

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VI(NEW) EXAMINATION – WINTER 2022****Subject Code:3161903****Date:14-12-2022****Subject Name:Computer Aided Design****Time:02:30 PM TO 05:00 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
<b>Q.1</b>	(a) State the usage of CAD tools in various stages of design process.	<b>03</b>
	(b) What do you mean by Computer Aided Design (CAD)? Discuss reasons for implementing CAD in industry.	<b>04</b>
	(c) What is meant by a scan conversion? Explain Bresenham's circle drawing algorithm	<b>07</b>
<b>Q.2</b>	(a) Write equations of following curves in parametric form: (1) Line (2) Circle (3) Ellipse	<b>03</b>
	(b) Write the differences between (i) Raster scan and Vector scan displays (ii) Analytic curves and Synthetic curves	<b>04</b>
	(c) Distinguish between B-Rep and C-Rep of Solid modeling techniques.	<b>07</b>
	<b>OR</b>	
	(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 $1$ .	<b>07</b>
<b>Q.3</b>	(a) Explain the Geometric Transformation.	<b>03</b>
	(b) List the advantages and limitations of surface modeling.	<b>04</b>
	(c) A rectangle ABCD has vertices A (10,20), B (40,20), C (40,40) and D (10,40). This rectangle is to be sheared in such a way that coordinates of vertices C and D changes to $C'(50,40)$ and $D'(20,40)$ , with A and B remaining unchanged. Write down the necessary transformation.	<b>07</b>
	<b>OR</b>	
<b>Q.3</b>	(a) What is homogenous coordinate system? Explain its importance in CAD.	<b>03</b>
	(b) Compare wireframe, surface and solid modeling techniques.	<b>04</b>
	(c) A triangle ABC with vertices A (0,0), B(4,0) and C(2,3) is translated through 4 and 2 units along X and Y direction respectively and then rotated through $90^\circ$ in counter clock wise direction about the new position of point C. Find the (1) New concatenated transformation matrix and (2) The new position of triangle.	<b>07</b>
<b>Q.4</b>	(a) Give step by step procedure of Finite Element Analysis	<b>03</b>
	(b) Write matrices for 2D scaling, 2D translation, 2D rotation and mirroring about Y axis for object in 2D space using homogeneous coordinates.	<b>04</b>
	(c) Explain the following with reference to optimization: i) Objective function ii) Constraints	<b>07</b>
	<b>OR</b>	
<b>Q.4</b>	(a) State the application of Finite Element Analysis	<b>03</b>
	(b) Briefly explain the Graphic exchange standard.	<b>04</b>

(c) Discuss applications of optimization in engineering.

07

**Q.5 (a)** Discuss in brief the elements used in FEA

03

**(b)** Discuss the shape functions in natural coordinate system.

04

**(c)** An axial load  $F=20000\text{N}$  is applied as shown in figure 1 on the bar.

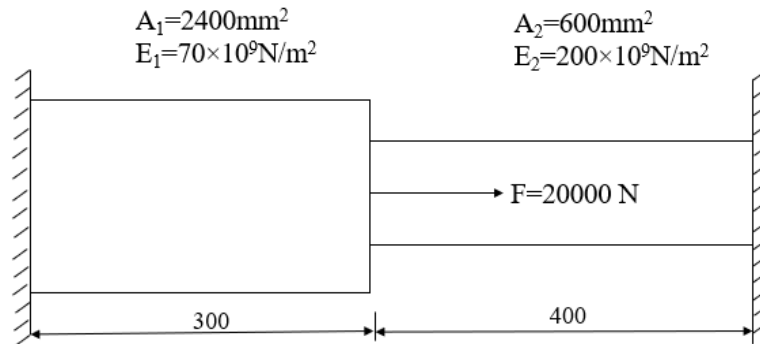
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Find out following using finite element method.

(a) Nodal displacement.

(b) Stress in each section.

(c) Reaction forces.



**Figure 1**

**OR**

**Q.5 (a)** Discuss the properties of global stiffness matrix.

03

**(b)** Discuss the elimination approach used in FEA.

04

**(c)** The arrangement of the truss element is shown in figure 2.

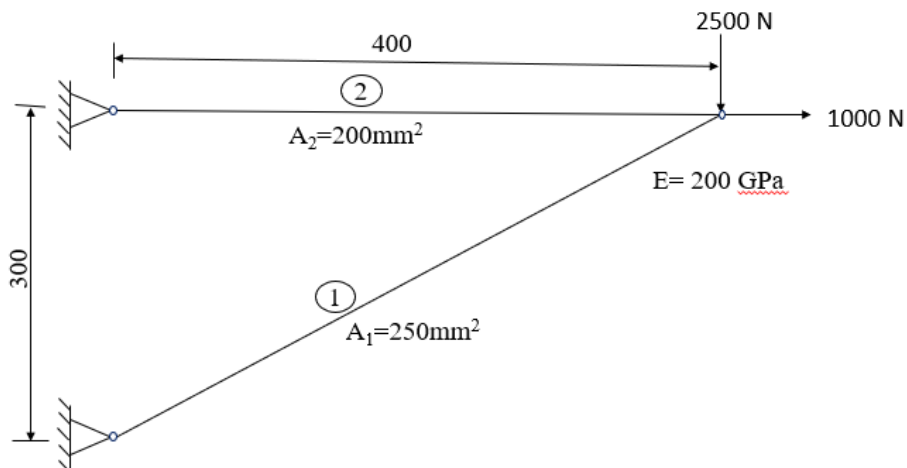
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Find out following using finite element method.

(a) Nodal displacement.

(b) Stress in each section.

(c) Reaction forces.



**Figure 2**

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