Code: 15A01401

R15

B.Tech II Year II Semester (R15) Regular & Supplementary Examinations May/June 2018

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 the term obliquity.
(b) State maximum principal stress theory.
(c) Name the stresses set up in a thin cylinder subjected to internal fluid pressure.
(d) Mention the different methods of reducing hoop stresses in thick cylindrical shells.
(e) Define the term polar modulus.
(f) What are the various types of spring?
(g) Mention the failure of long columns and short columns.
(h) Give the expression of load carrying capacity of column according to secant formula.
(i) What do you mean by unsymmetrical bending?
(j) Write the Winkler-Bach formula for a curved beam.

PART – B

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

UNIT – I

2 The principal stresses at a point in a bar 160 N/mm^2 (tensile) and 80 N/mm^2 (compressive). Determine the resultant stress in magnitude and direction on a plane inclined at 60° to the axis of the major principal stress. Also determine the maximum intensity of shear stress in the material at the point.

OR

3 A bolt is subjected to an axial pull of 12 kN together with a transverse shear force of 6 kN. Elastic limit in tension = 300 N/mm^2, factor of safety = 3. Determine the required diameter of the bolt by using maximum principal stress theory.

UNIT – II

4 A thin cylindrical shell 100 cm diameter, 1 cm thick and 5 m long. Calculate the change in diameter, change in length, change in volume, if it is subjected to internal pressure of 3 N/mm^2. Take the value of E = 2 x 10^5 N/mm^2 and Poisson's ratio = 0.3.

OR

5 A thick metallic cylindrical shell of 150 mm internal diameter is required to withstand an internal pressure of 8 N/mm^2. Find the necessary thickness of the shell, if the permissible tensile stress in the section is 20 N/mm^2.

UNIT – III

6 Determine the diameter of a solid steel shaft which will transmit 90 kW at 160 r.p.m. Also determine the length of the shaft, if the twist must not exceed 1° over the entire length. The maximum shear stress is limited to 60 N/mm^2. Take the value of modulus of rigidity = 8 x 10^4 N/mm^2.

OR

7 An open coil helical spring made up of 10 mm diameter wire and of mean diameter of 100 mm has 12 coils, angle of helix being 15°. Determine the axial deflection and the intensity of bending stress under an axial load of 500 N. Take 'C' as 80 GPa and 'E' as 200 GPa.

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UNIT – IV

8 Drive the equation for the Euler's crippling load for a both ends are fixed.

OR

9 Find the Euler's crippling load for a hollow cylindrical steel column of 38 mm external diameter and 2.5 mm thick. Take length of the column as 2.3 m and hinged at its both ends. Determine the crippling load by Rankine's formula. Take E = 205 GPa, Yield stress = 335 N/mm^2 and Rankine's constant (a) = 1/7500.

UNIT – V

10 A 40 mm x 40 mm x 5 mm angle is used as a simply supported beam over a span of 2.4 m. It carries a load of 200 N along the vertical axis passing through the centroid of the section. Determine the resulting bending stresses on the outer corners of the section.

OR

11 A steel bar 38 mm in diameter is bent into a curve of mean radius 31.7 mm. If a bending moment of 4.6 N-m tending to increase the curvature acts on the bar, find the intensity of maximum tensile stress.

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