D 30892 (Pages : 3) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION OCTOBER 2012

Civil Engineering

CE09 303/PTCE 09.302—MECHANICS OF SOLIDS

(2009 Admissions)

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

I. (a) Define Young's modulus and Modulus of rigidity.

(b) Define Modular ratio.

(c) Write the relationship between (i) Shear force and Load intensity ; (ii) Bending moment and Shear force.

(d) What is meant by section moduli ?

(e) What is hoop stress ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

II. (a) What is the procedure to find the thermal stresses in a composite bar ?

(b) Draw SFD and BMD for a simply supported beam carrying a point load at the centre.

(c) Explain the shear centre of thin walled open section.

(d) Derive an expression using Macaulay's method for fixed beam.

(e) Derive the Euler's formula for a column with both end fixed.

(f) Compare the thin cylinder and thick cylinder in terms of stresses induced.

(4 × 5 = 20 marks)

Part C

III. (a) A brass bar, having cross-section area of 900 mm^2, is subjected to axial forces as shown in Fig.1, in which AB = 0.6 m, BC = 0.8 m, and CD = 1.0 m. Find the total elongation of the bar. Take $E = 1 \times 10^5$ N/mm^2.

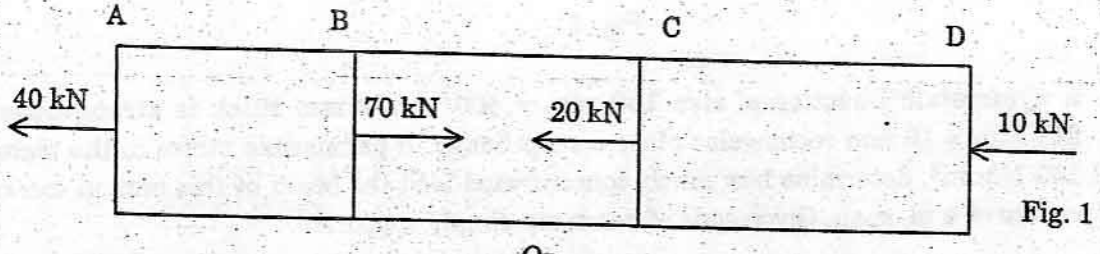

Fig. 1

Or

(b) A member ABCD is subjected to point loads P_1, P_2, P_3 and P_4 as shown in Fig. 2. Calculate the force P_3 necessary for equilibrium if P_1 = 120 kN, P_2 = 220 kN and P_4 = 160 kN. Determine also the net change in the length of the member. Take E = 200 GN/m^2.

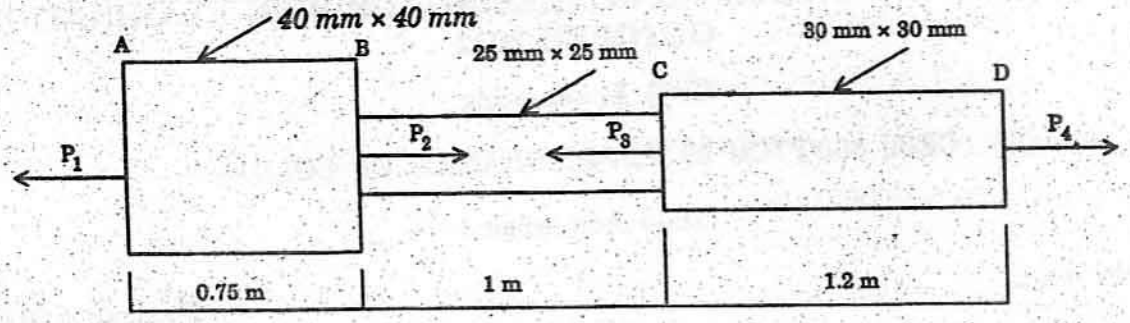

Fig. 2

IV. (a) Draw SFD and BMD for the beam shown in Fig. 3. Indicate the position and the magnitude of maximum bending moment.

