Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

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 applications of computer to the design process?	(5)
	b)	Comment on the advantages of CAD compared to traditional designing?	(3)
	c)	Explain (i) Wireframe modelling (ii) Surface modelling	(2)
2	a)	Explain in details about the 2D transformation of points and line	(5)
	b)	Consider the line of coordinates (1, 1) and (2, 4). Rotate the line about the origin by 30°. Determine the transformation of line.	(3)
	c)	Describe 2D concatenation?	(2)
3	a)	Explain the Data Exchange Formats.	(5)
	b)	Explain Graphic Standards.	(5)
4	a)	A line of end points (5, 8) and (6, 11) should be rotated about one of its end point (5, 8) through 30° anticlockwise. Explain the transformation	(6)
	b)	Explain GUI and ICG	(4)

PART B

Answer any three full questions, each carries 10 marks.

5	a)	Differentiate between Bezier curve and Hermit curve.	(5)
	b)	Comment on the benefits of using B-spline curves.	(3)
	c)	Define Control nets.	(2)
6	a)	Explain the various methods for solid model representation	(8)
	b)	Explain the need of Boolean operation in 2D model?	(2)
7	a)	Write and explain the parametric equation for Bezier curve.	(5)
	b)	Explain various types of surface entities.	(5)

8 a) Explain about Boundary Representation solid modelling technique. (5)

b) Illustrate the sweep representation modelling citing an example. (5)

PART C

Answer any four full questions, each carries 10 marks.

9 a) List and describe steps involved in FEA (10)

10 a) Derive the interpolation function for constant strain triangular element (10)

11 a) A tapered bar of length 600mm is having cross sectional areas of 650 mm^2 and 350mm^2 at two ends. The bar is fixed at the end having larger area and subjected to axial forces 40kN which is acting axially outwards at the smaller end and 10kN, acting at a point 200mm from smaller end and directing axially towards the larger side. The Modulus of Elasticity of the bar is $200*10^3$ N/mm^2. Model the bar with three finite elements and Determine (8)

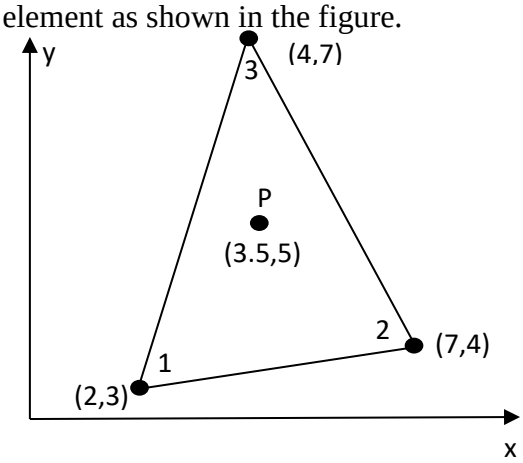
i. The nodal displacements.

ii. The stresses in each element.

iii. The reaction force at the support.

b) What is meant by Dynamic analysis. (2)

12 a) Determine the shape functions N_1, N_2 and N_3 at the interior point P for the triangular element as shown in the figure. (6)



b) Derive the stiffness matrix for CST (2D) element (4)

13 a) Explain the following terms briefly (6)

(i) Discretization process

(ii) Global Stiffness Matrix

(iii) Quad4 element

b) Differentiate between a Rod element and Bar element. (4)

14 a) For the plane stress element whose co-ordinates are given by (100, 100), (400, 100) and (200, 400). The nodal displacements are u_1=2mm, v_1=1mm, u_2=1mm, v_2=1.5mm, u_3=2.5mm, v_3=0.5mm.Determine the elemental stress. Assume E=200 GN/m^2 , μ=0.3, t=10mm (8)

b) Define isoparametric element. (2)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

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)	Discuss the steps in conventional design process.	(3)
	b)	In which of these steps in design, computerisation is possible and how?	(4)
	c)	List three benefit of CAD over conventional design.	(3)
2	a)	Name three each software packages for Computer Aided Design (Modelling) and Computer Aided Analysis.	(3)
	b)	List any six user interaction devices used in CAD system.	(3)
	c)	Define IGES? Describe its file structure.	(4)
3	a)	Explain the basic transformations in CAD?	(3)
	b)	A rectangle of length 60 mm and width 30 mm with left bottom vertex coinciding with the origin is to be transformed into a square with 90 mm sides having the origin coinciding with centroid of the square. Describe the transformations and sketch the both rectangles.	(7)
4	a)	Write the transformation matrices for front view, top view and bottom view in orthographic projection.	(6)
	b)	Briefly compare between the vector generation and raster in computer graphics.	(4)

PART B

Answer any three full questions, each carries 10 marks.

5	a)	Compare Synthetic curves with Analytic curves	(3)
	b)	Identify the advantages of Bezier curves over cubic curves.	(5)
	c)	Calculate the equation for tangent of a curve $y = 2x^2+3$ at a point $x=1$	(2)
6	a)	List the methods for generating curves.	(2)
	b)	Briefly describe about synthetic surfaces?	(3)
	c)	List the standard surfaces used for modelling and sketch any three.	(5)
7	a)	Comment on solid modelling?	(3)
	b)	List the method for solid modelling?	(3)
	c)	With sketches describe constructive solid geometry method.	(4)
8	a)	With the aid sketches give comparison between linear sweep and rotational sweep.	(6)

b) List and state four modelling tools in solid modelling. (4)

PART C

Answer any four full questions, each carries 10 marks.

