R20 Regulation *Subject code: 3P7CA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech VII Semester Supplementary Examinations, November 2025

FINITE ELEMENT METHODS

(ME)

Maximum Marks: 70 Date: 24.11.2025 Duration: 3 hours

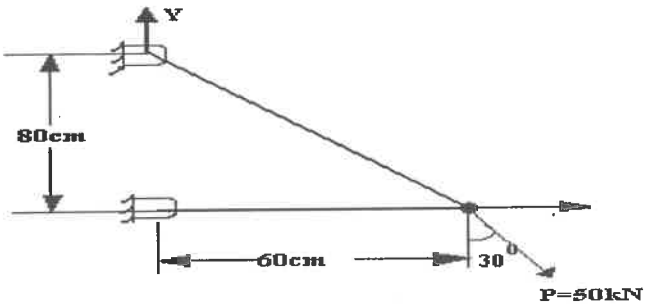
Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	Define Finite Element Method.	2M	1	L1
2	What is Discretization?	2M	1	L1
3	How the element displacement vector q is represented?	2M	2	L1
4	Explain the shape functions used in 1-D Bar problems.	2M	2	L1
5	What are local coordinates?	2M	3	L1
6	Write the stiffness matrix of a bar element.	2M	3	L1
7	What is purpose of constant strain triangles in FEM.	2M	4	L1
8	Draw the beam element and show the slopes in it.	2M	4	L1
9	Write the Lagrangian interpolation function?	2M	5	L1
10	What is the required condition for the Eigen vector?	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	Different types of boundary conditions? Give examples.	10M	1	L2
	OR			
12	List the various methods of solving boundary value problems.	10M	1	L2
13	Derive the strain displacement matrices for triangular element of revolving body.	10M	2	L2
	OR			
14	Explain the elimination method and penalty method for imposing specified displacement boundary conditions.	10M	2	L2
15	Explore the stress strain relation for 2D and 3D elastic problems.	10M	3	L2
	OR			
16	The spring system show in the figure, find the displacement the nodes and the reactions given K1=100N/mm^2, K2=200N/mm^2, K3 =100N/mm^2 and P=500N Stiffness matrix.	10M	3	L2

				
17	Determine the temperature distribution in a fin having rectangular cross section and is 8 cm long, 4 cm wide and 1 cm thick. Assume convection heat loss occurs from the free end of the fin. One end is fixed. Take k=3 W/cm0C, h= 0.1 W/cm^2 ^{0}C and T∞=20^{0}C.	10M	4	L2
	OR.			
18	Calculate the nodal displacements for the truss shown in the figure. E= 70Gpa, A=2cm^2 for all truss members. 	10M	4	L2
19	Draw beam element in global and intrinsic co-ordinate system.	10M	5	L2
	OR			
20	Use galerkin's approach to find the stiffness matrix of a torsional triangular element.	10M	5	L2