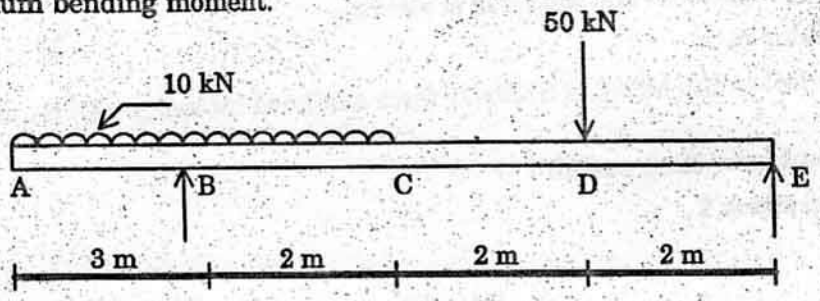

Fig. 3

Or

(b) Draw SFD and BMD for the beam shown in Fig. 4. Indicate the position and the magnitude of maximum bending moment.

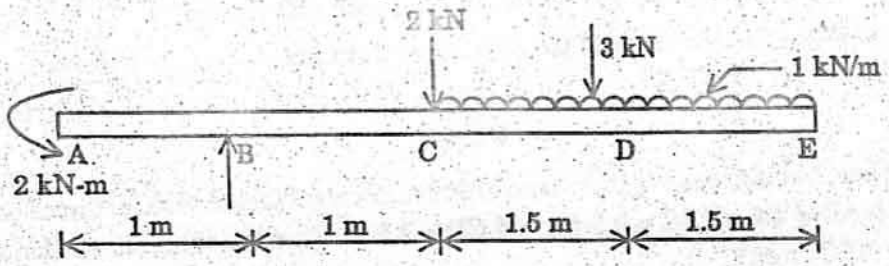

Fig. 4

V. (a) A symmetric I-section of size 180 mm × 400 mm, 8 mm thick is strengthened with 240 mm × 10 mm rectangular plate on top flange. If permissible stress in the materials is 150 N/mm^2, determine how much concentrated load the beam of this section can carry at centre of 4 m. span. Given ends of beam are simply supported.

Or

(b) Fig. 4 shows the cross-section of a cantilever beam of 2.5 m span. Material used is steel for which maximum permissible stress is 150 N/mm^2. What is the maximum uniformly distributed load this beam can carry ?

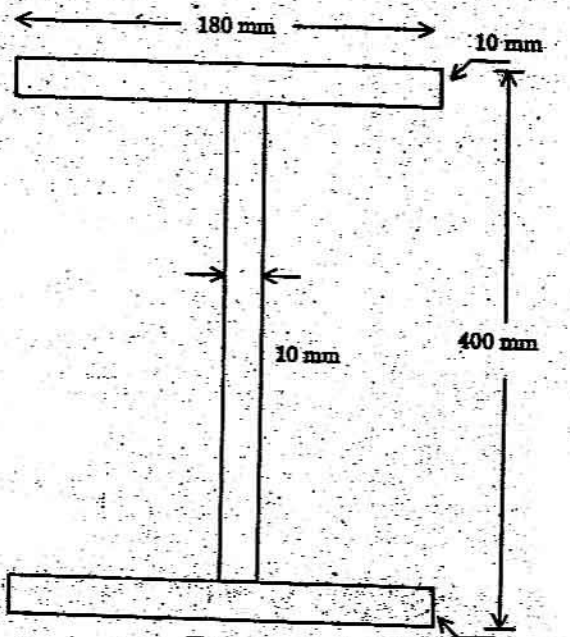

Fig. 5

(a) A cylindrical shell 900 mm long, 150 mm internal diameter, having thickness of metal as 8 mm. is filled with a fluid at atmospheric pressure. If an additional 20000 mm^3 of fluid is pumped into the cylinder, find (i) pressure exerted by the fluid on the cylinder ; (ii) hoop stress induced.

Or

(b) A 1.5 mm long column has a circular cross-section 50 mm diameter. Both ends of the column are fixed. Taking factor of safety of 2, calculate the safe load using Rankine's formula and Euler's formula. Take $\alpha = 1/1600$, $f_c = 560$ N/mm^2, and $E = 2 \times 10^5$ N/mm^2.

(4 × 10 = 40 marks)