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

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2161903 Date:08/05/2018

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.**

Figures to the right indicate full marks

			MARKS
Q.1	**(a)**	Explain interactive computer graphics.	**03**
	(b)	Calculate the memory requirement for the 24-bit true color system for the 1024 x 1024 pixel resolutions.	**04**
	(c)	Explain the concept of FEM and discuss steps involved in FEA.	**07**
Q.2	**(a)**	Explain *same geometry different topology* for solid modeling.	**03**
	(b)	Explain constructive solid geometry.	**04**
	(c)	Explain DDA algorithm for generation of line.	**07**
		OR	
	(c)	Using Bresenham's line algorithm, find the Pixel value position of line between points (1,5) and (4,10).	**07**
Q.3	**(a)**	Explain different types of surfaces with respect to modeling.	**03**
	(b)	Prove that $R(\theta_1).R(\theta_2) = R(\theta_1 + \theta_2)$ for geometrical transformation	**04**
	(c)	A line is represented by the ends (2, 4, 6) and (-3, 6, 9). If the value of parameter u is 0 and 1 at endpoints, determine tangent vector for line. Also determine coordinate represented by u = 0, u = 0.25, u = 0.5 and u = 1. Also, determine length of line and find out unit vector n for line.	**07**
		OR	
Q.3	**(a)**	Develop vector equation of line in parametric form.	**03**
	(b)	Triangle ABC has its vertices at A (4, 2), B (8, 2) and C (6, 5). It is to be rotated anticlockwise about point C through 90^0. Find the new position of triangle.	**04**
	(c)	Plot the Bezier curves having points, P_0 (1, 3), P_1 (5, 6), P_2 (6, 0) and P_3 (7,2). Plot for values u = 0, 0.2, 0.4, 0.6, 0.8, 1.0, if the characteristic polygon is drawn in sequence P_0 - P_1 - P_2 - P_3.	**07**
Q.4	**(a)**	Draw and explain 2D element.	**03**
	(b)	For a 1D linear element prove the relation between displacement, strain and stress $\boldsymbol{\sigma} = E\,\mathbf{B}\,\mathbf{q}$.	**04**
	(c)	Model a tapered bar shown in figure 1 as a single element and determine deflection at 100 mm 200 mm and 300 mm from fixed end. Assume modulus of elasticity as 200 GPa.	**07**
		OR	
Q.4	**(a)**	Explain the statement "FEM operates from part to the whole".	**03**
	(b)	Explain penalty approach used in FEA.	**04**
	(c)	An axial load of 20 KN applied on the bar as shown in figure 2. Using finite element method find the nodal displacement, stresses in each section and the reaction forces.	**07**

Q.5 **(a)** Explain plain stress and plain strains with figure. **03**

(b) A 25 m long 1D element is having linear shape function if the temperature at node 1 is 50^0C and at node 2 is -20^0C, find the temperature at a point 5 m away from node 1. **04**

(c) Compare result in case of 2D transformation of triangle ABC. **07**

1. Reflected about x-axis first followed by line y= -x
2. Rotated about origin at 270^0.

Coordinate of triangle ABC are: A (0, 0) B (3, 0) and C (0, 3).

OR

Q.5 **(a)** Explain degree of freedom in FEA. Show degree of freedom associated with structural, electrical and heat transfer problem. **03**

(b) In a triangular element, temperatures at nodes A, B and C are 100, 200 and 300 ^{0}C respectively. The coordinates of nodes are A (0, 0), B (10, 0) and C (5, 8). Estimate the shape functions associated with nodes and find temperature at point P (5,6). Refer figure 3. **04**

(c) For two member Struss as shown in figure 4, derived global stiffness matrix and determine deflection at node 2. Consider area A = 200 mm^2 and E = 200 GPa for each element. **07**

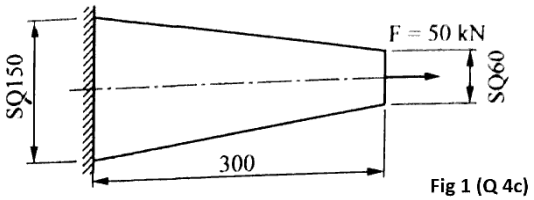

Figure 1 (Q 4c)

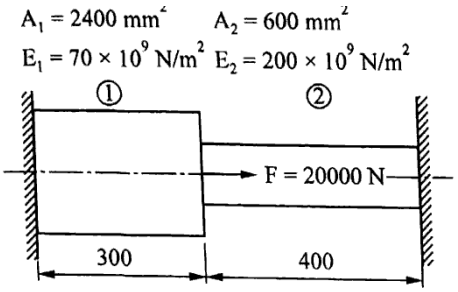

Figure 2 (Q 4c-or)

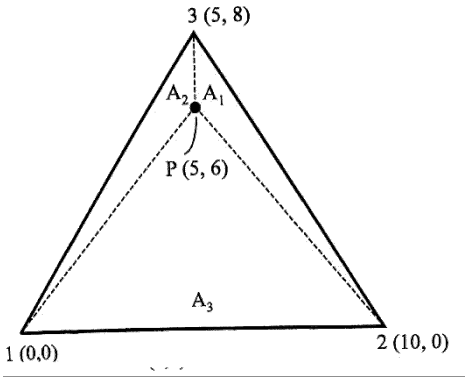

Figure 3 (Q 5b-or)

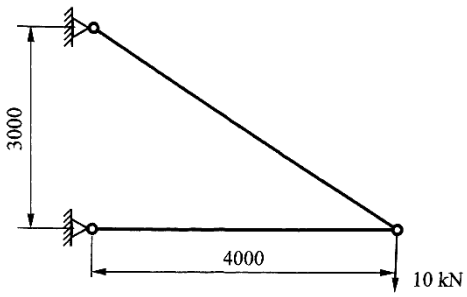

Figure 4 (Q 5c-or)