B.Tech II Year II Semester (R13) Regular & Supplementary Examinations May/June 2016

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) State the assumptions made for developing torsion equation.
(b) Define the state of plane stress at a point.
(c) What is generalized Hook's law?
(d) What are the various theories of failure?
(e) Define cumulative fatigue damage.
(f) Define point of contraflexure.
(g) What is strain energy?
(h) What is hogging and sagging of beams?
(i) State the Castigliano's theorem.
(j) What is modulus of resilience?

PART – B

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

UNIT – I

2 A compound bar of length 500 mm consists of a strip of aluminum 50 mm wide × 20 mm thick and a strip of steel 50 mm wide × 15 mm thick rigidity joined at ends. If the bar is subjected to a load of 50 kN, find the stresses developed in each material and the extension of the bar. Take elastic modulus of aluminum and steel as 1×10^5 N/mm^2 and 2×10^5 N/mm^2 respectively.

OR

3 Derive the expression for Maximum Energy Theory.

UNIT – II

4 The stress component at a point are given by $\sigma_x = 10, \sigma_y = 15, \zeta_{xy} = 10, \zeta_{yz} = 20\ MPa$. Calculate the strain components. Assume E = 200 GPa and $\eta = 0.25$.

OR

5 A thick cylinder of external and internal diameter of 300 mm and 180 mm is subjected to an internal pressure of 42 N/mm^2 and external pressure 6 N/mm^2. Determine the stresses in the material. Now if the external pressure is doubled, what internal pressure can be maintained without exceeding the previously determined maximum stress?

UNIT – III

6 Derive the equation for torsional moment.

OR

7 Derive the equation for closed coiled helical springs of radium R subjected to an axial load.

UNIT – IV

8 (a) What are the limitations of Euler's theory?
(b) Derive the Euler's equation for the condition both ends are fixed.

OR

9 A built up section has an overall depth of 400 mm, width of flanges 50 mm and web thickness 30 mm. It is used as a beam with simply supported ends and it deflects by 10 mm when subjected to a load of 40 kN/m length. Find the safe load if this I-section is used as a column with both ends hinged. Use Euler's formula. Assume a factor of safety 1.75 and take E = 2×10^5.

UNIT – V

10 Derive graphical solution for Mohr's stress circle.

OR

11 (a) A circular bar 40 mm diameter carries an axial tensile load of 105 kN. What is the value of shear stress on the planes on which the normal stress has a value of 50 MN/m^2 tensile?
(b) What are the salient features of Mohr's stress circle?

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