Code No: 154CA

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year II Semester Examinations, September/October - 2023
STRENGTH OF MATERIALS – II
(Civil Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a) State the assumptions made in the theory of pure torsion. [2]
b) A close-coiled helical spring is to carry a load of 950 N. Its mean coil diameter is 10 times that of the wire diameter. Calculate the diameters of coil and wire if the shear stress in the material of the spring is 80 N/mm^2. [3]
c) Write the end conditions for a column. [2]
d) What do you mean by Equivalent length of the column? Mention its value for different end conditions of the column. [3]
e) Define direct stress and bending stress. [2]
f) What is the difference between dam and retaining wall? [3]
g) Define volumetric strain and circumferential strain. [2]
h) Write down the assumptions of Lame's theory. [3]
i) What is the importance of the shear center? [2]
j) Explain how unsymmetrical bending is developed in a beam. [3]

PART – B

(50 Marks)

2. Derive the relation for the circular shaft when subjected to torsion as given below.

$$\frac{T}{J} = \frac{\tau}{R} = \frac{C\theta}{L}$$

Where, T= torque transmitted, J= polar moment of inertia, τ=maximum shear stress, R = radius of the shaft, θ= angle of twist, C= modulus of rigidity, L= length of the shaft. [10]

OR

3.a) Find the power that can be transmitted by a 60mm diameter shaft at 160rpm, if the permissible shear stress is 80N/mm^2 and the maximum torque is 30% greater than the mean torque.
b) Derive an equation for the deflection of an open coiled helical spring. [5+5]

4. Derive an expression for the Euler's crippling load for a long column when both ends are hinged. [10]

OR

5.a) Define the slenderness ratio. State the limitations of the Euler's formula.
b) Write the merits of Rankine's load over Euler's load in buckling. [5+5]

6. What do you mean by the stability of the dam? What are the different conditions under which a dam is going to fail? [10]

OR

7.a) Describe different types of dams. Why are trapezoidal dams mostly used?
b) Prove that an eccentric load causes direct stress as well as bending stress. [4+6]

8.a) Derive the expression for the volumetric strain of the thin spherical shell subjected to internal pressure 'p'.
b) Differentiate between Thick and Thin cylinders. [6+4]

OR

9. A thin steel cylindrical shell of thickness 10mm, 1.5mm diameter and 4.5m long is carrying a fluid at a pressure of 3.5N/mm^2. Find the change in diameter, length and volume of the cylinder. Assume E = 2×10^5 N/mm^2 and Poisson's ratio = 0.25. [10]

10.a) Analyze the shear center of a channel section of 400mm × 200mm outside and 5mm thick.
b) How will you find out the resultant stress in unsymmetrical bending? [6+4]

OR

11.a) Explain the concept of unsymmetrical bending and also state the assumptions made in analyzing the beam for unsymmetrical bending.
b) Write short notes on the deflection of beams in unsymmetrical bending. [5+5]

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