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

SUMMER-2024	
Exam Seat No.:	
Academic Year:2023-2024	Semester: I
Class: FY	Program: M.Tech
Branch Code: CIV	Pattern:2022
Name of Course: Solid Mechanics	Course Code:CIV225103
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 02 pages.
    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

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

Question No. 2 Attempt following Question

2a)   Explain whether the $\phi = A(2y^4 - 6x^2y^2)$ is Airy's Stress function.   (6)   CO2

Question No. 3 Attempt following Question

3a)   What is Axisymmetric element? Obtain the stress strain relationship of Axisymmetric Problem.   (8)   CO3

<div align="center">**OR**</div>

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

<div align="center">**OR**</div>

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 (ii) Strain Hardening with suitable diagram.   (8)   CO4

<div align="center">**OR**</div>

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

4c) Short note (i) Tressca 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 is125 MPa and shear stress is 40 MPa. If the yield strength of the material is 190 MPa. Find if yeilding occurs according to Tressca's Failure criteria and Von Mises Heneky 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 Triangular section (8) CO5

OR

5b) A simply supported rectangular beam of length 5 m and dimensions of 75 mm wide and 100 mm depth is subjected to central point load. Taking yield stress as 250 Mpa. Find the load at the incipient yielding stage, elastic-plastic stage when the 25mm depth of beam yields plastically and plastic stage. (8) CO5

5c) Derive the Moment equations of rectangular beam for Incipeint yielding stage and Elasto-plastic stage. (8) CO5

OR

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

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