Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2024

Subject Code:3161903 Date:17-05-2024

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)	A raster system has 1024 × 720 resolution. Compute the size of frame buffer (in Megabytes) to store 32 bits per pixel. For 24-bit display system how many different colours are possible?	03
	(b)	Define drawing entities and utilities and give their examples.	04
	(c)	Determine the pixels for a straight line connecting two points (2, 7) and (15, 10) using Bresenham's algorithm.	07
Q.2	(a)	Write down advantages of Parametric representation and disadvantages of Non-Parametric representation.	03
	(b)	Draw sketch of any two analytical surfaces and two synthetic surfaces.	04
	(c)	The end points of a cubic spline curve are P_0 (2,3) and P_1 (10,1). The tangent vector for end P_0 is given by line joining P_0 and point P_2 (8,6). The tangent vector for end P_1 is given by line joining P_2 and point P_1. Determine the parametric equation of Hermite cubic curve and tangent vector. Also plot the Hermite cubic curve.	07
		OR	
	(c)	Describe the characteristics of Bezier curve. List advantages of B-spline curve. Differentiate geometry and topology in solid modeling.	07
Q.3	(a)	Explain primitive instancing with neat sketch.	03
	(b)	Short note: CSG	04
	(c)	Write 3x3 transformation matrix for each of the following effects: 1) Scale the image to be twice as large and then translate it 1 unit to the left. 2) Scale x-direction to be half as large and then rotate anticlockwise by 90° about origin. 3) Translate down 0.5 unit, right 0.5 unit and then rotate anticlockwise by 45°.	07
		OR	
Q.3	(a)	Explain cell decomposition with neat sketch.	03
	(b)	Short note: B-rep	04
	(c)	Consider a triangle A (5,5), B (8,5) and C (5,10). Find new vertex positions if: 1) The triangle is scaled 2 times in x-direction and 3 times in y-	07

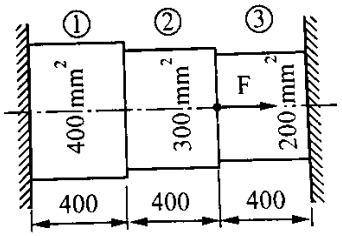
direction about vertex-A.

2) If it mirrored about a line y = 2x + 4.

Q.4 (a) Sketch and name any three 3D elements used in FEA. 03

(b) Explain the statement "FEM is an approximate method" with suitable example. 04

(c) A stepped shaft is shown in the figure below. Determine the stresses, reactions and deflections in each of the sections. Assume uniform material for the complete shaft having a modulus of elasticity as 200 GPa and the axial force F as 35 kN. 07

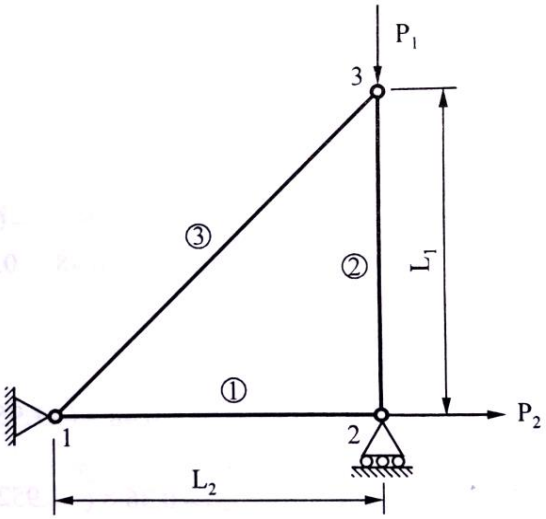


OR

Q.4 (a) Explain discretization with neat sketch. 03

(b) Determine the temperature at x = 60 mm, if the temperature at node-1 = 150° C, node-2 = 90° C and x_1 = 15 mm, x_2 = 80 mm. 04

(c) A three-bar truss is shown in the figure below. Modulus of elasticity of the material is 3,00,000 N/mm^2. Area of the bar for the truss is 60 mm^2 for all the elements. Length L_1 = 750 mm and L_2 = 100 mm. Load P_1 = 20 kN and P_2 = 25 kN. Determine nodal displacements, stresses and reaction forces for each element. 07



Q.5 (a) Write down important properties of matrices for concatenation. 03

(b) Draw a neat sketch of any four half-spaces used to represent bounded solids. 04

(c) Using Johnson's method design a tensile bar of length, L = 200 mm to carry a tensile load of 5 kN for minimum cost, out of the following materials: 07

Material	Mass Density (kg/m^3)	Material Cost (Rs./N Weight)	Yield Strength (MPa)
Steel	7500	16	130

Al. Alloy	3000	32	50
Ti. Alloy	4800	480	90
Mg. Alloy	2100	32	20

OR

Q.5 (a) Write down matrices for scaling, mirror and shear transformation in the homogeneous coordinate system. 03

(b) Define optimization and write down its engineering applications. 04

(c) What is feature based modeling? Describe any three sketched features and any three pick and place features. 07

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