K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

SUMMER-2024	
Exam Seat No.:	
Academic Year: 2023-2024	Semester: II
Class: FY	Program: M.Tech
Branch Code: CIV	Pattern: 2022
Name of Course: Finite Element Method	Course Code: CIV225108
Max. Marks: 60	Duration:2.50 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 02 pages.
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Question No. 1 Attempt following Question

1a)   Enlist and draw the various types elements used in finite element analysis with their applications.   (6)   CO1

Question No. 2 Attempt following Question

2a)   Explain in detail -   (6)   CO2

    a) Principle of minimum potential energy (3 marks)

    b) Galerkin method   (3 marks)

Question No. 3 Attempt following Question

3a)   Derive shape function for two noded beam (bending) element using polynomials.   (8)   CO3

<div align="center">**OR**</div>

3b)   Derive shape function for a four noded rectangular element using polynomials.   (8)   CO3

3c)   Obtain the shape functions for a nine noded two dimensional Lagrange rectangular element.   (8)   CO3

<div align="center">**OR**</div>

3d)   Derive shape functions of eight noded rectangular serendipity element. Use natural coordinate system.   (8)   CO3

Question No. 4 Attempt following Question

4a)   Explain Jacobian matrix in case of two dimensional isoparametric element.   (8)   CO5
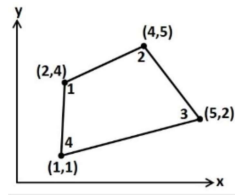
4b)	For an axisymmetric element state relation between Strain and Displacement.	(8)	CO5
4c)	What are the advantages of isoperimetric elements. State and explain sub classes of Isoparametric elements.	(8)	CO5

<div align="center">**OR**</div>

4d)	Obtain Jacobian matrix for the quadrilateral element as shown in figure using isoparametric formulation.	(8)	CO5

Question No. 5 Attempt following Question

5a)	Write minimum eight displacement functions for BFS element.	(8)	CO4

<div align="center">**OR**</div>

5b)	What do you understand by C^0, C^1 and C^2 continuity? Explain with suitable examples.	(8)	CO4
5c)	Explain Mindlin's theory of plate element.	(8)	CO4

<div align="center">**OR**</div>

5d)	Write displacement fields in 4 noded degenerated shell element.	(8)	CO4

<div align="center">**XXXXXXXXXXXXXXXXXXXXXXXXXXXXX**</div>