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

VII SEMESTER B.TECH (CIVIL ENGINEERING) END SEMESTER EXAMINATIONS
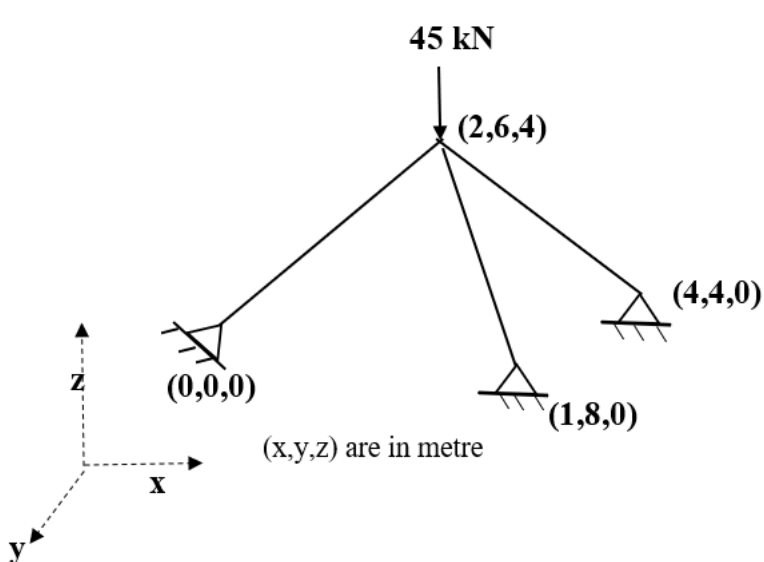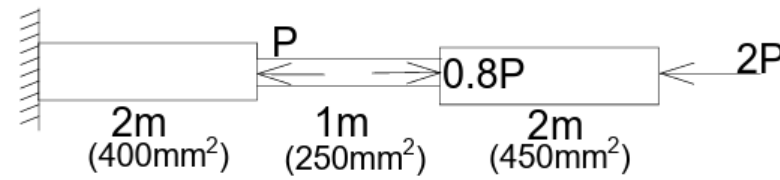NOV/DEC-2023
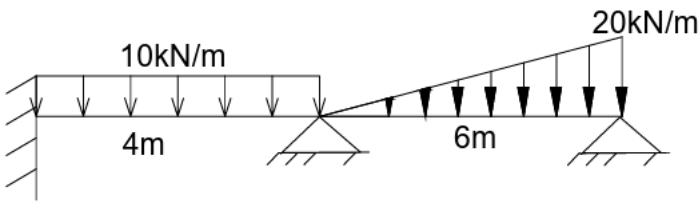### SUBJECT: FUNDAMENTALS OF FEM
[CIE 4082]

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.	Discuss principle of minimum potential energy	**(5)**	CO1
1B.	Apply Rayleigh Ritz method to derive an expression for maximum deflection in a simply supported beam subjected to UDL throughout.	**(5)**	CO2
2A	Derive shape function of a 2 noded bar element.	**(4)**	CO2
2B	Derive stiffness matrix of a beam element	**(3)**	CO3
3A	Analyze the truss shown in figure using FEM.	**(5)**	CO4
3B	Analyze the bar shown in figure below using FEM. Dimensions and C/s area are provided in figure. Take P= 50kN.	**(5)**	CO3

4A	Evaluate the integral $\int_{-1}^{1} x^2 + x + 3$ using Gaussian Quadrature. Compare it with classical solution.	(3)	CO3
4B	Analyze the beam shown in the figure below. 	(7)	CO4
5A	Derive shape functions of a quadrilateral element	(4)	CO4
5B	Distinguish plane stress and plane strain conditions with relevant examples.	(2)	CO4
5C	Explain incremental method in nonlinear finite element analysis with a suitable example.	(4)	CO5