

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (NEW) - EXAMINATION – SUMMER 2016

Subject Code:2161903

Date:11/05/2016

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.

- Q.1** (a) Explain DDA algorithm for line generation with its limitations. **07**
(b) What is graphic standard? Explain different CAD standards. **07**

- Q.2** (a) A triangle ABC with vertices A (30, 20), B (90, 20) and C (30, 80) is to be scaled by factor 0.5 about a point X (50, 40). Determine (i) the composition matrix and (ii) the coordinates of the vertices for a scaled triangle. **07**
(b) Explain two dimensional geometric transformations in details. Also give transformation matrix for each. **07**

OR

- (b) Explain orthographic and oblique projections in details with suitable sketch. **07**

- Q.3** (a) What is parametric representation? A line having length 20 unit, passes through the point $P_1 (1, 2)$. It makes an angle 60° with X-axis. Determine the parametric equation of line. **07**
(b) Explain B-spline curve and mention its advantages. **07**

OR

- Q.3** (a) Explain the following surfaces **07**
1. Plane surface 2. Bezier surface 3. B-spline surface 4. Coons surface
(b) 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 . **07**

- Q.4** (a) Write short note on Constructive Solid Geometry (CSG) for solid modeling. **07**
(b) What do you understand by 2 ½ D model? Clearly distinguish it from 3-D model. **07**

OR

- Q.4** (a) What are the different types of elements used in FEA? Explain in brief. **07**
(b) Enlist the various methods of geometric modeling. Discuss wire frame modeling in detail with neat sketch. **07**

- Q.5** (a) Explain the concepts of FEM. Discuss the different steps involved in FEA in detailed. **07**
(b) A stepped metallic bar with circular cross section consists of two segments. Length & cross section area of first segment is 350 mm & 275 mm^2 respectively. Length & cross section area of second segment is 250 mm & 175 mm^2 respectively. Assume modulus of elasticity is 200 GPa. If one end of the bigger segment is fixed and if an axial tensile force acting on the free end of the smaller segment is 700 kN, find: (1) Nodal displacements, using global stiffness matrix. (2) Elemental Stresses, (3) Support Reaction. **07**

OR

- Q.5** (a) Explain Penalty approach and Elimination approach for FEA. **07**

- (b)** A two-step bar as shown in figure is subjected to thermal loading conditions. The length of left step is 250 mm & length of right step is 350 mm. An axial load $P = 200 \times 10^3$ N applied at 20°C to the end. The temperature of the bar is raised by 50°C . 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 $^\circ\text{C}$ and $\alpha_2 = 11.7 \times 10^{-6}$ per $^\circ\text{C}$.


