## VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD M.E. (Mech. Engg.: CBCS) I-Semester Main Examinations, January-2019

(Advanced Design & Manufacturing)

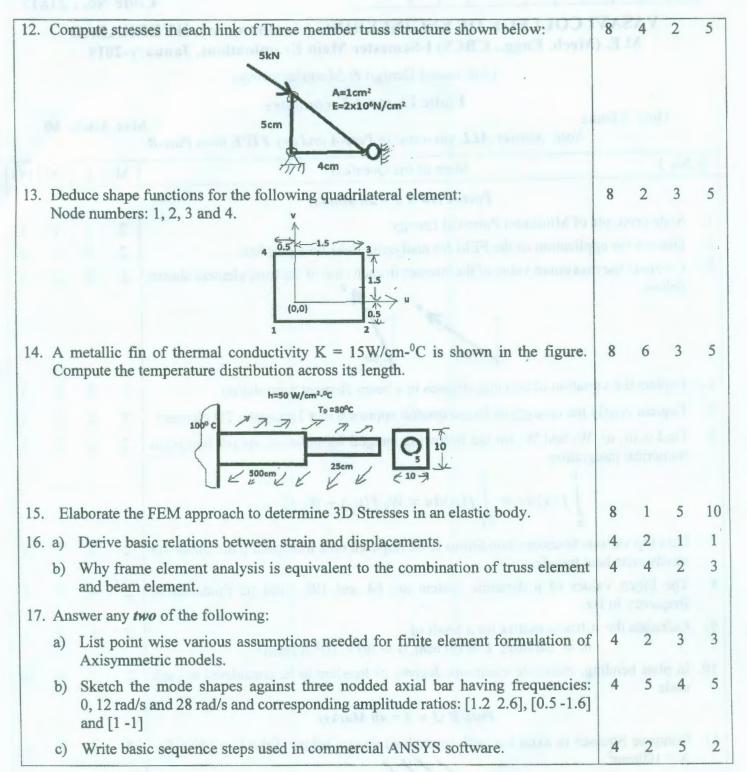
## Finite Element Techniques

Time: 3 hours

Max. Marks: 60

Note: Answer ALL questions in Part-A and any FIVE from Part-B

1.					PO
1.	$Part-A (10 \times 2 = 20 Marks)$		3-4		
	State principle of Minimum Potential Energy.	2	1	1	1
2.	Discuss the application of the FEM for analyzing fluid flow problem.	2	2	1	2
	Compare the maximum value of the stresses in each case of the truss element shown below:	2	3	2	3
4.	Explain the variation of bending stresses in a beam element formulation.	2	2	2	3
5.	Explain briefly the concept of Isoparametric approach in a Triangular 2D element.	2	2	2	3
	Find u, u <sub>1</sub> , u <sub>2</sub> , W <sub>1</sub> and W <sub>2</sub> for the following integral formulation. As per two point numerical integration. $\int_{a}^{b} f(x)dx = \int_{-1}^{1} f(u)du = W_1 f(u_1) + W_2 f(u_2)$	2	4	3	5
7.	Develop various boundary conditions to be imposed on a triangular plate under 2D steady state heat transfer.	2	2	3	5
8.	The Eigen values of a dynamic system are 64 and 108. Find its fundamental frequency in Hz.	2	4	3	5
9.	Calculate the stiffness matrix for a Shaft of $d = 20 \text{ mm}, L = 60 \text{ mm}, G = 80 \times 10^3 \text{ N/mm}^2$ .	2	3	3	3
10.	In plate bending, elaborate minimum degrees of freedom to be considered at each node.	2	1	4	10
	Part-B $(5 \times 8 = 40 \text{ Marks})$	11			
11.	Compute Stresses in axial bar with linear load shown below: Take $E = 180$ GPa, $A = 100 \text{mm}^2$ .	8	3	2	3
	consider the load as 2 KN at node 2 which is a mid-node				



M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	50%
2	Knowledge on application and analysis (Level-3 & 4)	35%
3	*Critical thinking and ability to design (Level-5 & 6)	15%
	(*wherever applicable)	