

Code: 9A01401

B.Tech II Year II Semester (R09) Supplementary Examinations December/January 2015/2016

STRENGTH OF MATERIALS - II

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

- 1 A thin spherical shell of diameter 600 mm and thickness 3 mm is full of water. It is then subjected to an internal pressure by pumping in additional $60,000 \text{ mm}^3$ of water. Determine the internal pressure for the shell material, if $E = 200 \text{ GPa}$, $\nu = 0.3$ and bulk modulus for water is 2 GPa .
- 2 (a) Stating assumptions derive Lamé's equations to find out the stresses in a thick cylindrical shell.
(b) A hollow cylinder has an external diameter of 250 mm and thickness of the wall is 50 mm. The cylinder is subjected to an internal fluid pressure = 35 MPa and external pressure = 3.5 MPa. Calculate the maximum and minimum circumferential stresses and plot the variation of the same across the wall thickness.
- 3 Calculate the angle of twist for a shaft having diameter of 60 mm at one end and 70 mm at the other end in a length of 2 m. Also, find the % error committed in calculating θ , if it is calculated on the basis of an average diameter of 65 mm.
- 4 A closely coiled helical spring is made of steel wire 12 mm diameter. The number of coils is 20 and the mean radius of each coil is 75 mm. Calculate the stiffness of the spring. Take $G = 0.84 \times 10^5 \text{ N/mm}^2$.
- 5 A stanchion is built-up of two 325 mm X 165 mm R.S. joists placed 200 mm centre to centre with two 400 mm X 12 mm plates riveted to each flange. If it is 6 meters long, both ends fixed, calculate the safe axial load using Rankine's formula and a factor of safety 3. For each joist, area of section = 54.9 cm^2 ; $I_{xx} = 9874.6 \text{ cm}^4$; $I_{yy} = 510.8 \text{ cm}^4$. Take $f_c = 315 \text{ N/mm}^2$.
- 6 (a) What is limit of eccentricity for a rectangular section? Prove the limit of eccentricity is less than one sixth of its dimensions of the section.
(b) A steel flat 150 mm wide and 20 mm thick is subjected to a pull of 180 kN, which is off the geometrical axis by 4 mm in the plane which bisects the thickness. Determine the maximum and minimum stress intensities set up in the section.
- 7 Find the centroidal principal moments of inertia of a equal angle section 60 x 60 x 8 mm.
- 8 A horizontal circular bow girder of radius 8 m is continuous over four equally spaced supports. It carries a vertical u.d.l of 40 kN/m. Obtain the B.M. torsional moment and S.F diagrams for one span indicating the critical values.
