D 2327 (Pages 3) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2009

EE–04–303—STRENGTH OF MATERIALS

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

I. (a) Explain Hooke's law. Also distinguish between Modulus of Rigidity and Bulk Modulus.

(b) Explain Strain rosette.

(c) Draw the shear force diagram of a Cantilever beam subjected to uniformly distributed load of magnitude w/m length over the whole span of length L.

(d) Derive the section modulus of a hollow rectangular section shown in Figure 1.

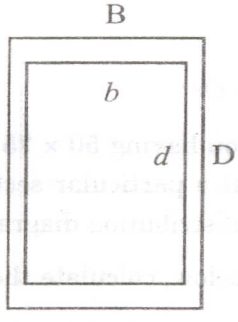

Fig. 1

(e) Derive the differential equations of the elastic curve.

(f) Derive the equation for deflection of a closely coiled helical spring subjected to an axial tension of W kN.

(g) Explain the assumptions and limitations of Euler's theory of buckling.

(h) Explain the following terms :—

(i) Lap joint.

(ii) Butt joint.

(iii) Staggered riveting.

(iv) Chain riveting.

(8 × 5 = 40 marks)

II. (a) A brass bar of cross-sectional area of 1500 mm^2 is subjected to an axial load of 150 kN. Determine the stress and strain in the material. Given the Young's modulus of brass as 80 kN/mm^2 and the length of the bar as 600 mm.

Or

(b) A point in a strained material is subjected to a horizontal tensile stress of 100 kN/m^2, and a vertical compressive stress of 150 kN/m^2. Determine graphically the normal and tangential stresses acting on a plane inclined at 30° with the minor stress plane. Also determine the maximum shear stress.

III. (a) Draw the shear force and bending moment diagrams of the beam shown in Figure-2 below :

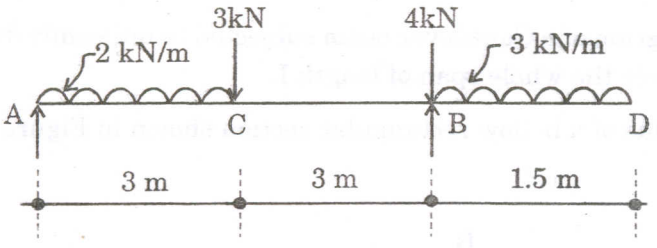

Fig. 2.

Or

(b) A beam of T shape for the cross-section having 50 × 75 mm flange and 70 × 20 mm web is subjected to a shear force of 15 kN at a particular section. Obtain the value of maximum bending moment and draw the shear distribution diagram across the depth of the section.

IV. (a) For the beam shown in the Figure-3 below, calculate the slope at point B and deflections at points C and D.

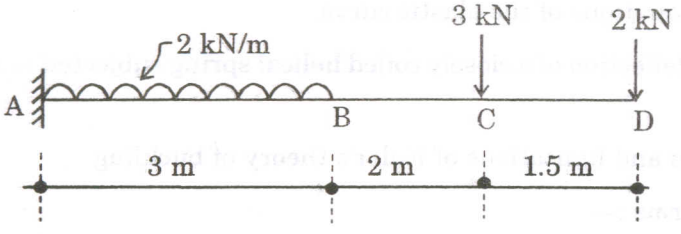

Fig. 3.

Or

(b) A closely coiled helical spring of 10 cm mean diameter is made up of 1 cm diameter wire and has 20 turns. Spring carries an axial load of 200 N. Calculate deflection under the load and stiffness of the spring. Take Rigidity Modulus as 8.4×10^4 MPa.

[redacted]

V. (a) An I section of length 6 m is used as a column with both ends fixed. The flanges are 200 mm wide and overall depth is 400 mm. Thickness of web and flange are 20 mm. Find the crippling load for the column using Euler's formula. Young's modulus for the steel is 2×10^5 N/mm^2.

Or

(b) A cylinder with 250 mm internal diameter and 50 mm metal thickness carries a fluid at a pressure of 10 N/mm^2. Determine the hoop stress and radial stress distribution across the wall thickness. Draw a neat sketch showing the variation of stress.

(4 × 15 = 60 marks)