

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**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 its use?  | (4) |
|   | b) Write the transformation matrices for rotation about z, y and x axes in homogeneous 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**

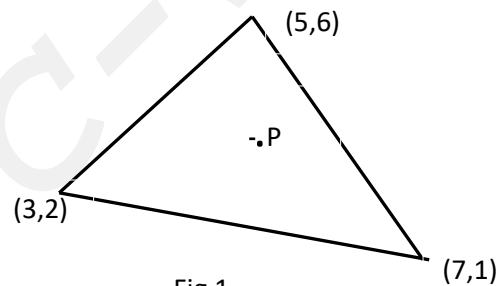
*Answer any three full questions, each carries 10 marks.*

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|---|---|-----|
| 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  $1/3^{\text{rd}}$  and  $2/3^{\text{rd}}$  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  $N_3 = 0.2$ .



- 14 a) What are isoparametric elements? (7)  
 b) Sketch the linear and quadratic quadrilateral isoparametric elements. (4)

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