9 a) Explain FEM? (2)

b) List the various steps in FEM. (3)

c) What is discretisation? Sketch two types elements each for one-dimensional and two-dimensional domains. (5)

10 a) Derive the shape function for one-dimensional linear element, plot its variation along the element. (4)

b) The nodal values of displacements for a one-dimensional element are 3 mm and 7 mm respectively. Determine the displacements at $1/3^{rd}$ lengths of the element considering it as linear element. (2)

c) In the above problem, if the displacement at midpoint of the element is given as 5 mm, determine the displacement at $2/3^{rd}$ length of the element considering it as quadratic element. (4)

11 a) Write the standard form of the discretised equation in FEM formulation, naming each term it. (3)

b) Write the integral equation for element stiffness matrix with conventional notations. (2)

c) Determine the stiffness matrix for a one-dimensional linear element of length 10 cm and cross-sectional area 1 square centimetre. Take $E=2X10^5$ N/mm^2 (5)

12 a) Elaborate about node connectivity matrix, what is its use? (4)

b) Sketch a simple truss with seven members and five joints is given in Fig.1. Divide and number each element and node of the truss, considering each member as one-dimensional linear element. Also prepare the node connectivity matrix for this. (6)

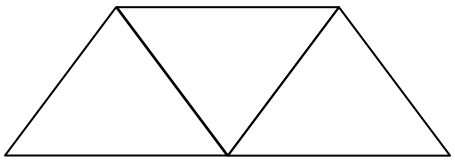

Fig.1

13 a) Enumerate and describe the types of elements used in two-dimensional domains? (5)

b) Sketch and compare the CST and LST triangular elements. (5)

14 a) Define Iso-parametric elements. Sketch a general quadrilateral element in cartesian and map into a rectangular iso-parametric element in natural coordinates (7)

b) Elaborate on Gauss quadrature method? where is it used in FEM? (3)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth semester B.Tech degree examinations (S), September 2020

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)	What are steps in conventional design? Which of these can be computerised?	(6)
	b)	List some engineering applications of CAD.	(4)
2	a)	Name two software packages each used in CAD, CAM and CAE.	(6)
	b)	Name and describe any two data exchange formats for computer graphics.	(4)
3	a)	What is homogeneous coordinate system and explain it use?	(4)
	b)	Write the transformation matrices for rotation about z, y and x axes in homogenous coordinates.	(6)
4	a)	Represent the tetrahedron with vertices (2,2,1), (5,3,1), (3,1,3) and (4,7,2) in matrix with homogeneous coordinates.	(3)
	b)	Determine the transformation matrix for displaying the top view of above tetrahedron, and sketch the top view.	(7)

PART B

Answer any three full questions, each carries 10 marks.

5	a)	What are the drawbacks of DDA line drawing algorithm?	(4)
	b)	Digitise and plot the line with endpoints (2,4) and (6,9) using any line drawing algorithm.	(6)
6	a)	Calculate the slope of the tangent and normal to the function $y = 3x^3+2x^2-x+5$ at $x=2$	(4)
	b)	What are Hermite curves? What are the methods to modify the shape of Hermite curves?	(6)
7	a)	What are the limitations of Hermite curves?	(5)
	b)	What is the advantage of B-Spline curve over Bezier curve?	(5)
8	a)	What is blending function? List some properties of the blending function.	(6)
	b)	Name and describe any two methods for representing solid models.	(4)

PART C

Answer any four full questions, each carries 10 marks.

9 a) What is FEM? Describe briefly the main steps in FEM. (8)

b) What is use of shape function in FEM? (2)

10 What are the different types of elements in used in FEM for 1D, 2D and 3D problems? Sketch two types of element s for each case. (10)

11 a) Derive the shape for one dimensional linear element and plot it distribution along the element. Also obtain the expression for the gradient of shape function and plot it. (6)

b) The axial displacements at the end points for one dimensional element subjected to axial force are 2 mm, 5 mm respectively. Determine the axial displacement of a point at distances of $1/3^{rd}$ and $2/3^{rd}$ of its length from one end. (4)

12 Derive the shape functions for linear triangular element, and also obtain the expression for the gradient of shape function. (10)

13 a) Differentiate between global coordinates, local coordinate and natural coordinates. (3)

b) Determine the x and y coordinate of point P (x,y) for the triangular element shown in Fig.1. The shape functions N_1 =0.3 and N_3 = 0.2.

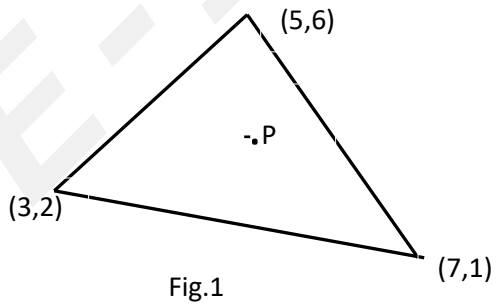

Fig.1

(7)

14 a) What are isoparametric elements? (4)

b) Sketch the linear and quadratic quadrilateral isoparametric elements. (6)

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