



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

	WINTER-2023		
	Exam Seat No.:		
	Academic Year: 2023-2024	Semester: I	
	Name of Programme: M.Tech	Pattern: 2022	
	Name of Course: Solid Mechanics	Course Code: CIV225103	
	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 _____ 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>	
--	---	--

**Question No. 1 Attempt following Question**

- 1a) Provide a short note on the stress tensor. (6) CO1

**Question No. 2 Attempt following Question**

- 2a) Explain the Hook's Law. (6) CO2

**Question No. 3 Attempt following Question**

- 3a) Derive the torsional equation of circular section without considering the overlapping effect. (8) CO3

**OR**

- 3b) Find out the Torsion of non-circular section also derive the Prandtl's function is zero over the boundary. (8) CO3

- 3c) Derive and state the warping function of St. Venent theory (8) CO3

**OR**

- 3d) Derive the governing equation of the non circular section by using Prandtl's theory. (8) CO3

**Question No. 4 Attempt following Question**

- 4a) Discuss the following (i) Mohr's Circle (i) Strain Hardening with suitable diagram. (8) CO4

**OR**

- 4b) Short note on (i) Stress-strain diagram of mild steel (ii) Von-Mises criterion (8) CO4

- 4c) Short note (i) Tresca theory. (ii) St. Venant Theory of Failure (8) CO4

**OR**

- 4d) The state of stress at given point is given by positive x directional stress is 75 MPa, negative y directional stress is 125 MPa and shear stress is 40 MPa. If the yield strength of the material is 190 MPa. Find if yielding occurs according to Tresca's Failure criteria and Von Mises Hencky yield criteria. (8) CO4

**Question No. 5 Attempt following Question**

- 5a) Explain the Plastic torsion by hill analogy and derive the plastic torsion using sand hill analogy of Circular section. (8) CO5

**OR**

- 5b) Explain the terms and conditions of Hoop stress and Radial stress with diagram of the Thick and thin Cylinder (8) CO5

- 5c) Explain the Plastic body and Elastic Body and and derive the plastic torsion using sand hill analogy of Rectangular section (8) CO5

**OR**

- 5d) Derive the Moment equations of rectangular beam for Incipient yielding stage and Elasto-plastic stage (8) CO5