Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI EXAMINATION – SUMMER 2025

Subject Code: 3161903 Date: 22-05-2025

Subject Name: Computer Aided Design

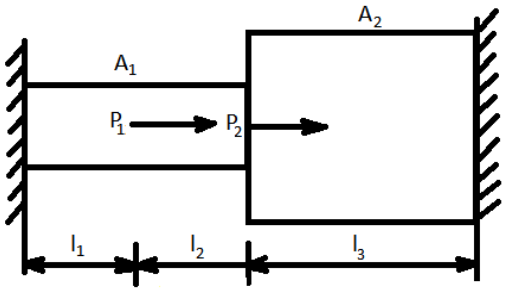
Time: 10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	What is CAD? Explain its capabilities in Detail	**03**
	(b)	What is persistence? Explain the effect of persistence on CRT ?	**04**
	(c)	Illustrate the Bresenham line generation algorithm by digitizing the line with end points (20,10) and (30,18)	**07**
Q.2	**(a)**	Differentiate between Constructive Solid Geometry and B-Represenrtation.	**03**
	(b)	Describe constructive solid geometry (CSG) and how it represents objects using Boolean operations.	**04**
	(c)	Describe the equations and properties of Bezier curves. How do Bezier curves differ from cubic splines in terms of control and representation?	**07**
		OR	
	(c)	Given: p0 (1,1): p1(2,3): p2(4,3): p3(3,1) as vertices of Bezier curve determine 3 points on Bezier curve.	**07**
Q.3	**(a)**	Explain scaling and its effect on objects in both 2D and 3D space.	**03**
	(b)	Show that the composition of two rotations is additive by concatenating the matrix representations for $R_{\theta 1}$ and $R_{\theta 2}$ to obtain $R_{\theta 1}\ R_{\theta 2} = R_{(\theta 1+ \theta 2)}$	**04**
	(c)	Reflect the diamond shaped polygon whose vertices are A(-1,0), B(0,-2), C(1,0) and D(0,2) about i. The horizontal line y =3 ii. The vertical line x = 3 iii. The line y = x + 3	**07**
		OR	
Q.3	**(a)**	What are the basic advantages of Homogeneous Coordinate system?	**03**
	(b)	A point (3,3) makes a rotating of 45 degree about the origin and then translating in the direction of vector v = 5i + 6j. Find the new location of point P.	**04**
	(c)	Obtain the mirror reflection of the triangle formed by vertices A(0,3), B(2,0), C(3,2) about the line passing through the points (1,3) and (-1,-1).	**07**
Q.4	**(a)**	Define Finite Element Analysis (FEA) and explain its significance in engineering.	**03**
	(b)	Explain Penalty approach by giving a suitable example.	**04**

(c) Determine the displacement of nodes and elemental stress for the bar as shown in figure. Take A1=400 mm² , A2=500 mm², l_1= l_2=200 mm, l_3=250 mm P_1=P_2=10 kN and E=200 GPa **07**

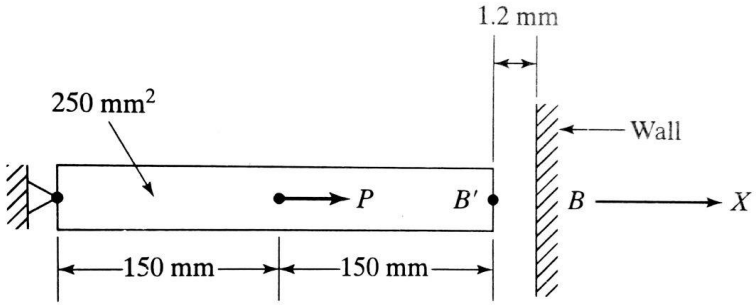


OR

Q.4 **(a)** Explain the concept of discretization in FEA and its importance in solving complex engineering problems. **03**

(b) Give step by step procedure for analyzing any component using FEM. **04**

(c) In fig a load P=60 x 103 N is applied as shown. Determine the displacement field, stress, and support reactions in the body. Take E= 20 x 103 N/mm2 **07**



Q.5 **(a)** Define optimization and explain its importance in the design of machine elements. **03**

(b) Explain how the stiffness matrix is derived from the strain-displacement matrix for structural problems. **04**

(c) Describe the steps involved in applying Johnson's method to determine the safe design parameters for machine elements. **07**

OR

Q.5 **(a)** Explain the role of optimization in improving the performance, reliability, and efficiency of machine elements. **03**

(b) Discuss the limitations and assumptions of Euler-Bernoulli beam theory. **04**

(c) Discuss the assumptions and limitations of Johnson's method. **07**

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