CE 223 (R-20)

Total No. of Questions : 10] [Total No.of Pages : 02

II/IV B. Tech. DEGREE EXAMINATIONS, AUGUST - 2024

Second Semester

CIVIL ENGINEERING

SOLID MECHANICS - II

Time : **Three Hours** Maximum : **70** Marks

Answer ONE question from each Unit. 5x14=70 M

All Questions carry equal marks.

UNIT - I

1. a) Describe the stress analysis of closely coiled helical springs subjected to axial loads.

   b) Explain the concept of combining multiple stress components to analyze complex loading conditions.

(OR)

2. a) What is the significance of the middle-third rule in dam design and safety ?

   b) A helical tension spring has a wire diameter (d) of 6 mm, an outer diameter (D) of 40 mm and a modulus of rigidity (G) of 100 GPa. Calculate the length (L) of the spring when it experiences a tensile force of 800 N.

UNIT - II

3. a) A column with a cross-sectional area of 200 square millimeters supports a compressive load of 15,000 Newtons. Determine the intensity of normal stress in the column.

   b) Describe the fundamental problem addressed in the analysis of plane-stress in materials and structures.

(OR)

4. a) Describe the steps involved in constructing Mohr's circle.

   b) How are principal stresses determined in a given stress state ?

UNIT - III

5. a) Define elastic strain energy and how is it related to uni-axial stress ?

   b) A steel beam, 4 meters in length and with a cross-sectional area of 200 square millimeters, is sujected to a bending moment of 10,000 Newton-meters. Find the work done in bending the beam ?

P.T.O.

(OR)

6. a) What is the expression for calculating strain energy due to shear in a beam ?

   b) Explain the process of determining displacements using the work and strain energy method.

UNIT - IV

7. a) Describe the criteria for stable equilibrium in structural systems. How do they relate to buckling ?

   b) What are the limitations of the maximum normal stress theory in predicting failure ?

(OR)

8. a) What are the consequences of failing to meet these stability criteria ?

   b) What is the maximum distortion energy theory, and how does it differ from other failure theories ?

UNIT - V

9. a) Define the strain-curvature relationship and its role in deflection analysis.

   b) What is the moment area method and how does it differ from other deflection analysis techniques ?

(OR)

10. a) Explain how the moment area method can be applied to determine the slope of a beam.

    b) How does the moment-curvature relationship contribute to understanding beam deflection behavior ?