GUJARAT TECHNOLOGICAL UNIVERSITY

BE-SEMESTER-6 (NEW SYLLABUS) EXAMINATION-SUMMER 2016

Subject Code: 2161903 Date: 26/10/2016 **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. (a) With the help of neat sketches explain various types of surfaces. Q-1 (b) What is graphic standard? Explain different CAD standards. [7] 1280 x 1024 and a refresh rate of 60Hz (non-interlaced): The size of graphical memory (refresh buffer memory). i. The time required to display a scan line & a pixel. ii. iii. The active display area of the screen if the resolution is 78 dpi (dots per inch). Q-2 (b) Write Bresenham's line algorithm. Determine intermediate pixels for line [7] starting from (1,1) to (8,5). OR Explain constructive solid geometry (CSG). Q-2 (b) i. Write limitations of a wire frame model. ii. (a) A triangle PQR has its vertices at P(0,0), Q(4,0) and R(2,3). It is to be translated Q-3 by 4 units in X direction, and 2 units in Y direction, then it is to be rotated in anticlockwise direction about the new position of point R through 90°. Find the final position of the triangle. (b) Derive general parametric equation for Hermitz cubic spline curve in matrix [7] Q-3 form. OR (a) A triangle ABC has vertices as A(2,4), B(4,6) and C(2,6). It is desired to reflect [7] Q-3 through an arbitrary line L whose equation is y=0.5x+2. Calculate the new vertices of triangle and show the result graphically. Q-3 (b) the condition for 1^{st} order (C¹) continuity between these two sections. (a) Consider the bar shown in figure-1. An axial load F=35 kN is applied as shown. [7] **O-4** Using **penalty approach** for handling boundary conditions, determine nodal displacements and support reactions. Take E=200 GPa for all elements. Length

What is shape function? Derive linear shape functions for 1-dimensional bar [7] **O-4** (b) element in terms of natural coordinate. Also plot variation of shape functions within this element.

of each element is in mm.

[7]

- Q-2 (a) Determine following for an 8-plane raster display with resolution of [7]
- [5] [2]
- [7]

- Two Bezier curve sections A and B have order of 3 and 4 respectively. Derive [7]

- Q-4 (a) Consider the bar as shown in figure-2. Determine the nodal displacements and [7] element stresses, if the temperature rises from 20 °C to 60°C. Take P=300kN, E₁=70GPa, A₁=900 mm², Coefficient of thermal expansion, α_1 =23 x 10⁻⁶ per °C; E₂=200GPa, A₂=1200 mm², Coefficient of thermal expansion, α_2 =11.7 x 10⁻⁶ per °C.
- Q-4 (b) Evaluate the shape functions N1, N2 and N3 at the interior point P(3.85,4.8) for [7] the triangular element shown in figure-3. Also determine Jacobian of the transformation J for the element.
- Q-5 (a) A stepped shaft is shown in figure-1. Using Elimination Approach, determine [7] the stresses and nodal displacements for each element. Assume uniform material for the complete shaft having a modulus of elasticity as 200 GPa and axial force F as 35kN. Length of each element is in mm.
- Q-5 (b) A four bar truss is as shown in figure-4. Assuming that for each element, the [7] cross-sectional area is 400 mm² and modulus of elasticity is 200 GPa, determine the nodal displacements. Length of each element is in mm.

OR

- Q-5 (a) With the help of suitable examples explain condition of plane stress and plane [7] strain.
- Q-5 (b) i. List properties of global stiffness matrix [K]. [4]
 - ii. Write element stiffness matrix and element load vectors for a beam [3] element.



Figure:4



Figure:1

Figure:3