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May 2024

B.Tech. (Civil) - IV SEMESTER

BASICS OF SOLID MECHANICS

(PCC-CE-205R)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Define Hooke's law. (1.5)

(b) Differentiate between elasticity and plasticity. (1.5)

(c) Define point of contra-flexure. (1.5)

(d) Define poisson's ratio. (1.5)

(e) Define torsion. (1.5)

(f) Define strain energy. (1.5)

(g) Differentiate between lateral stress and lateral strain. (1.5)

(h) Differentiate between working stress and temperature stress. (1.5)

(i) Define shear modulus. (1.5)

(j) Differentiate between thin and thick cylinder. (1.5)

PART–B

2. (a) Determine the value of Young's modulus and Poisson's ratio of a metallic bar of length 30 cm, breadth 4 cm and depth 4 cm when the bar is subjected to an axial compressive load of 400 kN. The decrease in length is given as 0.075 cm and increase in breadth is 0.003 cm. (10)

(b) What is volumetric stress and volumetric strain? How the volumetric strain is determined when a circular rod is loaded axially. (5)

3. (a) Illustrate the use of Macaulay's method with the help of examples. (5)

(b) Define the terms shear stress, shear strain, rigidity, principal stresses and principal strains. (10)

4. Draw the shear force and bending moment diagram for a simply supported beam of length 8 m and carrying a uniformly

distributed load of 10 kN/m for a distance of 6 m from the left end. Also calculate the maximum B.M on the section. (15)

5. (a) Derive the expression for hoop stress and longitudinal stress in case of thin cylinder. (5)

(b) Discuss the assumptions of theory of simple bending. (10)

6. (a) Derive the torsional equation. Write the assumption made in deriving the torsional formulas. (10)

(b) A cylinder of internal diameter 2.5 m and of thickness 5 cm contains a gas. If the tensile stress in the material is not to exceed 80 N/mm^2, determine the internal pressure of the gas. (5)

7. Derive the expression for section modulus of rectangular section and circular sections for both hollow and solid sections of each. (15)
