Reg. No_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: ME308

Course Name: COMPUTER AIDED DESIGN AND ANALYSIS (MA, ME, MP, PE)

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any three full questions. Each question carries 10 marks.

1	a	Draw Lay out representing design procedure	(2)
	b	List three software packages for CAD, CAM and CAA.	(3)
	c	Draw layout representing hardware details in a CAD work station.	(5)
2	a	Illustrate basic working principle of any interactive device.	(2)
	b	Write basic specifications of three hardware components in CAD.	(3)
	c	List five advantages using CAD.	(5)
3	a	Write 2D transformation operators for shearing, scaling, reflection and rotation.	(2)
	b	Formulate matrices for producing orthographic projection of a parallelepiped.	(3)
	c	Find the co ordinates of a reflected triangle having vertices (2,4), (4,3) and (3,7) about an arbitrary line represented by y= 2x+2. Plot the transformed triangle.	(5)
4	a	Write steps to rotate a triangle about its centroid which is not at origin.	(2)
	b	Derive 2D rotation transformation matrix and show that it is orthogonal.	(3)
	c	A square having co ordinates (2,2),(5,2), (5,4) and (2,4) is to be rotated about the pont (2,2) in clockwise direction at an angle 60^{o} and after that it is scaled to 3 unit in X direction and 2 unit in Y direction. Find and plot the final co ordinates of the geometry.	(5)

PART B

Answer any three full questions. Each question carries 10 marks.

5	a	With a suitable example explain the formulation of tangent and normal to a curve.	(2)
	b	Write properties of a cubic spline segment.	(3)
	c	Compare Bezier curve and B-spline curve.	(5)
6	a	Define blending function with a suitable example.	(2)
	b	State the features of bi cubic surface.	(3)
	c	Obtain the mathematical representation to show the continuity of adjacent cubic spline segments.	(5)
7	a	List the advantages of solid models.	(2)

	b	Illustrate CSG for solid modelling technique.	(3)
	c	List the advantages of surface models and solid models.	(5)
8	a	What is meant by spatial occupancy enumeration?	(2)
	b	Illustrate cell decomposition.	(3)
	c	Compare various solid modelling techniques.	(5)

PART C

Answer any Four full questions. Each question carries 10 marks.

9	a	State different types of finite elements and their applications.	(2)
	b	Formulate load vector for a vertically hanging bar.	(3)
	c	Derive shape function for 1D element.	(5)
10	a	State two properties of stiffness matrix.	(2)
	b	What is the role of transformation matrix while analysing truss elements?	(3)
	c	A vertically hanging bar is to be modelled by FEM. It is discretised in to four elements. It is subjected to a load of 10 kN at its end. If each element is considered to be having length of 300mm, Formulate the Global stiffness matrix. Find displacement at each nodes using Gauss elimination method.	(5)
11	a	Differentiate displacement and structural boundary conditions.	(2)
	b	A two nodded bar element having nodal variable u1 = 4mm and u2 = 6mm. Length of the element is l m. Find the displacement at points, l /3 of the element.	(3)
	c	With suitable example discuss the procedure to analyse a framed structure using a FE software package.	(5)
12	a	Define plane stress element and give example.	(2)
	b	Differentiate LST and CST elements.	(3)
	c	Illustrate the application of Gaussian quadrature in the analysis of plane stress problems.	(5)
13	a	Differentiate shape function and natural coordinate of a finite element.	(2)
	b	How polynomials suits to formulate shape functions.	(3)
	c	Formulate natural co ordinate of a triangular elements.	(5)
14	a	Distinguish with example, plane stress and plain strain problems.	(2)
	b	Write Pascal's triangle and explain the suitability of each level to model engineering problems.	(3)
	c	Differentiate isoperimetric, sub parametric and super parametric elements.	(5)

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