

Code: 13A01308

B.Tech II Year I Semester (R13) Regular Examinations December 2014

MECHANICS OF SOLIDS

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

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

- (a) Define stress and strain.
- (b) What is a Bulk modulus?
- (c) What are the different types of beams?
- (d) Draw the S.F and B.M diagrams for a cantilever of length L carrying a point load 'W' at the free end.
- (e) Write any four assumptions made in theory of simple bending.
- (f) What do you mean by shear stress in beams?
- (g) What is Macaulay's method? Where it is used?
- (h) Define the terms: Torsional rigidity and Polar moment of inertia.
- (i) Name the stresses set up in a thin cylinder subjected to internal fluid pressure.
- (j) What do you mean by a thick compound cylinder?

PART – B

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

UNIT - I

- 2 (a) Explain and draw stress & strain diagram for mild steel.
- (b) Find the young's modulus of a brass rod of diameter 25 mm and of length 25 mm, which is subjected to a tensile load of 50 kN when the extension of the rod is equal to 0.3 mm.

OR

- 3 A 10 mm diameter steel bar of length 150 mm is stressed by a weight of 120 kN dropping freely through 20 mm before commencing to stretch the bar. Find the max instantaneous stress and the elongation produced in the bar. Take $E = 2 \times 10^5 \text{ N/mm}^2$.

UNIT - II

- 4 A beam of span L, simply supported at its ends is loaded with distributed load which varies parabolically from zero at each end to a max at the mid span. Taking the span equal to 4 m and the value of total load equal to 6000 N, plot the S.F and B.M diagrams, indicating the principal values.

OR

- 5 A horizontal beam AD 10 m long carries a uniformly distributed load of 160 N/m together with a concentrated load of 400 N at the left end A. The beam is supported at a point B which is 1m from A and at C which is on the right hand, half of the beam and 'x' m from the end D. Determine the value of x, if the midpoint is a point of contra flexure and for this arrangement draw S.F & B.M diagrams.

UNIT - III

- 6 A cast iron test beam 20 mm x 20 mm in section and 1m long and supported at ends fails when a concentrated load of 640 N is applied. What uniformly distributed load will break a cantilever of the same material 50 mm wide, 100 mm deep and 2 m long?

OR

- 7 Show that for a rectangular section of the max shear stress is 1.5 times the average shear stress.

Contd. in page 2

UNIT - IV

8 Prove that deflection at the centre of a simply supported beam, carrying a point load at the centre is given by $y_c = WL^3/48EI$.

OR

9 Determine the angle of twist and max shear stress developed in a shaft which tapers uniformly from a diameter of 160 mm to a diameter of 240 mm. The length of the shaft is 2 m and transmits a torque of 48 kNm. Take the value of modulus of rigidity for the material as 80 GN/m^2 .

UNIT - V

- 10 (a) Derive an expression for circumferential stress and longitudinal stress for a thin cylinder.
(b) A cylinder of internal diameter 3.0 and of thickness 6 cm contains gas. If the tensile stress in the materials is not exceed 70 N/mm^2 , determine the internal pressure of the gas.

OR

11 Find the thickness of a metal necessary for a cylindrical shell of internal diameter 160 mm to withstand an internal pressure of 8 N/mm^2 . The max hoop stress in the section is not to exceed 35 N/mm^2 .
