K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:II
Class:PG-I	Program:M.Tech
Branch Code:CIV	Pattern:2024
Name of Course:Finite Element Method	Course Code:2404512
Max. Marks:60	Duration:2.30 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 two page(s).
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 of the Question/sub-question.

		Marks	CO
Question No. 1			
1a)	What are the different types of elements in FEM?	(6)	1
Question No. 2			
2a)	Explain in detail all the steps of Finite Element Method.	(6)	3
Question No. 3			
3a)	Using generalized co-ordinate approach find shape functions for two nodded bar elements.	(8)	3
	OR		
3b)	Determine the shape functions for the Constant Strain Triangle (CST) using polynomial functions.	(8)	3
3c)	A three-noded triangular element as shown in fig. 3(c) is used in plane elasticity problem. Find shape functions.	(8)	3

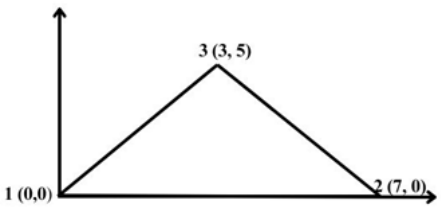

Fig. 3 (c)

OR

3d)	Coordinates of nodes of CST are shown in fig. 3(d). At an interior point P, if x = 2.8 and the value of N_1 = 0.3. Find the coordinate of point P and the values of N_2 and N_3.	(8)	3

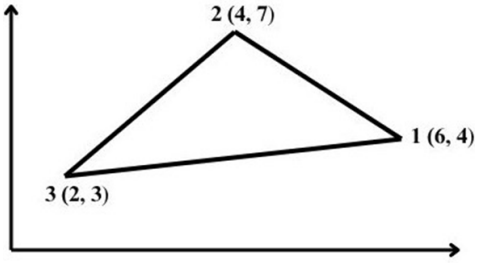

Fig. 3(d)

Question No. 4

4a) For an axisymmetric element, state the relation between Strain and Displacement. (8) 5

OR

4b) Derive the Jacobian matrix for four nodded iso-parametric quadrilateral element as shown in fig.4(b) (8) 5

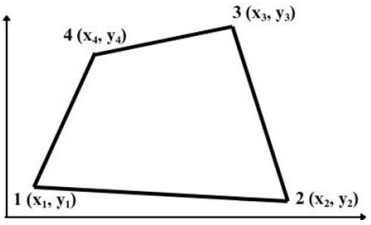

Fig.4(b)

4c) Determine the Jacobian Matrix for four nodded iso-parametric quadrilateral element as shown in fig. 4c (8) 5

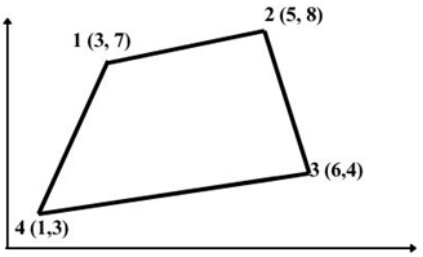

Fig. 4c and Fig. 4d

OR

4d) Determine natural coordinates (ζ, η) of the any point P whose cartesian coordinates are (3, 4) for four nodded iso-parametric quadrilateral element as shown in fig. 4(d) (8) 5

Question No. 5

5a) Explain with neat sketches the various three-dimensional elements used in the analysis of shells (8) 4

OR

5b) Explain Mindlin's theory of plate element (8) 4

5c) What do you understand by C^0, C^1 and C^2 continuity? Explain with suitable examples (8) 4

OR

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

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