Hall Ticket No	Quest	ion Paper Code: AME014
	STITUTE OF AERONAUTICAL ENGINEE (Autonomous)	RING
"10# 108 LINE"	B.Tech VI Semester End Examinations (Regular), November – 20 Regulation: IARE–R16 FINITE ELEMENT MODELLING)20
Time: 2 Hours	(ME)	Max Marks: 70
	Answer any Four Questions from Part A Answer any Five Questions from Part B	
	$\mathbf{PART} - \mathbf{A}$	
1. The stress vector	or at a point of a body is $[402030 - 301510]^T$ MPa. Find the correspondence	onding strain vector if

	$E = 200 GPa and \vartheta = 0.25.$	[5M]
2.	Determine the shape functions for beams and draw the shape functions.	[5M]
3.	What is the condition for number of unknown polynomial coefficients of a 2-D element.	[5M]
4.	What are different types of boundary conditions for 1D heat conduction problems?	[5M]
5.	What are the properties of eigen values and eigen vectors.	[5M]
6.	Differenciate between the plane stress and plane strain condition?	[5M]
7.	Determine the strain displacement matrix for triangular element.	[5M]
8.	Give some practical problems associated with finite element modelling.	[5M]

$\mathbf{PART} - \mathbf{B}$

9.	Determine stiffness matrix of 2-noded axial bar element using potential energy approach.	[10M]
10.	Explain the equilibrium state of the system, when the system is subjected to different types of loads and the stress and equilibrium relations.	explain [10M]
11.	Obtain the stiffness matrix of a 2-noded beam element starting from Hermite shape functions.	[10M]
12.	Find the expression for element stiffness matrix for two dimensional truss element.	[10M]
13.	Determine the element stiffness matrix and nodal load vectors, nodal displacement matrix for a CST ele	ement. [10M]
14.	Determine the shape functions for a 8 node quadratic quadrilateral element (boundary noded).	[10M]
15.	The coordinates of a 3-noded triangle thermal element are 1 $(1, 1)$, 2 $(10, 4)$ and 3 $(6, 7)$. The correspondal temperatures are 120, 140 and 80 respectively in ⁰ C. Assuming linear temperature within the element temperature at a point P whose coordinates are $(7, 4)$.	onding lement. [10M]
16	A sheft of rootangular arose section of dimensions 8 am x 6 am is having quarter symmetry when subje	eted to

16. A shaft of rectangular cross section of dimensions 8 cm x 6 cm is having quarter symmetry when subjected to out of plane twisting moment. Compute the global stiffness matrix assuming that the quarter of the rectangular cross section is divided into two triangle elements of equal size. [10M]

- 17. A beam of span 2L is fixed at both ends. Determine the frequencies of natural vibrations of this beam. The elastic modulus, density, area of cross-section and area moment of inertia are E, ρ , A and I respectively. Take two elements and use lumped mass matrix. [10M]
- 18. Differentiate lumped mass matrix and consistent mass matrix. Give application of FEM in analyzing the dynamic field problems. [10M]