

Roll No.

Total Pages : 3

002402

May, 2023

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) State Hooke's Law. (1.5)
- (b) What are the principal stresses and principal plane? Elaborate. (1.5)
- (c) Define point of contra-flexure. (1.5)
- (d) What is meant by pure bending? (1.5)
- (e) Define Castigliano first theorem. (1.5)
- (f) Differentiate between torsion and torque. (1.5)
- (g) Differentiate between thin and thick cylinders. (1.5)
- (h) Differentiate between helical and leaf springs. (1.5)

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- (i) Define slenderness ratio. (1.5)
 (j) What are thermal stresses? Elaborate. (1.5)

PART-B

2. (a) A wooden beam 100 mm wide and 150 mm deep is simply supported over a span of 4 metres. If shear force at a section of the beam is 4500 N, find the shear stress at a distance of 25 mm above the Neutral axis. (10)
 (b) A mild steel wire is 5 mm in diameter and 1 m long. If the wire is subjected to an axial tensile load of 10 kN, find its extension of the rod. ($E = 200 \text{ GPa}$) (5)
3. (a) Derive the expression for Euler-Bernoulli Bending equation. (5)
 (b) A thin cylindrical shell is 3 m long and 1 m in internal diameter. It is subjected to internal pressure of 1.2 MPa. If the thickness of the sheet is 12 mm, then find the circumferential stress, longitudinal stress, changes in diameter, length and volume. Take $E = 200 \text{ GPa}$ and $\mu = 0.3$. (10)
4. Derive the expression for normal stress and tangential stress using Mohr's circle method when a body is subjected to two mutually perpendicular principal tensile stresses of unequal intensities. If the tensile stresses are 120 N/mm^2 and 60 N/mm^2 then determine the normal, tangential and resultant stresses on a plane inclined at 30° to the axis of minor stress both analytically and through Mohr's circle method. (15)

5. (a) Discuss the different assumptions of simple bending theory. (5)
 (b) A cylindrical pipe of diameter 1.5 m and thickness 1.5 cm is subjected to an internal fluid pressure of 1.2 N/mm^2 . Determine the longitudinal stress and circumferential stress developed in the pipe. (10)
6. (a) Discuss the different ways of failure in a column. Also, discuss the different assumptions made in the Euler's Column theory. (10)
 (b) A composite rod is 1000 mm long, its two ends are 40 mm^2 and 30 mm^2 in area and length are 300 mm and 200 mm respectively. The middle portion of the rod is 20 mm^2 in area and 500 mm long. If the rod is subjected to an axial tensile load of 1000 N, find its total elongation. ($E = 200 \text{ GPa}$). (5)
7. A loaded beam is as shown below. Draw its S.F. and B.M. diagram. (15)

