units in y direction and 4 units in z direction. 9M

UNIT–V

9. a) Explain the Inductive proximity sensors. 7M

   b) Explain with neat sketch the application of robot in material handling. 7M

OR

10. a) Explain with a neat sketch about application of robot in any assembly operation. 7M

    a) Explain the working principle of any one position sensor. 7M

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Hall Ticket Number :										

Code: 4G573 **R-14**

IV B.Tech. I Semester Supplementary Examinations November 2018

Finite Element Methods

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) What is FEM? List out the Engineering applications of Finite Element Method. 6M

   b) Explain plane stress and plane strain problem with examples and write the relation between stress and strain. 8M

OR

2. a) Starting with shape functions, derive the element stiffness matrix for 1D quadratic element. 4M

   b) An axial load P = 300 KN is applied at 20^0C to the rod as shown in the Fig. Q 2(b). The temperature is then raised to 60^0C.

      i) Assembly the global stiffness matrix (K) and global load vector (F).

      ii) Determine the nodal displacements and element stresses.

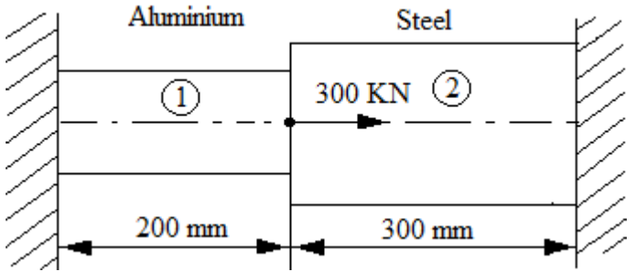

Fig. Q 2b)

$E_1 = 70 \times 10^9$ MPa, $E_2 = 200 \times 10^9$ MPa,

$A_1 = 900$ mm^2, $A_2 = 1200$ mm^2

$\alpha_1 = 23 \times 10^{-6}/^0$C, $\alpha_2 = 11.7 \times 10^{-6}/^0$C 10M

UNIT–II

3. a) Obtain the stiffness matrix for the truss element. 7M

   b) Consider the truss element shown in Fig. 3 (b). The x, y co-ordinates of the two nodes is indicated in the Fig. Q3(b). If q = [0.38, 0.25 0.53, 1.1]^T mm, determine the following.

      i. the vector q'

      ii. the stress in the element and

      iii. the stiffness matrix of the element

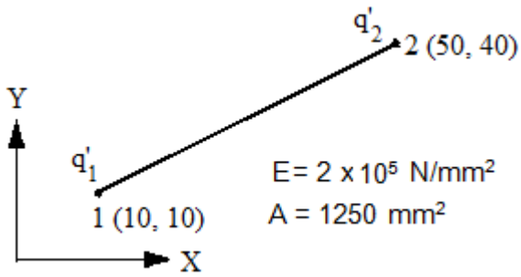

Fig. Q3(b) 7M

OR

4. A simply supported beam of span 6m and uniform flexural rigidity EI=40,000kN-m^2 is subjected to clockwise couple of 300 kN-m at a distance of 4m from the left end as shown in the Fig. Q4. Find the deflection at the point of application of the couple and internal loads.

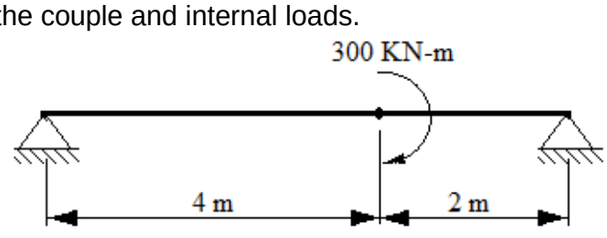

Fig. Q4 14M

UNIT–III

5. a) Derive the shape functions for triangular element (CST element) in natural co-ordinate system. 9M

   b) A model co-ordinate of the triangular element is as shown in Fig. Q5(b). At the interior point 'P' the co-ordinate is 3.3 and $N_1 = 0.3$. Determine 'N_2' and the y co-ordinate at point 'P'.

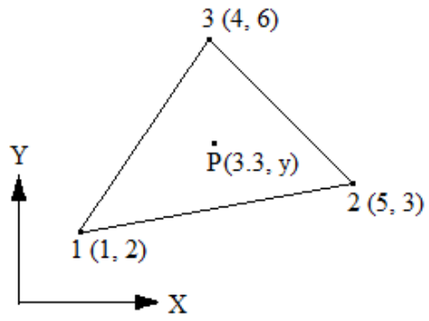

Fig. Q5(b) 5M

OR

6. Derive strain displacement [B] matrix for axisymmetric 3 noded CST element 14M

UNIT–IV

7. a) Derive an expression for Jacobean matrix for a four noded quadrilateral element 8M

   b) Explain the concept of ISO, sub and super parametric elements and their uses. 6M

OR

8. Determine the temperature distribution through composite wall, subjected to convection heat transfer on the right side surface, with convective heat transfer co-efficient shown in Fig. Q8. The ambient temperature is -5^0 C. Assume unit area.

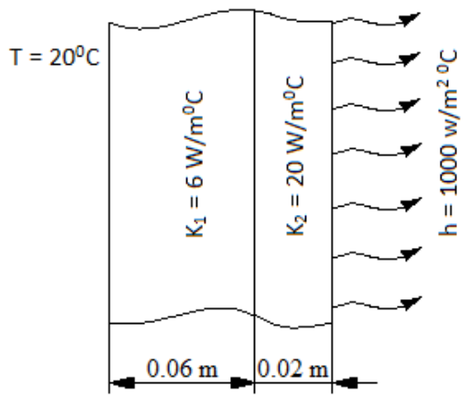

Fig. Q8 14M

UNIT–V

9. Derive the lumped matrix formulation for bar and beam element. 14M

OR

10. Find the lowest Eigen value and te corresponding Eigen mode for the beam shown in Fig. Q10

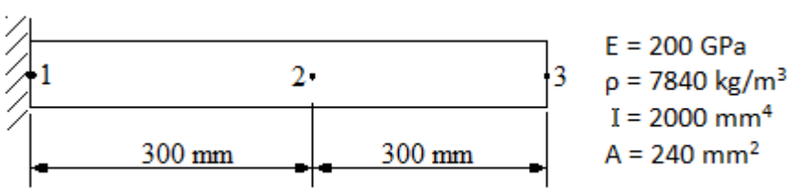

Fig. Q10 14M

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