



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

	SUMMER-2023		
	Exam Seat No.:		
	Academic Year:2022-2023	Semester:II	
	Name of Programme:M.Tech	Pattern:2022	
	Name of Course:Finite Element Method	Course Code:CIV225108	
	Max. Marks:60	Duration:2.50	

**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 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 and level of Blooms Taxonomy of the Question/sub-question

**Question No. 1 Attempt following Question**

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

**Question No. 2 Attempt following Question**

- 2 Explain in detail -Collocation method and Least squares methods (6) CO2

**Question No. 3 Attempt following Question**

- 3.a) Derive shape function for CST element. (8) CO3

**OR**

- 3.b) Derive shape function for a four noded rectangular element with co-ordinates 1 (0, 0); 2 (6, 0); 3(6, 4) and 4 (0, 4) (8) CO3
- 3.c) Obtain the shape functions for a nine noded two dimensional Lagrange rectangular element. (8) CO3

**OR**

- 3.d) By using natural coordinates, derive shape function of eight noded hexahedron element. (8) CO3

**Question No. 4 Attempt following Question**

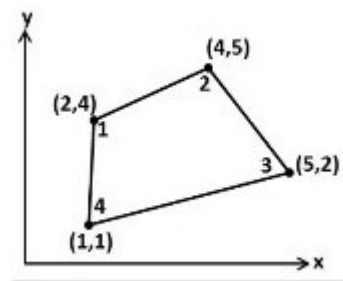
- 4.a) Explain Jacobian matrix in case of two dimensional isoparametric element. (8) CO5

**OR**

- 4.b) For an axisymmetric element state relation between Strain and Displacement. (8) CO5
- 4.c) State and explain three theorems of Isoparametric concept. (8) CO5

**OR**

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



(8) CO5

**Question No. 5 Attempt following Question**

- 5.a) What do you understand by  $C^0$ ,  $C^1$  and  $C^2$  continuity? Explain with suitable examples. (8) CO4

**OR**

- 5.b) Write minimum eight displacement functions for BFS element. (8) CO4
- 5.c) Explain Mindlin's theory of plate element. (8) CO4

**OR**

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