QP Code: RM23MTECH095 | Reg. No | | | | | | | | | | | AY 23

GIET UNIVERSITY, GUNUPUR – 765022

M. Tech (Second Semester) Examinations, May – 2024

MPCMD2010 /MPEMT2043 –Finite Element Methods

(MD / MFT)

Time: 3Hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer all questions	CO#	Blooms Level
a. Can you outline the key steps involved in the finite element method?	CO1	K2
b. Assess the benefits of the finite element method compared to other analysis techniques.	CO1	K2
c. Briefly describe why the finite element method is considered versatile in solving complex engineering problems?	CO1	K2
d. How is the stiffness matrix derived for a simple spring element?	CO2	K3
e. Explain the purpose of the global stiffness matrix in truss analysis?	CO3	K2
f. Explain the potential energy approach in deriving beam element equations.	CO2	K3
g. How do you evaluate the stiffness matrix using Gaussian quadrature?	CO4	K2
h. Explain the concept of axisymmetric elements in structural analysis.	CO3	K3
i. Explain the constant-strain triangular element stiffness matrix?	CO4	K3
j. How does the shape function play a role in isoparametric formulation?	CO4	K3

PART – B **(10 x 5=50 Marks)**

Answer ***ANY FIVE*** questions	Marks	CO#	Blooms Level
2. a. List out various application of FEM. Explain how boundary conditions are incorporated into the FEM analysis of a 2D lamina.	5	CO1	K3
b. Derive the relationship between the element stiffness matrix, nodal displacements, and internal forces in a bar element.	5	CO1	K2
3.a. Derive the element stiffness matrix for a simple truss element with two degrees of freedom.	5	CO3	K3
b. Can you walk through the computation of stress for a bar in the x-y plane and discuss the factors that influence the stress distribution?	5	CO2	K3
4. a. Derive the transformation matrix used to convert displacements from local to global coordinates for a bar element.	5	CO3	K3
b. Describe the fundamental differences between plane stress and plane strain analysis, and how do they influence structural behavior?	5	CO2	K3
5.a. Analyze the advantages and disadvantages of using linear-strain triangular elements in structural analysis.	5	CO4	K4
b. Explain the potential benefits of using FEM in the design and optimization of engineering structures.	5	CO2	K3
6. a. Discuss the concept of isoparametric formulation and its relevance in finite	5	CO4	K3

	element analysis.			
b.	Explore the solution of an axisymmetric pressure vessel, including the boundary conditions and loadings considered.	5	CO4	K4
7.a.	Elaborate on the principles behind Gaussian quadrature and its application in numerical integration for evaluating stiffness matrices.	5	CO4	K3
b.	Discuss the mathematical formulation and computational procedures involved in analyzing stress and strain using tetrahedral elements.	5	CO3	K3
8. a.	Explain how boundary conditions are applied and solved in three-dimensional stress analysis using finite element methods.	5	CO3	K4
b.	Explore the role of shape functions and interpolation techniques in the development of plate bending elements.	5	CO4	K3

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