

2015

STRENGTH OF MATERIALS

Paper : CE 302

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer **any five** questions.

1. (a) A steel bar of 600mm^2 cross-sectional area is carrying loads as shown in fig.01

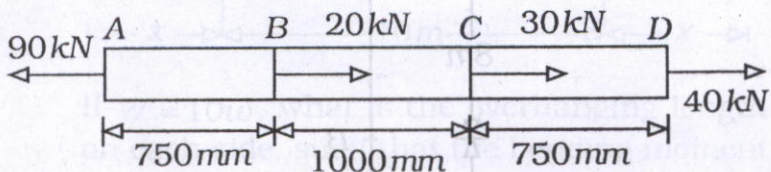


fig. - 01

Determine the elongation of the bar.
Take E for the steel as 200Gpa . 10

Contd.

- (b) A steel bar shown in *fig.02* is subjected to a tensile load of 120kN

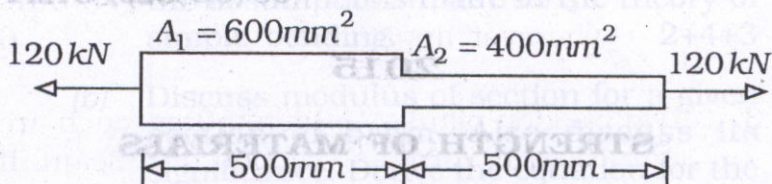


fig.02

Calculate the elongation of the bar.
Take E as 200Gpa. 10

2. (a) A steel wire ABC 16m long having cross sectional area of 4 mm^2 weighs 20N as shown in *fig. 03*. If the modulus of elasticity for the wire material is 200Gpa, find the deflections at C and B. 14

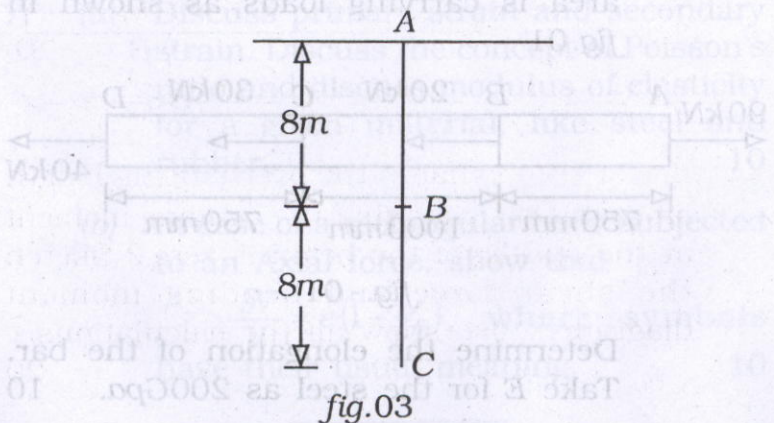
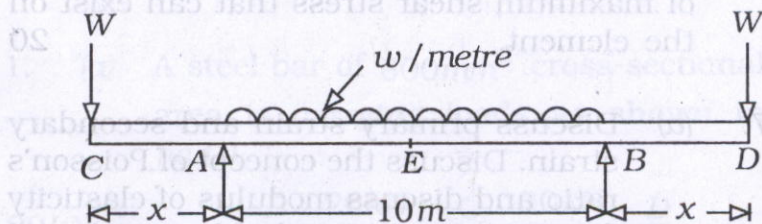


fig.03

(b) Derive for the deformation of a body due to force acting on it, with the use of usual notations and symbols wherever applicable. 6

3. Two wooden planks $150\text{mm} \times 50\text{mm}$ each are connected to form a T-section of a beam. If a moment of 6.4kNm is applied around the horizontal neutral axis, inducing tension below the neutral axis, find the bending stresses at both the extreme fibres of the cross section. 20

4. A simply supported beam with over-hanging ends carries transverse loads as shown in fig.04



If $W = 10w$, what is the overhanging length on each side, such that the bending moment at the middle of the beam is zero? Sketch the shear force and bending moment diagrams. Also show all the calculations. 20

5. (a) Define and also explain the concept of theory of simple bending. Also list out the assumptions made in the theory of simple bending. 2+4+3
- (b) Discuss modulus of section for a given section of beam. Also discuss its significance. Derive the equation for the theory of simple bending. 2+2+7
6. An element in a strained body is subjected to a tensile stress of 150Mpa and a shear stress of 50Mpa tending to rotate the element in an anticlockwise direction. Find (i) the magnitude of the normal and shear stresses on a section inclined at 40° with the tensile stress and (ii) the magnitude and direction of maximum shear stress that can exist on the element. 20
7. (a) Discuss primary strain and secondary strain. Discuss the concept of Poisson's ratio and discuss modulus of elasticity for a given material, like steel and rubber. 10
- (b) In case of a rectangular body subjected to an Axial force, show that
$$\frac{\delta V}{V} = e(1 - \frac{2}{m}),$$
 where symbols have their usual meaning. 10