) 8558 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER B.TECH.(ENGINEERING) DEGREE EXAMINATION, DECEMBER 2010

CE 04 303—MECHANICS OF SOLIDS

Time : Three Hours Maximum : 100 Marks

Answer **all** *the questions.*

I. (a) State Hooke's law. Sketch the stress-strain diagram for a ductile material like mild steel tested under tension upto destruction, marking the salient points on it.

(b) Distinguish between : stress and strain, normal stress and shear stress, working stress and yield stress.

(c) Explain the construction of Mohr's circle to obtain principal stresses.

(d) Derive the relationship between slope, deflection and radius of Curvature of a simply supported beam.

(e) Define section modulus and determine its value of a hollow circular section of outer diameter 100 mm and inner diameter 75 mm.

(f) Explain the application of moment area method for calculating the slope and deflection for a cantilever beam.

(g) Define slenderness ratio. State the limitations of Euler's formula.

(h) Derive Lame's equations for radial and hoop stresses developed in a thick cylinder which is subjected to fluid pressure.

(8 × 5 = 40 marks)

(a) Two vertical rods one of steel and another of brass and each fastened at the upper end at a distance of 1 m apart. Each rod is 1.2 m long and the diameter of steel rod is 25 mm and that of brass rod is 30 mm. A horizontal rigid bar connects the lower ends of the bar and is placed a load of 5 kN so that the bar remains horizontal. Find the position of the load on the cross-bar and the stresses in each rod. Take $E_{steel} = 2.1 \times 10^5$ MPa and $E_{brass} = 1 \times 10^5$ MPa.

Or

The modulus of rigidity of a material is 0.8×10^5 N/mm^2. When a 6 mm × 6 mm rod of this material was subjected to an axial pull of 3600 N it was found that the lateral dimension of the rod changed to 5.9991 mm × 5.9991 mm. Find the Poisson's ratio and the modulus of elasticity.

Turn over

III. (a) A machine component of semicircular section 200 mm diameter acts as a beam of span 1.25 metre. It is placed with its base horizontal. If it carries a uniformly distributed load of 300 kN/ metre run of the whole span, find the maximum stress induced.

Or

(b) Draw shear force, bending moment diagrams for the overhanging beam shown in Fig. 1

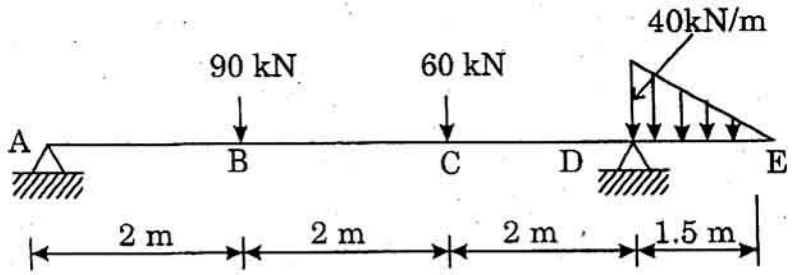

Fig. 1

IV. (a) A beam 5 m long is supported at one end and at point 1 m from the other end. The beam carries a uniformly distributed load of 12kN/m run over the whole length and concentrated loads of 10 kN at the extreme overhanging end at a section midway between the supports. Determine the deflection of the overhanging load below of supports. Take $E = 2 \times 10^5$ N/r and $I = 12 \times 10^{-6} m^4$.

Or

(b) A rolled steel joint ISMB 250 x 125 mm. carries a point load of 20 kN at 3m. from one simply supported beam of span 9 m. I_{xx} and E for the beam are 5131.6 cm^4 and 2 respectively. Using conjugated beam method, find the deflection under the load a maximum deflection of the beam

V. (a) A tube whose external and internal diameters are 360 mm and 240 mm respectively another tube 60 mm thick shrunk on to it. The bore of the outer tube is machined to 1 mm l than the external diameter of the tube on to which it is subsequently shrunk. If the tubes a made of steel for which the value of $E = 200 kN/mm^2$, determine expressions for the radial a hoop stresses developed in the inner tube.

Or

(b) A circular bar of length 1.2 m is used as a strut with one end hinged and the other end fre The same bar when freely supported at its ends gives the central deflection of 3 mm. when load of 0.1 kN is placed at its centre. Find the Euler load. Find also the safe load taking factor of safety of 3.

(4 x 15 = 60 mark