

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2018

Subject Code:2161903

Date:04/12/2018

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.

		MARKS
Q.1	(a) State the various stages for a design process, in which various CAD tools can be used to improve productivity.	03
	(b) Explain different types of coordinate systems available in CAD softwares.	04
	(c) Plot intermediate raster locations when scan converting a straight line from screen coordinate (2, 7) to screen coordinate (15, 10) using DDA algorithm.	07
Q.2	(a) Explain the concept of homogeneous coordinates and its use in representing geometrical transformation.	03
	(b) Derive the matrix for orthographic projection matrices for the Top view and Right Hand side view of a 3D model.	04
	(c) Calculate the concatenated transformation matrix for the following operations performed in the sequence as below: i) Translation by 4 and 5 units along X and Y axis ii) Change of scale by 2 units in X direction and 4 units in Y direction iii) Rotation by 60° in CCW direction about Z axis passing through the point (4, 4). Find new coordinates when the transformation is carried out on a triangle ABC with A (4, 4), B (8, 4) and C (6, 8). OR (c) A triangle PQR with vertices P (2, 5), Q (6, 7) and R (2, 7) is to be reflected about a line $x = 2y - 6$. Determine, (i) The concatenated matrix and (ii) The coordinates of the matrices for the reflected triangle.	07
Q.3	(a) Explain different types of surfaces used in CAD modeling.	03
	(b) Explain feature based modeling.	04
	(c) Plot the Bezier curve having endpoints P_0 (0, 0) and P_3 (7, 0). The other control points are P_1 (7, 0) and P_2 (7, 6). Plot values for $u = 0, 0.1, 0.2, \dots, 1$, if the characteristic polygon is drawn in the sequence $P_0 - P_1 - P_2 - P_3$. OR	07
Q.3	(a) Differentiate between Hermite Cubic Splines curves and Bezier curves.	03
	(b) What do you mean by Iso-parametric representations? Write the equation of a line in parametric form.	04

- Q.4** (a) Draw a sketch of following elements showing nodes: 03
 (i) Quadrilateral (ii) Six noded triangular (iii) Tetrahedral
 (b) Explain penalty approach used in FEA with an example. 04
 (c) Explain in details : The general procedure of Finite Element Method 07

OR

- Q.4** (a) List various engineering application of FEA. 03
 (b) What do you mean by thermal effects of temperature ? How it is included in calculation for 1-D elements? 04
 (c) What is shape function? Derive linear shape functions for 1-dimensional bar element in terms of natural coordinate. Also plot variation of shape functions within this element. 07
- Q.5** (a) List properties of global stiffness matrix [K]. 03
 (b) Determine the temperature at $x = 40$ mm (Figure 1), if the temperature at nodes $T_i = 120^\circ\text{C}$, $T_j = 80^\circ\text{C}$ and $x_i = 10$ mm and $x_j = 60$ mm. Consider linear shape function. 04
 (c) With the help of suitable examples explain condition of plane stress and plane strain. 07

OR

- Q.5** (a) Write element stiffness matrix and element load vectors for a beam element. 03
 (b) What are axisymmetric elements? Explain. 04
 (c) Consider the bar shown in Figure 2. An axial load $P = 200 \times 10^3$ N is applied as shown. Using the penalty approach for handling boundary conditions,
 (a) Determine the nodal displacements
 (b) Determine the stress in each material.
 (c) Determine the reaction forces. 07

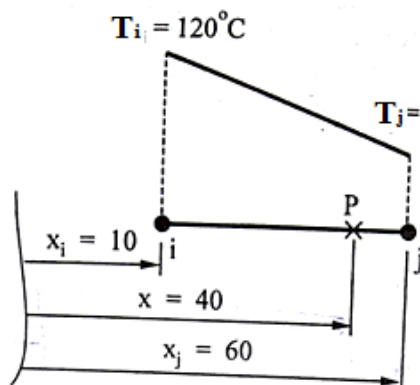
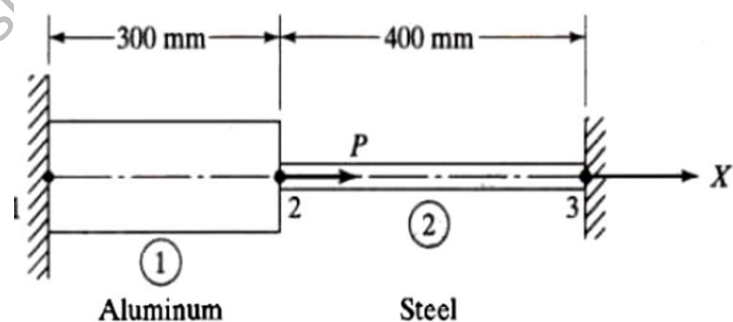


Figure 1



$$A_1 = 2400 \text{ mm}^2$$

$$E_1 = 70 \times 10^9 \text{ N/m}^2$$

$$A_2 = 600 \text{ mm}^2$$

$$E_2 = 200 \times 10^9 \text{ N/m}^2$$

Figure 2