Code: 13A01308

R13

B.Tech II Year I Semester (R13) Regular & Supplementary Examinations December 2015

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 compressive stress and compressive strain.
(b) What is resilience?
(c) What are the different types of beams?
(d) What is meant by point of contra-flexure?
(e) What are the assumptions made in the theory of simple bending?
(f) Define neutral axis of a cross section.
(g) Why hollow circular shafts are preferred when compared to solid circular shafts?
(h) What are the different methods used for finding deflection and slope of beams?
(i) Distinguish thin walled cylinder and thick walled cylinder.
(j) What are assumptions made in the analysis of thin cylinders?

PART – B

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

UNIT – I

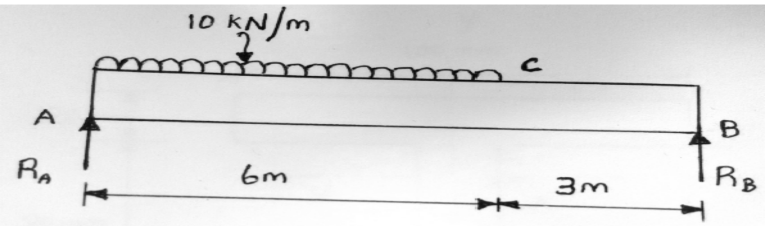
2 A compound tube consists of a steel tube 140 mm internal diameter and 160 mm external diameter and an outer brass tube 160 mm internal diameter and 180 mm external diameter. The two tubes are of the same length. The compound tube carries an axial load of 900 kN. Find the stresses and the load carried by each tube and the amount it shortens. Length of each tube is 140 mm. Take E for steel as 2 x 10^5 N/mm^2 and for brass as 1 x 10^5 N/mm^2.

OR

3 The stresses at a point in a bar are 200 N/mm^2 (tensile) and 100 N/mm^2 (compressive). Determine the resultant stress in magnitude and direction on a plane inclined at 60° to the axis of the major stress. Also determine the maximum intensity of shear stress in the material at the point.

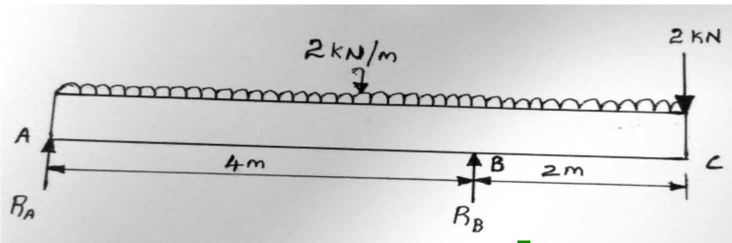
UNIT – II

4 Draw the shear force and bending moment diagram for a simply supported beam of length 9m and carrying a uniformly distributed load of 10 kN/m for a distance of 6 m from the left end. Also calculate the maximum bending moment on the section.



OR

5 Draw the shear force and bending moment diagram for overhanging beam carrying uniformly distributed load of 2 kN/m over the entire length and a point load of 2 kN as shown in figure. Locate the point of contraflexure.



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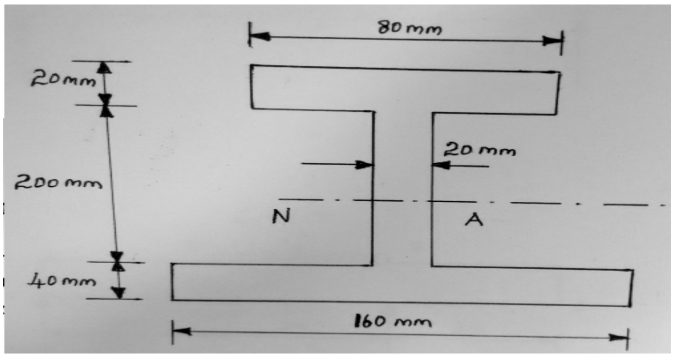
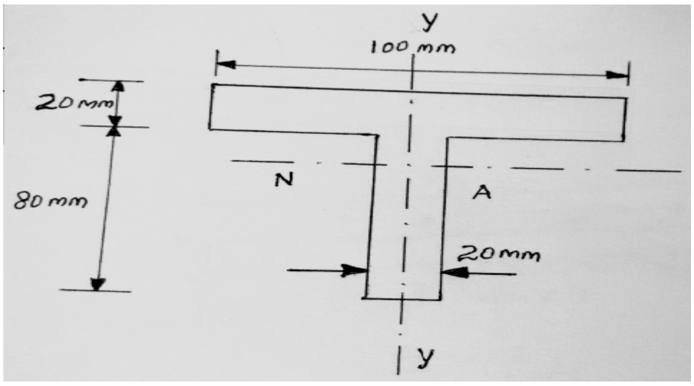
UNIT – III

6 A cast iron beam is of I-section as shown in figure. The beam is simply supported on a span of 5 m. If the tensile stress is not to exceed 20 N/mm^2, find the safe uniform load which the beam can carry. Find also the maximum compressive stress.



OR

7 The shear force acting on a section of a beam is 50 kN. The section of the beam is of T-shaped of dimensions 100 mm x 100 mm x 20 mm as shown in figure. The moment of inertia about the horizontal neutral axis is 314.221 x 10^4 mm^4. Calculate the shear stress at the neutral axis and at the junction of the web and the flange.

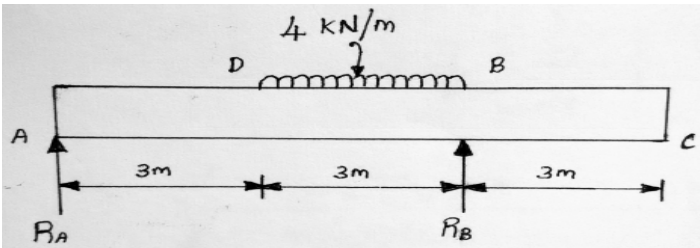


UNIT – IV

8 Determine the diameter of a solid shaft which will transmit 300 kW at 250 r.p.m. The maximum shear stress should not exceed 30 N/mm^2 and twist should not be more than 1° in a shaft length of 2 m. Take modulus of rigidity = 1 x 10^5 N/mm^2.

OR

9 A beam ABC of length 9 m has one support at the left end and the other support at a distance of 6 m from the left end. The beam carries a point load of 12 kN at right end and carries a uniformly distributed load of 4 kN/m over a length of 3 m as shown in figure. Determine the slope and deflection at point C.



UNIT – V

10 A boiler shell is to be made of 15 mm thick plate having a limiting tensile stress of 120 N/mm^2. If the efficiencies of the longitudinal and circumferential joints are 70% and 30% respectively. Determine: (i) The maximum permissible diameter of the shell for an internal pressure of 2 N/mm^2. (ii) Permissible intensity of internal pressure when the shell diameter is 1.5m.

OR

11 A steel cylinder of 300 mm external diameter is to be shrunk to another steel cylinder of 150 mm internal diameter. After shrinking the diameter at the junction is 250 mm and radial pressure at the common junction is 28 N/mm^2. Find the original difference in radii at the junction. Take E = 2 x 10^5 N/mm^2.

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