Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

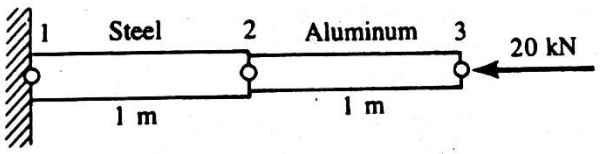
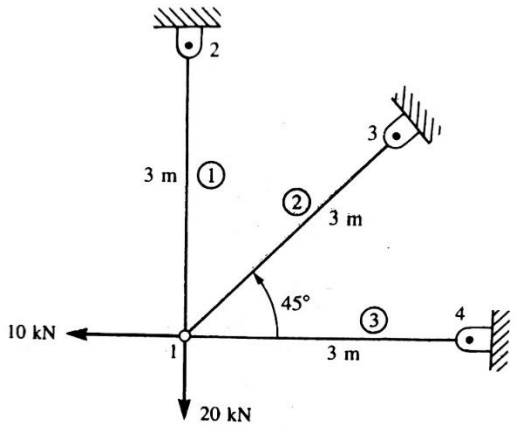
End Semester Examination, May 2021

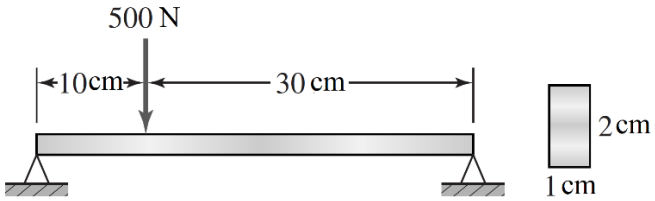
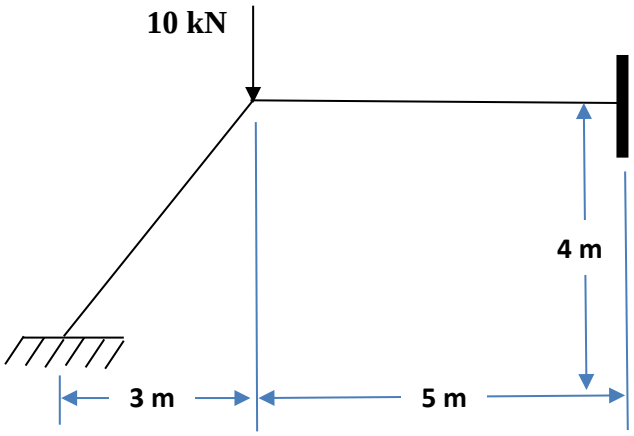
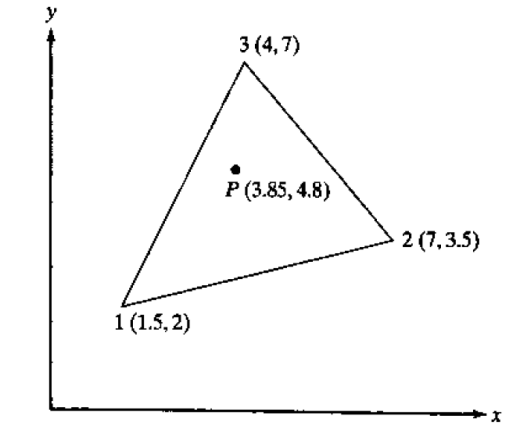
Programme Name: B.Tech ADE | **Semester : 8th**
Course Name : Finite element method | **Time : 03 hrs**
Course Code : MECH4007P | **Max. Marks : 100**
Nos. of page(s) : 03

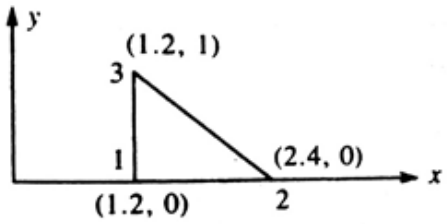
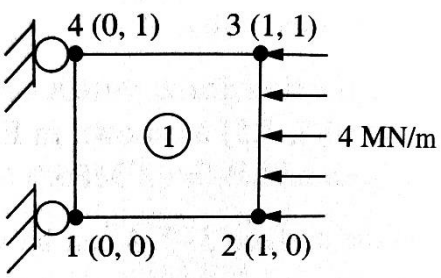
SECTION A

S. No.		Marks	CO
Q 1	Explain the difference between finite element method and classical methods.	5	CO1
Q 2	Explain the Rayleigh Ritz method.	5	CO1
Q 3	Why are the polynomials preferred as shape functions?	5	CO1
Q 4	Explain plane stress and plane strain problems.	5	CO1
Q 5	Explain the properties of the global stiffness matrix.	5	CO1
Q 6	Explain the terms nodes, primary nodes, secondary nodes and internal nodes.	5	CO1

SECTION B

Q 7	A composite rod subjected to compression is modeled by two bar elements, as shown in Figure. Determine the nodal displacements and the axial stress in each element. 	10	CO2
Q 8	A plane truss is loaded and supported as shown in Figure. Determine the displacements at the free end using finite element method. Take, E = 200 GPa and A = 200 mm^2 	10	CO2

Q 9	For the beam shown in Figure, determine the nodal values at the point of applied load. Take E = 200 GPa. 	**10**	**CO3**
Q 10	For the frame shown in Figure, determine the global stiffness matrix and load vector and apply the boundary conditions using the elimination approach. Take E = 200 GPa and Area = 2×2 cm^2 	**10**	**CO3**
Q 11	Determine the determinant of the Jacobian for the triangular element shown in Figure. 	**10**	**CO3**
SECTION-C			

Q 12	Determine the stiffness matrix for the element shown in Figure. The coordinates are in units of meters. Assume plane stress condition. Let E = 200 GPa, v = 0.25 and thickness t = 0.05 m.  	**20**	**CO3**
	OR		
	If the sides of a rectangular box are 1 m, determine the stiffness matrix and load vector of the element. E = 5 GPa and v = 0.25. horizontal roller constraints are assumed at node 1 and 4.  	**20**	**CO3**