



**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: Theory of Plates and Shells	Course Code: CIV225107	
	Max. Marks: 60	Duration: 2.30	

	<p><b>Instructions:</b> 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.</p> <ol style="list-style-type: none"><li>1. This question paper contains 2 page(s).</li><li>2. Answer to each new question is to be started on a new page.</li><li>3. Assume suitable data wherever required, but justify it.</li><li>4. Draw the neat labelled diagrams, wherever necessary.</li><li>5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question</li></ol>	
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**Question No. 1 Attempt following Question**

- 1a) Sketch the free body diagram of a plate element representing lateral loads, moments and shears. (6) CO1

**Question No. 2 Attempt following Question**

- 2a) Distinguished between Navier and Levy Plate Theory. (6) CO2

**Question No. 3 Attempt following Question**

- 3a) Derive the Governing equation of the Circular Plate (8) CO3

**OR**

- 3b) Derive the equation of deflection for circular plate subjected to centre concentrated load with fixed end condition (8) CO3

- 3c) Derive the equation of deflection for circular plate subjected to centre concentrated load with simply supported end condition. (8) CO3

**OR**

- 3d) Derive the equation of deflection for circular plate subjected to UDL with fixed support. (8) CO3

**Question No. 4 Attempt following Question**

- 4a) Describe the shell element and classify it on the basis of aspect (6) CO4

**OR**

- 4b) State the advantages and disadvantages of shell structures compared to plates. (6) CO4

- 4c) Derive the equilibrium equation of surface revolution along the tangent to parallel of latitude ( $\theta$  direction) (10) CO4

**OR**

- 4d) Derive the equilibrium equation of surface revolution of shell along the radial direction. (10) CO4

**Question No. 5 Attempt following Question**

- 5a) Write down the Short Note on

i. Principle curvature

ii. Membrane Action

iii. Membrane state of stress

(6) CO5

**OR**

- 5b) Classify thin shell into various types based on shell geometry and curvature. (6) CO5

- 5c) Derive the equilibrium equations for membrane theory of cylindrical shell, considering actions on an infinitesimal element (10) CO5

**OR**

- 5d) In a thin shell of thickness  $h$ , if  $\sigma_x$ ,  $\sigma_y$ ,  $T_{xy}$ ,  $T_{xz}$  and  $T_{xy}$  are the stresses at a point  $Z$  from midplane, write expressions for stress resultants at the section. (10) CO5