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Question Paper Code : 51244

B.E/B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Third Semester

Civil Engineering

CE 2201/CE 34/CE 1202 A/080100010/10111 CE 304 – MECHANICS OF SOLIDS

(Regulations 2008/2010)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Define modulus of Elasticity and Modulus of rigidity.

2. Explain upper yield point, lower yield point and plastic range in a stress-strain curve. For what type of steel do you expect upper and lower yield points.

3. What are the advantages of trusses over beams ?

4. Define 'tension coefficient'.

5. List the types of supports.

6. Define shear force.

7. Write the assumptions made in theory of simple bending ?

8. Define the term slope.

9. Give any two uses of leaf springs.

10. Write the equation of torsion in shafts.

PART – B (5 × 16 = 80 Marks)

11. (a) A steel rod of cross-sectional area 2000 mm^2 and brass rods each of cross-sectional area of 1200 mm^2 together support a load of 60 kN as in fig. 11(a). Find the stresses in the rods. Take E for steel = 2×10^5 N/mm^2 and E for brass = 1×10^5 N/mm^2. **(16)**

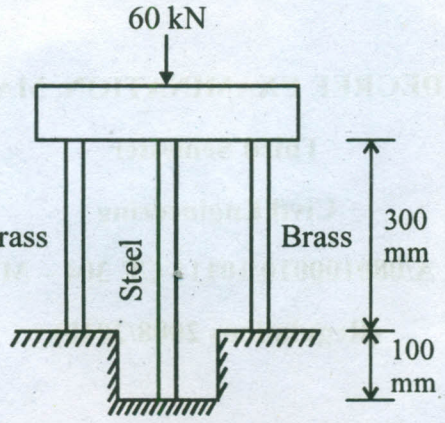

Fig. 11 (a)

OR

(b) A bar of 25 mm diameter is subjected to a pull of 40 kN. The measured extension on gauge length of 200 mm is 0.085 mm and the change in diameter is 0.003 mm. Calculate the Poisson's ratio and the values of the three moduli. **(16)**

12. (a) Determine the forces in the members of the frame shown in fig. 12 (a) by method of joints. **(16)**

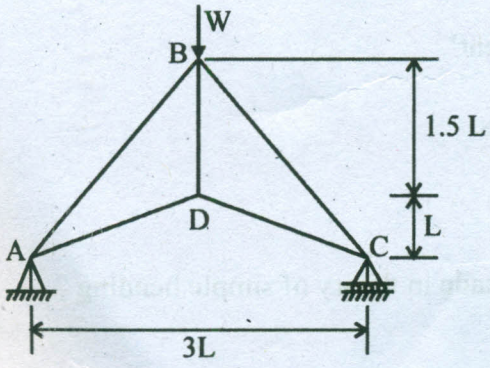

Fig. 12 (a)

OR

(b) (i) A cylindrical shell 2 m long and 90 cms internal diameter and 12 mm metal thickness is subjected to an internal pressure of 1.6 N/mm^2. Determine

(1) Maximum intensity of shear stress and

(2) Changes in the dimensions of the shell. Take E = 2×10^5 N/mm^2 and 1/m = 0.3. **(8)**

(ii) A copper cylinder 900 mm long, 400 mm internal diameter and 6 mm thick, with flat ends, is initially full of oil at atmospheric pressure. Calculate the volume of oil which must be pumped into the cylinder in order to raise the pressure to 5 N/mm^2 above atmospheric pressure. For copper take E = 1×10^5 N/mm^2 and Poisson's ratio = 1/3. Take bulk modulus of oil as 2500 N/mm^2. Neglect the deformation of the end plates. **(8)**

13. (a) Draw the shear force and bending moment diagrams for the beam shown in fig. 13 (a). Clearly mark the position of the maximum bending moment and determine its value. **(16)**

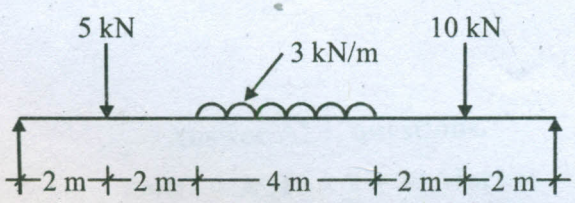

Fig. 13 (a)

OR

(b) The moment of inertia of a symmetrical section of a beam about its neutral axis is 2640 cm^4 and its depth is 20 cm. Determine the longest span over which, when simply supported, the beam would carry a UDL of 6 kN/m run without the stress due to bending not exceeding 1.2×10^5 N/mm^2. **(16)**

14. (a) Determine the slope at the supports and maximum deflection for the beam given in fig. 14 a use Macaulay's method. **(16)**

E = 2×10^5 N/mm^2

I = 20×10^6 N/mm^2

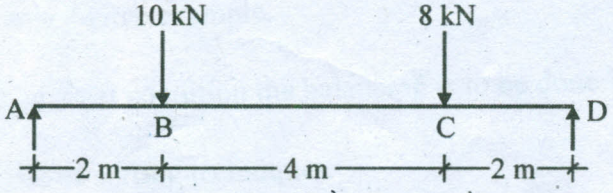

Fig. 14 (a)

OR

(b) The cross section of a T-beam is as follows : flange thickness = 10 mm; width of flange = 100 mm; thickness of web = 10 mm; depth of web = 120 mm. If a shear force of 2 kN is acting at a particular section of the beam. Draw the shear stress distribution across the cross section. **(16)**

15. (a) A solid steel shaft is subjected to a torque of 45 kNm. If the angle of twist is 0.5 degrees per meter length of the shaft and the shear stress is not to be allowed to exceed 90 MN/m^2, find (i) Suitable diameter for the shaft (ii) Final maximum shear stress, and (iii) Maximum shear strain in the shaft. Take C = 80 GN/m^2. **(16)**

OR

(b) An open coiled helical spring of wire diameter 12 mm, mean coil radius 84 mm, helix angle 20 degrees carries an axial load of 480 N. Determine the shear stress and direct stress developed at inner radius of the coil. **(16)**
