Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI EXAMINATION – SUMMER 2020

Subject Code: 2161903 **Date:02/11/2020**

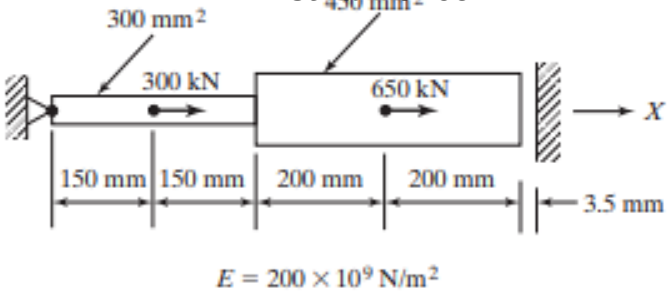
Subject Name: COMPUTER AIDED DESIGN

Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Why CAD is widely used in modern manufacturing industries?	**03**
	(b)	Determine raster locations of a line joining two points from A(12, 12) to B(4, 2) using DDA line drawing algorithm.	**04**
	(c)	Determine generalized parametric form of a line passing through two points using neat sketch. Find Parametric equation of line through points A(3,-6,7) and B(5,1,-4).	**07**
Q.2	**(a)**	Why Bresenham's algorithm is superior to DDA algorithm?	**03**
	(b)	Answer the following: (i) Compare Analytic and Synthetic curves (ii) Why Homogeneous coordinate transformations are used in CAD?	**04**
	(c)	Prove that the transformation matrix for reflection about the line $Y = -X$ is equivalent to clockwise rotation by 45º followed by reflection relative to Y axis and finally counter clockwise rotation by 45º.	**07**
		OR	
	(c)	Find concatenated matrix if the operations are performed as per the following sequence: a) Rotation through 45º counterclockwise. b) Translation through 5 and -8 units along the X and Y directions. c) Rotations through 60º clockwise.	**07**
Q.3	**(a)**	Discuss any three properties of solid models. (Don't enlist properties only).	**03**
	(b)	Explain following surfaces: (i) Revolved surface (ii) Bezier Surface	**04**
	(c)	A Bezier curve is to be constructed using control points P_0 (35, 30), P_1 (25, 0), P_2 (15, 25) and P_3 (5, 10). The Bezier curve is anchored at P_0 and P_3. Find the equation of the Bezier curve and plot the curve for u= 0, 0.2, 0.4, 0.6, 0.8 and 1.	**07**
		OR	
Q.3	**(a)**	Explain Constructive Solid Geometry (CSG) with sketch.	**03**
	(b)	Enlist various types of surfaces. Explain ruled surface.	**04**
	(c)	Derive equation of a Hermite's cubic spline curve with two end points P0 and P1 and their tangent vectors are P_0' and P_1'.	**07**
Q.4	**(a)**	What are the properties of the Stiffness matrix?	**03**
	(b)	What is shape function? Draw a sketch for a linear shape function used in FEM.	**04**
	(c)	How many elements to be considered in the problem of figure 1? Determine Global stiffness matrix bar elements used in the system below:	**07**



$E = 200 \times 10^9$ N/m²

Figure1

OR

Q.4 **(a)** What do you mean by 'Discretization'? State precautions required during discretization. **03**

(b) What do you mean by 'Iso-Parametric formulation' of problems in FEM. **04**

(c) How many elements to be considered in the problem of figure 2? Determine Global stiffness matrix bar elements used in the system below: **07**

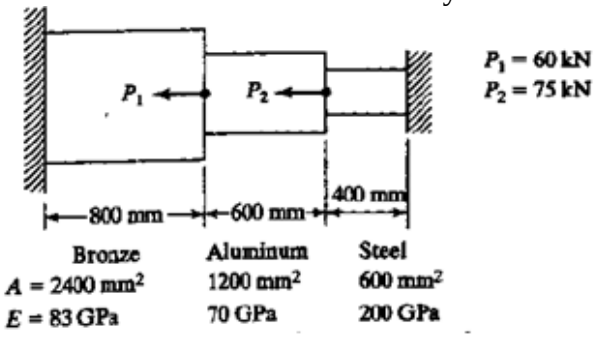


Figure 2

Q.5 **(a)** List applications areas of Finite Element Analysis (FEA). **03**

(b) Enlist steps to be followed for solution of Structural problems using FEM. **04**

(c) For one dimensional element shown in Figure 3, temperature at node 1 is 100˚ C and at node 2 is 40˚ C. Evaluate shape function associated with node 1 and node 2. Calculate temperature at point P. Assume linear shape function **07**

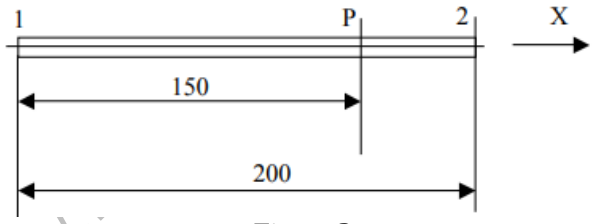


Figure 3

OR

Q.5 **(a)** What are the types of loading acting on the structure? Give suitable examples. **03**

(b) Define total potential energy. State the principle of minimum potential energy. **04**

(c) Analyze the two-members truss shown in Figure 4. Assume EA to be constant for all members. The length of each member is 5m. Area A=0.01 m^2 and E=210GPa. Compute nodal displacements and reactions forces. Determine stresses in each member. **07**

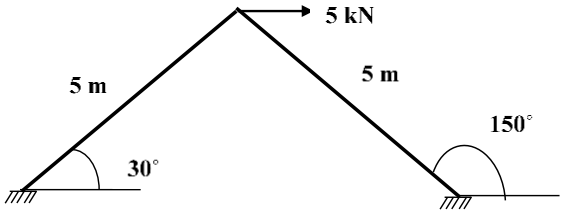


Figure 4

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