Code: 13A01401

R13

B.Tech II Year II Semester (R13) Regular Examinations May/June 2015

STRENGTH OF MATERIALS – II

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Define principal plane and principle stress.
(b) Discuss maximum principle stress theory.
(c) What is meant by a circumferential stress and longitudinal stress in a cylindrical shell?
(d) Write the assumptions for solving problems on thick cylindrical shells.
(e) Explain the term polar modulus.
(f) What is carriage spring? Where it is used?
(g) Define the term slenderness ratio and describe with mathematical expression, how it limits the use of Euler's formula for crippling load.
(h) Write the assumptions made in Euler's theory.
(i) What is meant by unsymmetrical bending?
(j) Mention the assumptions for the stresses in bending of curved beams.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 A plane element in a boiler is subjected to tensile stresses of 400 MPa on one plane and 150 MPa on the other at right angles to former. Each of the above stresses is accompanied by a shear stress of 100 MPa such that when associated with the minor tensile stress tends to rotate the element in anticlockwise direction. Find:

(a) Principal stresses and direction.
(b) Maximum shearing stress and the direction of plane on which they out.

OR

3 (a) Explain total strain energy theory.
(b) Explain distortion strain energy theory.

UNIT – II

4 (a) A cylindrical vessel 2 m long and 500 mm in diameter with 10 mm thick plate is subjected to an internal pressure of 3 MPa. Calculate the change in volume of the vessel. Take E = 200 GPa and Poisson's ratio = 0.3.

(b) Derive the expression for change in diameter and volume of a thin spherical shell due to internal pressure.

OR

5 A compound thick cylinder is formed by shrinkage tube of external diameter 300 mm over another tube of internal diameter 150 mm. After shrinking the diameter at the junction of the tube is found to be 250 mm and radial compression as 28 N/mm^2. Find the original difference in radii at the junction. Take E for the cylinder metal as 200 GPa.

UNIT – III

6 A solid shaft of 200 mm diameter has the same cross-sectional area as a hollow shaft of the same material with the inside diameter of 150 mm. Find the ratio of: (i) Powers transmitted by both the shafts at the same angular velocity. (ii) Angle of twist in equal lengths of those shafts, when stressed to the same intensity.

OR

7 (a) Derive the expression for closely-coiled helical springs subjected to an axial twist.

(b) A closely coiled helical spring of round steel wire 5 mm in diameter having 12 complete coils of 50 mm diameter is subjected to an axial load of 100 N. Find the deflection of the spring and the maximum shearing stress in the material. Take modulus of rigidity (C) = 80 GPa.

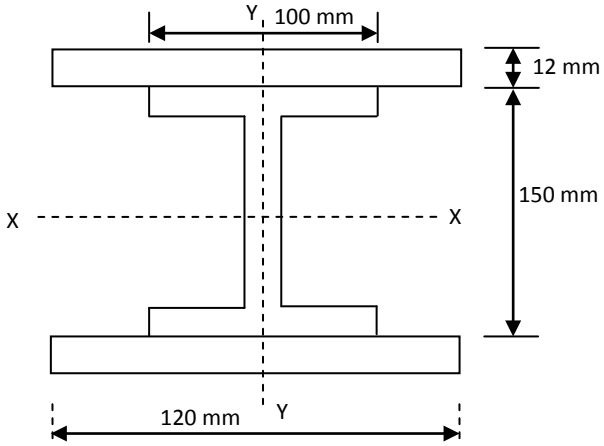
Contd. in page 2

UNIT – IV

8 Derive an Euler's load expression for the column with one end fixed and the other end hinged.

OR

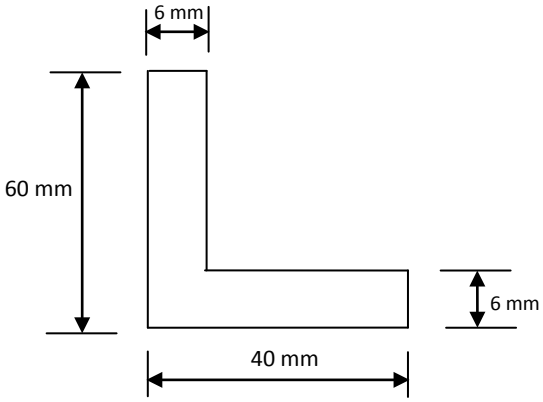
9 A Built-Up column consisting of 150 mm × 100 mm R.S.J with 20 mm × 12 mm riveted in each plane as shown in figure given below.



Calculate the safe load of the column carry of 4 m long having one end fixed and the other hinged with a factor of safety 3.5. Take the properties of the joist: area = 2167 mm^2, I_{XX} = 8.39 × 10^6 mm^4, I_{YY} = 0.945 × 10^6 mm^4. Assume the yield stress as 315 MPa and Rankine's constant (a) = 1/7500.

UNIT – V

10 Determine the principal moment of inertia for unequal angle section 60 × 40 × 6 mm shown in figure below.



OR

11 A beam of circular section of diameter 20 mm has its centre line curved to a radius 50 mm. Find the intensity of maximum stresses in the beam, when subjected to a moment of 5 kN-mm.

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