

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-VI (NEW) EXAMINATION – WINTER 2020****Subject Code:2161903****Date:01/02/2021****Subject Name:Computer Aided Design****Time:02:00 PM TO 04:00 PM****Total Marks: 56****Instructions:**

1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1**
- (a) Clearly distinguish between conventional design and CAD. **03**
 - (b) Explain different coordinate systems available in a CAD software. **04**
 - (c) Write Bresenham's algorithm for line having slope less than 45° . **07**
- Q.2**
- (a) What is homogenous coordinate system? Explain its importance in CAD. **03**
 - (b) Write the differences between **04**
 - (i) Raster scan and Vector scan displays
 - (ii) Analytic curves and Synthetic curves
 - (c) Reflect the diamond shaped polygon whose vertices are A(-1,0), B(0,-2), C(1,0) and D(0,2) about
 - i) Horizontal line $y = 2$
 - ii) Vertical line $x = 2$**07**
- Q.3**
- (a) Explain plane surface and revolution surface in detail. **03**
 - (b) The endpoints of a line are $P_1(2, 7, 12)$ and $P_2(5, 6, 4)$. Determine **04**
 - (i) The parametric equation of line
 - (ii) Tangent vector of the line
 - (iii) Length of the line
 - (iv) Unit vector in the direction of the line
 - (c) Compare wireframe, surface and solid modeling techniques. **07**
- Q.4**
- (a) Discuss the structure of an IGES file. **03**
 - (b) What are different representation schemes for solid models? Differentiate between CSG and B-rep. **04**
 - (c) The coordinates of four control points relative to a current WCS are given by $B_0[3 \ 3 \ 0]^T$, $B_1[3 \ 4 \ 0]^T$, $B_2[4 \ 4 \ 0]^T$, $B_3[4 \ 3 \ 0]^T$. Find the equation of the resulting Bezier curve. Also find points on the curve for $U = 0, 1/4, 1/2, 3/4, 1$. **07**
- Q.5**
- (a) List the fields of applications of FEA. **03**
 - (b) Explain Penalty approach to solve FEA problem. **04**
 - (c) Discuss the steps involved in finite element analysis of a problem. **07**
- Q.6**
- (a) Explain curved shell elements in FEA. **03**
 - (b) Discuss the properties of global stiffness matrix. **04**
 - (c) Consider a two stepped bar as shown in Figure 1 below. Determine the nodal displacements if the temperature raises by 50°C . Consider $E_1 = 200 \times 10^3 \text{ N/mm}^2$, $E_2 = 70 \times 10^3 \text{ N/mm}^2$, $A_1 = 1000 \text{ mm}^2$, $A_2 =$ **07**

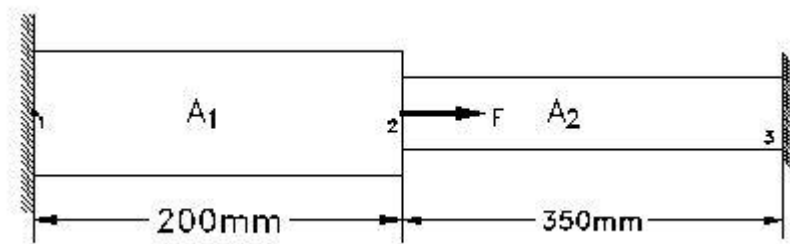


Figure 1

- Q.7** (a) With suitable examples explain plane stress condition. Which type of element will you use to solve a plane stress problem with FEA? **03**
- (b) Derive the element stiffness matrix of a truss element. **04**
- (c) For the loading system shown in Figure 2 below, determine the displacements and stresses. Assume modulus of elasticity $E = 80 \times 10^3$ N/mm², cross sectional area $A = 225$ mm² and $F = 90$ KN. **07**

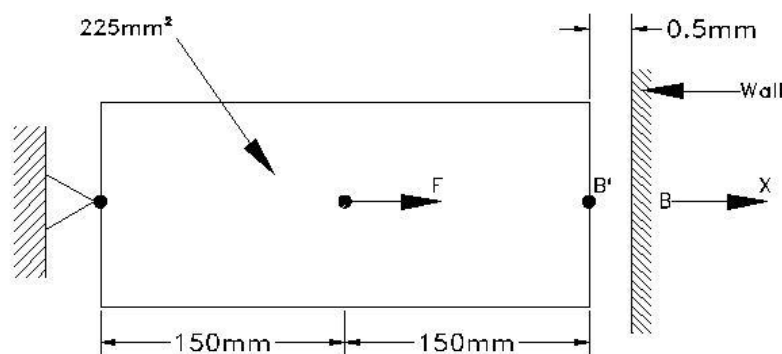


Figure 2

- Q.8** (a) Draw the following elements showing nodes **03**
- (i) 4 noded quadrilateral (ii) 3 noded triangle (iii) 8 noded hexahedron
- (b) A 1D spar element having a linear shape function is as shown Figure 3 below. If the temperature at node 1 is 50° C and at node 2 is -20° C, find the temperature at point P. **04**

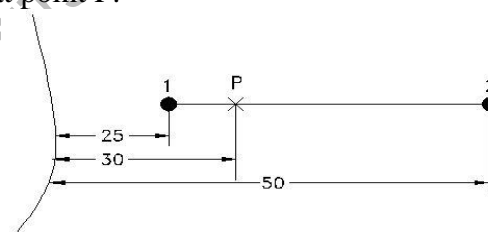


Figure 3

- (c) Explain in detail the discretization process with respect to **07**
- (i) Types of elements (ii) Size of elements
- (iii) Location of nodes (iv) Number of elements
