Code: 13A01308

**R13**

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)

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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 x $10^5$ 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.

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**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 $N/mm^2$.

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