Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 161903 **Date: 27/04/2017**

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 Bresenham's algorithm for line generation with flow chart. **07**

(b) Using transformation matrix determine the new coordinates of triangle A(10,20), B(30,40) and C(10,60) after it is rotated 60 degree clockwise about A. **07**

Q.2 **(a)** Derive the parametric equation in matrix form for Hermite Cubic spline. **07**

(b) Explain followings: **07**

i) Raster Scan
ii) Vector Scan
iii) Frame buffer

OR

(b) Explain the working principle of CRT monitor. **07**

Q.3 **(a)** A 3D object is represented by the following six vertices: **07**
A(10,10,5), B(10,40,5), C(70,40,5), D(10,10,20), E(10,40,20), F(70,40,20)
Generate the necessary concatenated transformation matrices for scaling the object by factor of 2 in all directions such that the vertex C remains unmoved. Find new coordinates of all vertices.

(b) Bezier curve is defined by four control points in sequence (30, 0, 10), (40, 0, 40), (70, 0, 30) and (60, 0, 20). Find the equation of the curve. Evaluate the function for u=0, 0.2, 0.4, 0.6, 0.8 and 1.0. **07**

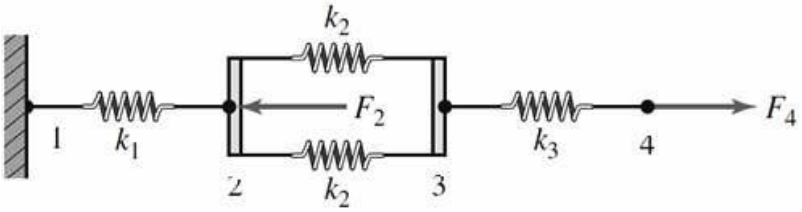
OR

Q.3 **(a)** Show that transformation matrix for a reflection about the line Y= X is equivalent to a reflection relative to the X axis, followed by an anticlockwise rotation of 90º. **07**

(b) Derive the parametric equation in matrix form for Bezier curve with four control points. **07**

Q.4 **(a)** Explain pre-processing, processing and post-processing steps in FEA software. **07**

(b) Determine the displacements of nodes of the spring system shown in figure using minimum potential energy method. **07**
$k_1 = 20$, $k_2 = 30$, $k_3 = 40$ N/mm, $F_2 = 50$ N, $F_4 = 100$ N

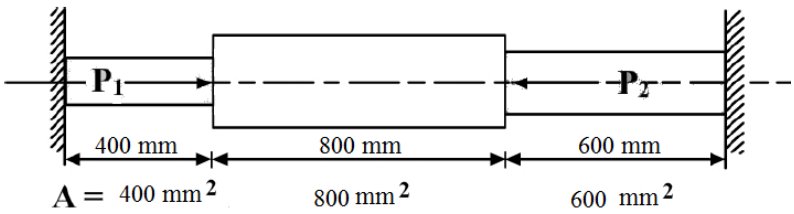


OR

Q.4 **(a)** Explain the steps to be followed in Finite Element Analysis for structural problem. **07**

(b) Determine the maximum stress and reactions in an axially loaded bar as shown in the following figure. **07**

Assume: $P_1 = P_2 = 50$ kN and E = 200 GPa.



Q.5 **(a)** Explain 1) Wire frame Modeling 2) Surface Modeling and 3) Solid Modeling. **07**

(b) Two products P and Q are sold by a company. The selling price of product P is Rs. 12 per kg more than its cost price, while for Q it is Rs. 9 per kg more than cost price. To make 1 kg of P, 500 gms of R and 700 gms of S are needed. To prepare 1 kg of Q, 600 gms of R and 500 gms of S are needed. The market requirement for the products is 75 kg of P and 115 kg of Q. The availability of raw materials is 100 kg of R and 80 kg of S. How much of each should be produced to maximize profit? Formulate the optimization problem. **07**

OR

Q.5 **(a)** Explain the following CAD data transfer methods: **07**

i) Neutral file format

ii) Direct CAD translator

(b) An open rectangular box with square base is to be made from 48 ft.^{2} of material. What dimensions will result in a box with the largest possible volume? **07**

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