Seat No_____ Enrollment No_____

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.**

Q-1 (a) With the help of neat sketches explain various types of surfaces. [7]

(b) What is graphic standard? Explain different CAD standards. [7]

Q-2 (a) Determine following for an 8-plane raster display with resolution of 1280 x 1024 and a refresh rate of 60Hz (non-interlaced): [7]

i. The size of graphical memory (refresh buffer memory).

ii. The time required to display a scan line & a pixel.

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 starting from (1,1) to (8,5). [7]

OR

Q-2 (b) i. Explain constructive solid geometry (CSG). [5]

ii. Write limitations of a wire frame model. [2]

Q-3 (a) A triangle PQR has its vertices at P(0,0), Q(4,0) and R(2,3). It is to be translated 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^o. Find the final position of the triangle. [7]

Q-3 (b) Derive general parametric equation for Hermitz cubic spline curve in matrix form. [7]

OR

Q-3 (a) A triangle ABC has vertices as A(2,4), B(4,6) and C(2,6). It is desired to reflect through an arbitrary line L whose equation is $y=0.5x+2$. Calculate the new vertices of triangle and show the result graphically. [7]

Q-3 (b) Two Bezier curve sections A and B have order of 3 and 4 respectively. Derive the condition for 1^{st} order (C^1) continuity between these two sections. [7]

Q-4 (a) Consider the bar shown in figure-1. An axial load F=35 kN is applied as shown. Using **penalty approach** for handling boundary conditions, determine nodal displacements and support reactions. Take E=200 GPa for all elements. Length of each element is in mm. [7]

Q-4 (b) 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. [7]

OR

Q-4 (a) Consider the bar as shown in figure-2. Determine the nodal displacements and element stresses, if the temperature rises from 20 ^oC to 60^oC. Take P=300kN, E_1=70GPa, A_1=900 mm^2,Coefficient of thermal expansion, α_1=23 x 10^{-6} per ^oC ; E_2=200GPa, A_2=1200 mm^2, Coefficient of thermal expansion, α_2=11.7 x 10^{-6} per ^oC. [7]

Q-4 (b) Evaluate the shape functions N1, N2 and N3 at the interior point P(3.85,4.8) for the triangular element shown in figure-3. Also determine Jacobian of the transformation J for the element. [7]

Q-5 (a) A stepped shaft is shown in figure-1. Using **Elimination Approach**, determine 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. [7]

Q-5 (b) A four bar truss is as shown in figure-4. Assuming that for each element, the cross-sectional area is 400 mm^2 and modulus of elasticity is 200 GPa, determine the nodal displacements. Length of each element is in mm. [7]

OR

Q-5 (a) With the help of suitable examples explain condition of plane stress and plane strain. [7]

Q-5 (b) i. List properties of global stiffness matrix [K]. [4]

ii. Write element stiffness matrix and element load vectors for a beam element. [3]

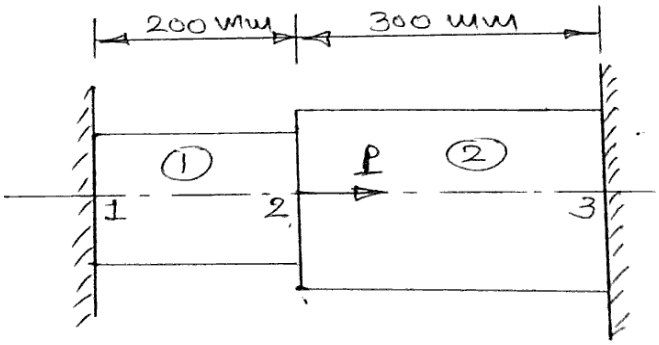

Figure:2

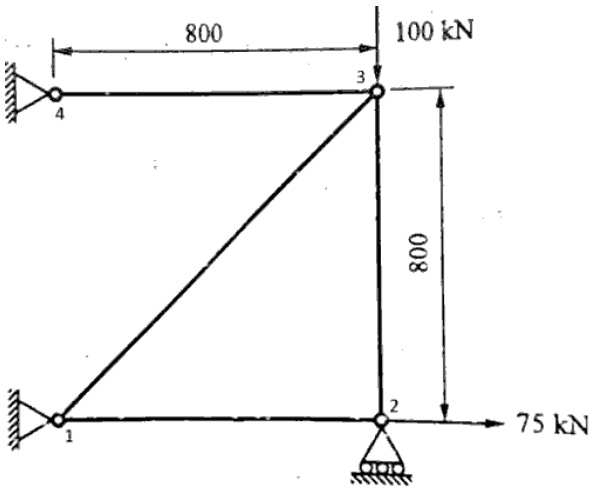

Figure:4

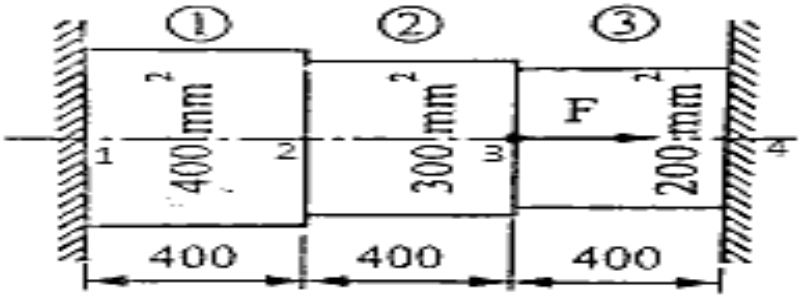

Figure:1

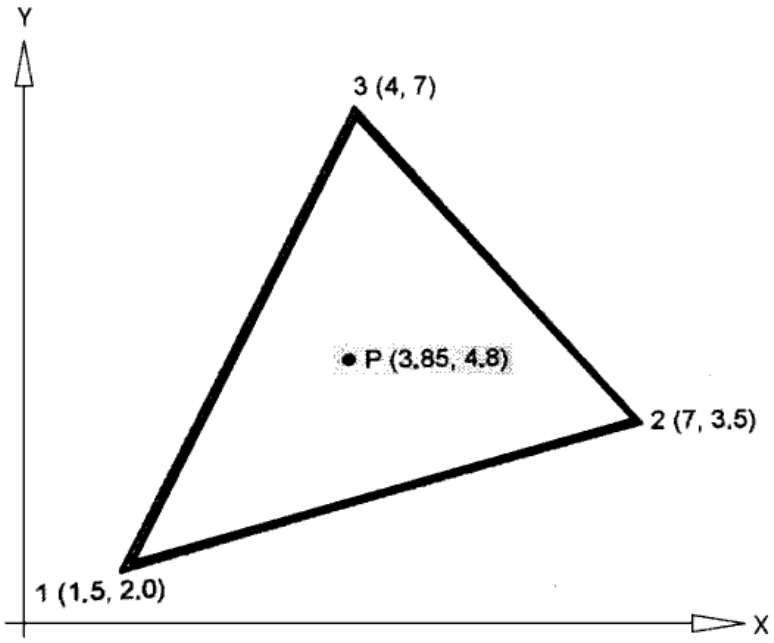

Figure:3