D 51479 (Pages 3)

Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2008

EE 04 303—STRENGTH OF MATERIALS

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

I. (a) Define temperature stresses. Derive an expression for the temperature stress.

(b) Explain principal strains.

(c) Explain the following terms :—

(i) Hogging and sagging moments.

(ii) Points of contra flexure.

(iii) Uniformly distributed and uniformly varying loads.

(d) Determine the section modulus of the I-section shown in Fig. 1. below.

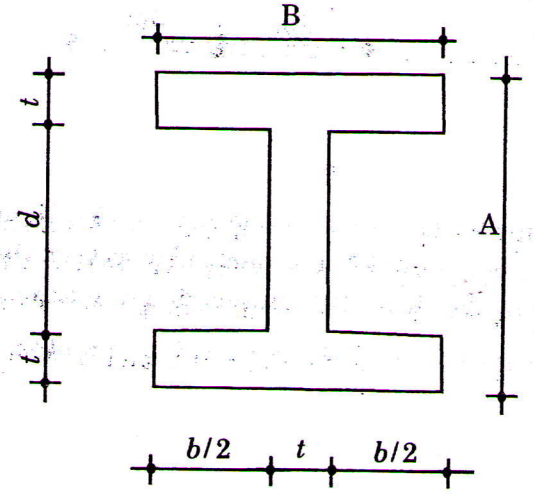

Fig. 1.

(e) Differentiate between Statically determinate and Indeterminate beams.

(f) Derive the torsion equation between torque T, and maximum shear stress f_s in the case of a solid shaft subjected to a driving torque of T kN-m.

(g) Write Rankine's formula and explain each term.

(h) Explain welding. Distinguish between butt welds and fillet welds.

(8 × 5 = 40 marks)

Turn over

II. (a) (i) Derive the relationship between Young's modulus E and rigidity modulus N of a bar of steel of length L and Poisson's ratio μ.

(ii) The diameter of a circular steel rod is 30 mm and it is 350 mm long. Calculate the extension of the rod if it is subjected to a tensile force of 100 kN.

Or

(b) At a certain point in a material the normal stresses are 60 MN/m^2 tensile in x-direction and 40 MN/m^2 compressive in y-direction. The maximum principal stress allowed is 150 MN/m^2. What stress in shear may be allowed on x-and y-planes ? What will then be the minimum principal stress and maximum shear stress developed ?

III. (a) Draw the Shear Force and Bending Moment diagrams of the beam shown in Fig 2..

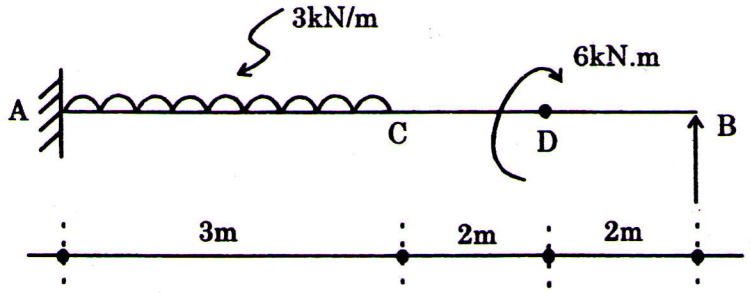

Fig. 2.

Or

(b) A beam of inverted T-shape for the cross-section having 75 × 25 mm flange and 75 × 25 mm web is subjected to a shear force of 20 kN at a particular section. Obtain the value of maximum bending moment and draw the shear distribution diagram across of depth of the section.

IV. (a) Determine the slope at point B, and deflections at C and D of the beam shown in the Fig. 3. below :

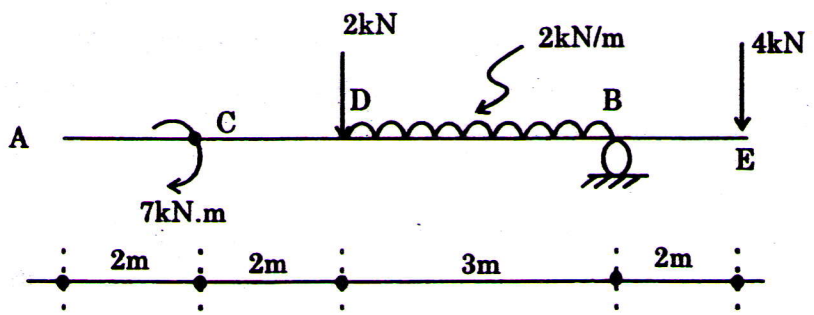

Fig. 3.

Or

(b) A solid aluminium shaft 150 cm long and 10 cm in diameter is to be replaced by a hollow steel shaft of the same length and same outside of diameter. Both the shafts could carry the same torque and both get twisted through the same angle. What must be the inner diameter of the hollow shaft ? Take modulus of rigidity of Aluminium as 28×10^2 MPa and that of steel as 85×10^3 MPa.

V. (a) Derive an expression for the crippling load of a column with both ends fixed. What assumptions are made in the derivation ?

Or

(b) A water main 800 mm in diameter contains water at a pressure head of 100 m. If the specific weight of water is 10 kN/m^3, calculate the minimum thickness of the metal. The maximum permissible stress in the material is restricted to 20 N/mm^2. Derive the formula used.

(4 × 15 = 60 marks)