

Code: 9A01401

B.Tech II Year II Semester (R09) Supplementary Examinations May/June 2017

STRENGTH OF MATERIALS – II

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 A closed cylindrical vessel made of steel plates 4 mm thick with plane ends, carries fluid under pressure of 3 N/mm^2 . The diameter of the cylinder is 25 cm and length is 75 cm. Calculate the longitudinal and hoop stresses in the cylinder wall and determine the change in diameter, length and volume of the cylinder. Take $E = 2.1 \times 10^5 \text{ N/mm}^2$ and $1/m = 0.286$.
- 2 A pipe 150 mm bore with a thickness of metal of 50 mm transmits water under a pressure of 6 N/mm^2 . Calculate the maximum and minimum intensities of hoop stress induced.
- 3 A solid shaft of 80 mm diameter is transmitting 100 kW power at 200 r.p.m. Calculate the maximum shear stress induced in the shaft and the angle of twist in degrees for a length of 6 m. Take $N = 8 \times 10^4 \text{ N/mm}^2$.
- 4 Find the mean radius of an open-coiled spring with an angle of helix of 30° to give a vertical displacement of 2.25 cm and an angular rotation of the loaded end of 0.02 radians under an axial load of 40 N. The material available is steel rod of 6mm diameter. Take $E = 210 \text{ GPa}$ & $G = 84 \text{ GPa}$.
- 5 (a) Derive secant formula for columns under eccentric loading.
(b) A steel column is made of a 4m long channel section, 300 mm x 100 mm is fixed at both the ends. The thickness of flange is 11.6 mm while thickness of web is 6.8 mm. Using Rankine's formula. Calculate the load it can carry with a factor of safety of 3. Take $f_c = 330 \text{ N/mm}^2$ and Rankine's constant $a = 1 / 7500$.
- 6 Explain the following:
 - (a) Core of section.
 - (b) Combined stresses.
 - (c) Eccentric loading.
 - (d) Slenderness ratio.
- 7 A rectangular section of 90 mm wide and 130 mm deep is subjected to a bending moment of 15 kNm. The trace of plane of loading is inclined at 45° to YY axis of the section. Locate neutral axis and find the maximum stress induced in the section.
- 8 A curved beam, semi circular in plan, supported on three equally spaced supports. The beam carries a uniformly distributed load of w per unit of the circular length. Analyze the beam and sketch the bending moment, twisting moment diagrams and shear force diagram.
