C 47949 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION JUNE 2008

CE 04 303—MECHANICS OF SOLIDS

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*
Assume additional data if required.

Part A

I. (a) Derive relationship between Youngs modulus (E) ; Shear modulus, (G) and Poisson's ratio, (μ).

(b) Write short note on strain energy.

(c) Discuss on Pure bending.

(d) Show that for a rectangular section the distribution of shear stress is parabolic.

(e) Discuss on method of successive integration.

(f) Briefly explain conjugate beam method.

(g) Distinguish between Euler's formula and Rankine's formula.

(h) What is a helical spring ? Differentiate between two types of helical springs.

(8 × 5 = 40 marks)

Part B

II. (a) A member ABCD is subjected to point loads, P_1, P_2, P_3 and P_4 as shown in Fig. 1. Calculate the force P_2 necessary for equilibrium, if $P_1 = 45$ kN, $P_3 = 450$ kN, $P_4 = 130$ kN. Determine the total elongation of the member, assuming the modulus of elasticity to be 2.1×10^5 N/mm.^{2}

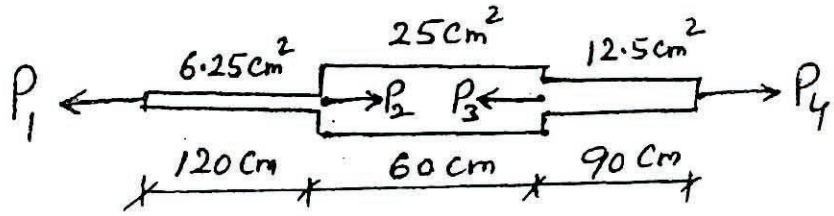

Fig. 1

Or

(b) At a point in a bracket the stresses on two mutually perpendicular planes are 120 N/mm.^{2} tensile and 60 N/mm.^{2}. Find using Mohr's stress circle, the principle stresses and maximum shear stress at the point.

(15 marks)

Turn over

III. (a) A beam 5 m. long supported at the ends carries point loads 140 kN, 70 kN and 90 kN at distances 0.5 m., 2.5 m and 3.5 m respectively from the left end. Find maximum shear force and bending moment. Draw shear force diagram and Bending moment diagram.

Or

(b) A simply supported timber beam of span 5 m. has to carry a load of 70 kN/m. Calculate dimensions of the beam, if the maximum permissible stress is limited to 8 N/mm^2. The Ratio of depth to width is to be 1.6. Calculate maximum shear stress in the beam.

(15 marks)

IV. (a) A simply supported beam of span 6 m is carrying uniformly distributed load of 60 kN/m. over its entire span. If E = 210 GPa and I = 8000 cm^4, find slope at the support and deflection at the centre using moment area method.

Or

(b) A cantilever of length l carries a uniformly distributed load of w/metre over the whole length. Calculate slope and deflection at free end. Use conjugate beam method.

(15 marks)

V. (a) Compare Crippling loads by Euler's and Rankine's and formulae for a tubular steel shut 3.0 m. long having outer and inner diameters 50 mm. and 45 mm. loaded through pin joints at both ends. Take yield stress as 320 N/mm.^{2} and Rankine's constant as $\frac{1}{7500}$. E = 2.1 × 10^5 N/mm.^{2}

Or

(b) The air vessel of a torpedo is 550 mm. external diameter and 10 mm thick, the length being 183 cm. Find change in external diameter and length when charged to 10.5 N/mm.^{2} internal pressure. Take E = 2.1 × 10^5 N/mm.^{2} and Poisson's ratio as 0.3.

(15 marks)

[4 × 15 = 60 marks]