Reg No.:_____ Name:_____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree Regular and Supplementary Examination July 2021

Course Code: ME308

Course Name: COMPUTER AIDED DESIGN AND ANALYSIS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any three full questions, each carries 10 marks. Marks

1	a)	Enumerate the historical developments in CAD.	(3)
	b)	Describe with flow chart, the application of computers to the design process.	(5)
	c)	What is Interactive computer graphics (ICG) and Non ICG?	(2)
2	a)	Explain Augmented Reality.	(2)
	b)	What are the types of Data in CAD/CAM?	(3)
	c)	Explain any five advantages of CAD/CAM systems.	(5)
3	a)	List various 2D transformation techniques.	(2)
	b)	Write general form of 2D transformation operator in a homogeneous co ordinate system and write the role of each sub-matrix.	(3)
	c)	Illustrate the steps involved in rotate a triangle about one of its vertices, which are not at origin.	(5)
4	a)	A triangle ABC is defined by its coordinates A(2,3), B(4,3) and C(3,5) which is translated by 2 and 1.5 units along x and y direction and then it is rotated by 60°. Finally it is reflected about y = x. Draw and find the final coordinates of triangle by homogeneous concatenated transformations.	(5)
	b)	A rectangle ABCD is defined by its coordinates A(0,0), B(0,3), C(2,3) and D(2,0) which is translated by 2 and 3 units along x and y direction and then it is sheared about Y-shear with shear element of 1.5 units. Finally it is scaled by 1.5 units along both directions. Find and plot the final coordinates of rectangle by homogeneous concatenated transformations.	(5)

PART B

Answer any three full questions, each carries 10 marks.

5	a)	Draw picture indicating conic sections terminologies.	(2)

b) Find the equation to normal of a parabola given by the equation $y^2 = 4ax$, at $(at^2, 2at)$. (3)

c) With an example illustrate the steps in DDA for drawing a line. (5)

6 a) Write equation to a cubic spline and illustrate the role of each parameter. (2)

b) Discuss the limitations of cubic spline. (3)

c) Illustrate the constructional details of Bezier curve. (5)

7 a) What is second order continuity? (2)

b) Explain the parametric representation of curves. (3)

c) The coordinates of four control points relative to a current WCS are given by $P_0 = [2\ 2\ 0]^T$, $P_1 = [2\ 3\ 0]^T$, $P_2 = [3\ 3\ 0]^T$ and $P_3 = [3\ 2\ 0]^T$. Find the equation of the resulting Bezier curve. Also, find the point on the curve for u=0.75. (5)

8 a) Differentiate topology and geometry of an object. (3)

b) Explain representation scheme for solid modeling. (3)

c) Describe the constructive solid geometry method. (4)

PART C

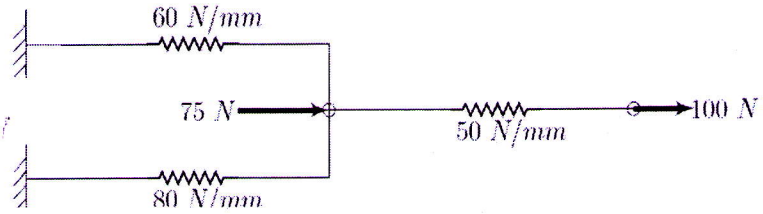
Answer any four full questions, each carries 10 marks.

9 a) Describe the various modules in FEA software. (5)

b) What is discretisation? Sketch two types elements each for one-dimensional and two dimensional domains. (3)

c) What is the importance of enforcing boundary conditions in FEM. (2)

10 a) Determine Global stiffness matrix and find the unknown displacement of the spring system as shown in Figure. (6)



b) Enlist the important properties of Global stiffness matrix. (4)

11 a) Discuss the role of shape function in a FE problem. (2)

b) The nodal displacement for a 1D element is 2mm and 4mm respectively. If the length of the element is 60 cm, find the displacement at a point 20 cm from the left end. (3)

c) Derive shape function for a 1D element. (5)

12	a)	Discuss the term, load vector in a FE problem.	(2)
	b)	Illustrate the concept of isoparametric elements in FEM.	(3)
	c)	With an example illustrate the steps to solved in solving a structural problem using any software package based on FEM.	(5)
13	a)	Define C^0 and C^1 continuity with examples.	(3)
	b)	Describe Gaussian Quadrature numerical integration scheme in FEM.	(4)
	c)	Define plane stress element and give example.	(3)
14	a)	Explain the nature of shape functions in constant strain elements.	(2)
	b)	How the shape functions are represented by area coordinates?	(3)
	c)	Calculate the pressure at a point P (2, 1.5) inside a triangular element of coordinates (4, 0.5), (2, 5) and (0, 0). The nodal values of pressure are 40 MPa, 34 MPa and 46 MPa respectively.	(5)

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