U.S.N

P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belagavi)
Fourth Semester, B. E. - Mechanical Engineering
Semester End Examination; August - 2023
Mechanics of Materials

Time: 3 hrs   *Max. Marks: 100*

Note: Answer **FIVE** full questions, selecting **ONE** full question from each unit.

UNIT - I

1 a.	Explain stress-stain curve for ductile material.	10
b.	Derive an expression for change in length of a uniformly tapering rectangular bar subjected to an axial force.	10

OR

2 a.	Explain the thermal stress in composite bars.	10
b.	Explain stress analysis of composite bars.	10

UNIT - II

3 a.	A compound bar of length 500 mm consists of a strip of aluminium 50 mm wide × 20 mm thick and a strip of steel 50 mm wide × 15 mm thick rigidly joined at ends. If the bar is subjected to a load of 50 kN, find the stresses developed in each material and the extension of the bar. Take elastic modulus of aluminium and steel as 1×10^5 N/mm^2 and 2×10^5 N/mm^2 respectively.	10
b.	A rectangular bar is subjected to a direct stress (σ) in one plane only. Prove that the normal stress on oblique plane is given by $\sigma_n = \sigma \, Cos^2\theta$.	10

OR

4.	Write a note on Mohr's circle of stresses.	20

UNIT - III

5 a.	Explain the different types of loads acting on a beam.	10
b.	Derive the relationship between load intensity, shear force and bending moment.	10

OR

6 a.	Draw shear force and bending moment diagram for a cantilever of length 'L' carrying a point load at the free end and define point of contra-flexure	10
b.	Draw SFD and BMD for simply supported beam with point load at centre of beam.	10

UNIT - IV

7 a.	Derive the relation between bending moment, bending stress and radius of curvature.	10
b.	A rectangular beam 100 mm wide and 250 mm deep is subjected to a maximum sheer force of 50 kN. Determine; i) Average shear stress ii) Maximum shear stress	10

OR

8. Derive an expression for maximum deflection and slope for a simply supported beam subjected to central concentrated load using Macaulay's method.

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UNIT - V

9 a. Derive Torsional equations and state assumptions.

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b. Explain limitations of Euler's formula and explain Rankine's formula.

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OR

10. Derive an expression for crippling load, when both ends of the column are hinged.

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