

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

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

**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  $1/3^{\text{rd}}$  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  $2/3^{\text{rd}}$  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  $E=2 \times 10^5 \text{ N/mm}^2$  (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)

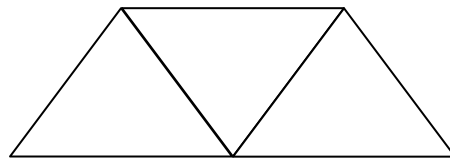


Fig.1

- 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)