

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VI (NEW) EXAMINATION – WINTER 2021****Subject Code:3161903****Date:26/11/2021****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 do you understand by geometry and topology in solid modelling?	03
	(b) What do you mean by Computer Aided Design (CAD)? Discuss reasons for implementing CAD in industry.	04
	(c) Explain the concept of finite element method. Discuss about various steps involved in finite element analysis.	07
Q.2	(a) Discuss applications of optimization in engineering.	03
	(b) Derive the 2-D transformation matrix for the Rotation.	04
	(c) Identify the pixel locations that will be chosen by the DDA algorithm while scan converting a line from screen coordinate (10, 30) to (19, 36).	07
OR		
	(c) What is meant by a scan conversion? Explain Bresenham's circle drawing algorithm.	07
Q.3	(a) Enlist various graphic standards with full name.	03
	(b) Differentiate between wireframe modeling and solid modeling technique for CAD.	04
	(c) Compare explicit and implicit non parametric representation of curve. Explain the parametric representation of a curve and its advantages over nonparametric representations with suitable example.	07
OR		
Q.3	(a) Prepare the detailed specification for a CAD workstation.	03
	(b) Distinguish between B-Rep and C-Rep of Solid modeling techniques.	04
	(c) The vertices of a Bezier polygon are: (2,2), (3,4), (4,4) and (5,4) respectively. Determine four points on Bezier Curve.	07
Q.4	(a) What is Geometric Transformation?	03
	(b) Find reflection matrix, when the axis of reflection is given by the equation $y=5x$.	04
	(c) A Triangle PQR with Vertices P (2,5) Q (6,7) and R (2,7) is to be reflected about line $Y = 0.5X + 3$. Determine the Concatenated transformation matrix.	07
OR		
Q.4	(a) State the advantage of homogenous coordinate transformation.	03
	(b) Distinguish between Geometric Transformation and Geometric Mapping.	04
	(c) The composite transformation of the graphics elements consists of the following operations. <ol style="list-style-type: none"> (i) The rotation through 120° about Z- axis. (ii) The translation through 10 and -20 units along X and Y directions respectively. 	07

(iii) The rotation through 30° about X- axis.

Write the homogenous transformation matrices for the above operation and develop the composite transformation matrix, if operation is done above sequence.

Will the sequence operation affect the end results?

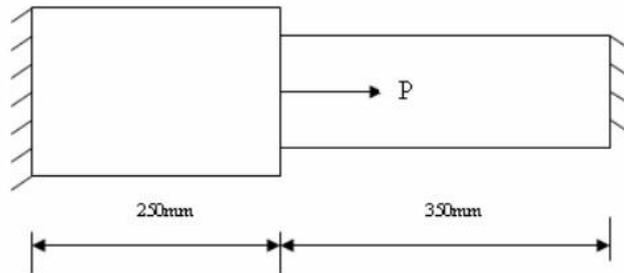
Q.5 (a) Explain Elimination approach for FEA. **03**

(b) Explain the following with reference to optimization:
i) Objective function ii) Constraints **04**

(c) A stepped bar as shown in figure is subjected to an axial load $P = 200$ KN applied at 20° C to the end. The temperature of the bar is raised by 50° C. **07**

Calculate:

(i) Element stiffness matrix (ii) Global stiffness matrix
Consider $E_1 = 70 \times 10^3$ N/mm², $E_2 = 200 \times 10^3$ N/mm²,
 $A_1 = 700$ mm², $A_2 = 1000$ mm²,
 $\alpha_1 = 23 \times 10^{-6}$ per $^\circ$ C and $\alpha_2 = 11.7 \times 10^{-6}$ per $^\circ$ C



OR

Q.5 (a) Discuss quadratic shape functions and their uses. **03**

(b) What do you mean by primary and subsidiary design equation? **04**

(c) Evaluate the shape functions N_1 , N_2 and N_3 at the interior point P (3.85,4.8) for the triangular element shown in figure. **07**

