

Roll No.

Total Pages : 3

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)

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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 $E = 2 \times 10^5 \text{ N/mm}^2$ 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 $2.1 \times 10^3 \text{ kN}$ 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 $1 \times 10^4 \text{ N/mm}^2$ then find (a) slope at the supports and (b) maximum deflection. (15)
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