Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH (CIVIL ENGINEERING) END SEMESTER EXAMINATIONS

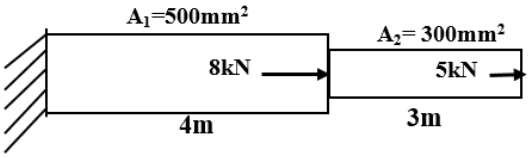
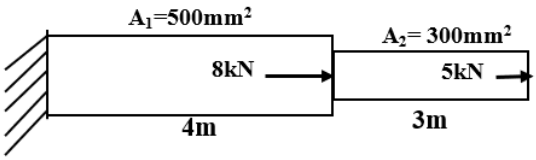
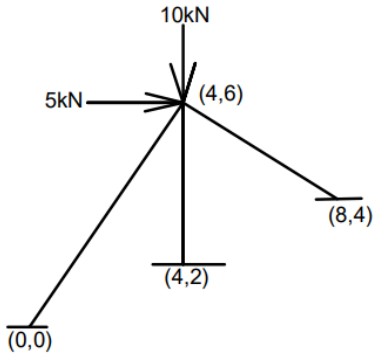
NOV/DEC-2022

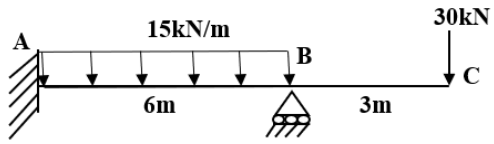
SUBJECT: FINITE ELEMENT METHOD OF ANALYSIS
[CIE 4065]

Date of Exam: Time of Exam: 3 hours Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions & missing data may be suitably assumed
- Compulsorily write DOF numbers and node numbers wherever required.

1A.	Explain principle of minimum potential energy and its application in FEM.	**(4)**	**CO1**
1B.	Derive shape function for 2 noded bar element.	**(4)**	**CO2**
1C	Derive transformation matrix for 2 noded plane truss element	**(2)**	**CO3**
2A	Analyze the bar shown in Figure. Take $E=2\times10^5 N/mm^2$ 	**(7)**	**CO2**
2B	Nodal displacements of the bar shown in Figure, is assumed to be [0, 0.6mm, 0.9mm] at nodes 1,2 and 3 respectively (from left to right). Determine the member forces in the bar. Take $E=2\times10^5 N/mm^2$ 	**(3)**	**CO2**
3A	Analyze the plane truss shown in figure. Coordinates of nodes are given in metres. Take $A= 1000mm^2$. $E= 1.8\times10^5 N/mm^2$ 	**(7)**	**CO3**

3B	Explain the procedure to obtain the stiffness matrix of a space truss element in global direction.	**(3)**	**CO3**
4A.	Describe the displacement model and write the shape functions for a 2 noded beam element with neat figure.	**(3)**	**CO4**
4B.	Analyze the beam shown in the figure. Take EI=3,000 kNm^2. 	**(7)**	**CO4**
5A.	Determine the strains at (r , s)= (½ ,0) in a 4-noded element defined by Cartesian coordinates{(0,0),(6,0),(6,7),(0,7)} when the corresponding nodal displacements are {(0,0), (0.1,0.4),(0.4,0.4),(0,0)}.	**(7)**	**CO5**
5B.	Distinguish between plane stress and plane strain problems.	**(3)**	**CO5**