GANPAT UNIVERSITY

B. Tech. Semester: VII Mechanical Engineering
Regular Examination Nov-Dec 2016
2ME704 Computer Aided Design

Time: 3 Hours   Total Marks: 70

Instructions: 1. Assume suitable data if necessary.
                   2. Write your answer to the point and clearly.

Section - I

Que. – 1		**Attempt all questions.**	
	(a)	Differentiate clearly between raster scan and vector refresh. Give the areas of their applications.	[04]
	(b)	Calculate the points for line points A(1,1) and B (8,5) using Bresenham's line drawing algorithm.	[04]
	(c)	Write program for trigonometric circle generation.	[04]

OR

Que. – 1		**Attempt all questions.**	
	(a)	Define: i) Aspect ratio ii) Resolution iii) World coordinate iv) persistent	[04]
	(b)	Derive decision variable equations for midpoint algorithm for circle.	[04]
	(c)	Determine pixel position on graphical display to draw circle which having center (2,2) and radius 10 using trigonometric method.	[04]
Que. – 2		**Attempt all questions.**	
	(a)	What are the requirements of geometric modeling?	[03]
	(b)	Apply the shearing transformation to square with A(0,0), B(1,0), C(1,1) and D(0,1) as given below: I. Shear parameter value of 0.5 relative to line Y II. Shear parameter value of 1.5 relative to line X	[04]
	(c)	Write a Matlab program for 30^0 clockwise rotation of any geometry.	[04]

OR

|			
Que. – 2		**Attempt all questions.**	
	(a)	Prove following : I. Two successive translations are additive. II. Two successive rotations are multiplicative.	[04]
	(b)	A triangle ABC has vertices as A (2,4), B (4,6) and C(3, 10). It is desired to reflect through an arbitrary line y = 0.5 x + 8. Calculate the new vertices of triangle.	[04]
	(c)	Write a Matlab program for uniform scaling of triangle.	[03]
Que. – 3		**Attempt ANY THREE questions**	[12]
	(a)	What are the limitations of wire frame modeling? Explain with an example.	
	(b)	P0[10 8 0], P1[18 6 0], are data point of cubic curve and P0'[2 2 0], P1'[5 2 0] are tangent vector of end points. Find out intermediate three points.	
	(c)	Explain Graphics standard IGES.	
	(d)	Following are given data points of Bezier curve P_0[3 3 0], P_1[4 5 0], P_2[5 2 0], P_3[5 6 0]. Find out point at u=0.25, 0.5, 0.75.	

Que. – 4   **Attempt all questions.**

(a) Write the procedure of finite element analysis. [06]

(b) Derive the element stiffness matrix for one dimensional bar element [06] from potential energy principle.

OR

Que. – 4   **Attempt all questions.**

(a) What is shape function? Discuss its importance with figure. [06]

(b) Derive the shape function matrix with natural coordinate system from [06] cartesian coordinate system for bar element.

Que. – 5   **Attempt all questions.**

(a) Determine the stresses in 4 cm long bar in figure A, using one linear [08] element model.

$A = 20 \text{ cm}^2$ and $E = 2.1E05 \text{ N/mm}^2$.
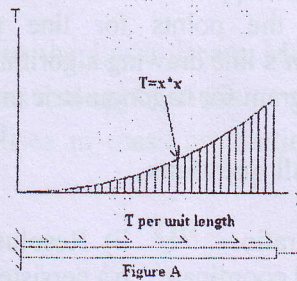
Figure A

(b) Explain penalty approach for treatment of boundary conditions in FEM. [03]

OR

Que. – 5   **Attempt all questions.**

(a) The plane truss shown in Figure B is composed of members having a [08] square 15 mm × 15 mm cross section and modulus of elasticity E = 69 GPa.

a. Assemble the global stiffness matrix.

b. Compute the nodal displacements in the global coordinate system for the loads shown.
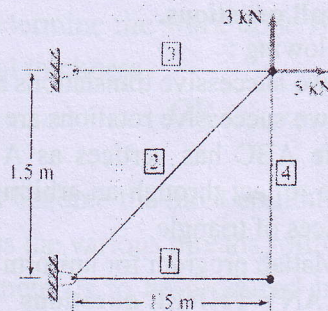
c. Compute the axial stress in each element.

Figure B.

(b) How axial stress is calculated in truss element in global coordinate [03] system? Derive equation for the same.

Que. – 6   **Attempt all questions** [12]

(a) Write a short note on thermal load vector in 1D element.

(b) Write down the FEM form equation of strain energy and explain method to assemble global matrix.

(c) Describe your opinion about mesh quality and its effect on FEM result.

END OF PAPER