



**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:I	
Name of Programme:M.Tech	Pattern:2022	
Name of Course:Solid Mechanics	Course Code: CIV225103	
Max. Marks:60	Duration:2.30	

**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 2 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 Derive the strain displacement relationship for 3D elasticity problem (6)

**Question No. 2 Attempt following Question**

- 2 Derive stress strain relation and strain displacement relation for plane stress and plane strain condition (6)

**Question No. 3 Attempt following Question**

- 3.a) Derive the stress displacement relation from basic equation of axis symmetric problem for circular rotating disc (10)

**OR**

- 3.b) What are the different analogous methods used for solving torsion problem. Explain Prandtl's theory for torsion of solid section (10)

- 3.c) Obtain the expression for torsion of circular cross section bar. (6)

**OR**

- 3.d) Derive the stress displacement relation from basic equation of axis symmetric problem for rotating shaft. (6)

**Question No. 4 Attempt following Question**

- 4.a) Explain in brief about maximum principal stress theory and maximum elastic energy theory (8)

**OR**

- 4.b) Explain in detail Prandtl Reuss equality and ideal plastic body with its stress-strain curve. (8)
- 4.c) What do you understand by yield criteria? Explain the two yield criteria commonly used. (8)

**OR**

- 4.d) Explain in detail Mohrs theory of yielding (8)

**Question No. 5 Attempt following Question**

- 5.a) Explain in brief plastic torsion and Nadais sand heap analogy. (8)

**OR**

- 5.b) Derive the elastic/plastic analysis of thick hollow sphere. (8)
- 5.c) Derive the equation of radial and tangential stress in plastic zones for thickened walled cylinders under internal pressures considering elasto-plastic behaviour (8)

**OR**

- 5.d) Explain the successive stages in plastic yielding of rectangular beam. (8)