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002402

May 2024

B.Tech. (Civil) - IV SEMESTER

Strength of Materials (PCC-CED-205)

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 castigliano first theorem. (1.5)

(b) Define Hooke's law. (1.5)

(c) Define resilience. (1.5)

(d) What is section modulus? Elaborate. (1.5)

(e) What is poisson's ratio? Elaborate. (1.5)

(f) Define hoop stress. (1.5)

(g) Define torsion. (1.5)

(h) Define modulus of elasticity. (1.5)

(i) What are influence lines? Elaborate. (1.5)

(j) Define pure bending. (1.5)

PART–B

2. (a) Determine the changes in length, breadth and thickness of a steel bar which is 4 m long, 30 mm wide and 20 mm thick and is subjected to an axial pull of 30 kN in the direction of its length. Take $E = 2 \times 10^5$ N/mm^2 and Poisson's ratio = 0.3. (10)

(b) Differentiate between helical and leaf springs. (5)

3. (a) The safe stress for a hollow steel column which carries an axial load of 2.1×10^3kN is 125 MN/m^2. If the external diameter of the column is 30 cm, determine the internal diameter. (5)

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

4. Discuss the following : (15)

(a) Maxwell's reciprocal & Betti's theorem,

(b) Eddy's theorem,

(c) temperature stresses in suspension cables.

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

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

6. (a) Illustrate the use of Macaulay's method with the help of examples. (10)

(b) Discuss the different assumptions made in the Euler's column theory. (5)

7. A beam of uniform rectangular section 200 mm wide and 300 mm deep is simply supported at its ends. It carries a uniformly distributed load of 9 kN/m run over the entire span of 5 m. If the value of E for the beam material is 1×10^4 N/mm^2 then find (a) slope at the supports and (b) maximum deflection. (15)