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(Pages : 3)

Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, OCTOBER 2011

CH 09 303/PTCE 09 302—MECHANICS OF SOLIDS

(2009 admissions)

Time : Three Hours

Maximum : 70 Marks

Part A

Answer **all** *questions.*

I. (a) Define Stress and strain.

(b) Define Poisson's ratio.

(c) Define the term conjugate beam.

(d) State the assumptions made in deriving bending equation.

(e) What is thin shell and thick shell ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

II. (a) Determine the total change in length of the bar of three sections of a bar is having different lengths and different diameters when it is subjected to an axial load P. Take Young's modulus of different sections same.

(b) Draw SFD and BMD for a cantilever beam carrying a UDL of intensity w per metre run.

(c) Explain the theory of simple bending.

(d) Derive the differential equation for deflection curve.

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

(f) Derive the expression of hoop stress for thin cylindrical shell.

(4 × 5 = 20 marks)

Part C

III. (a) A axial pull of 40000 N is acting on a bar consisting of three sections of length 30 cm., 25 cm., and 20 cm. and of diameters 2 cm., 4 cm., and 5 cm. respectively. If the Young's modulus = 2×10^5 N/mm.^{2}, determine :

(i) Stres in each section ; and

(ii) Total extension of the bar.

Or

(b) 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 = 1×10^5 N/mm.^{2}

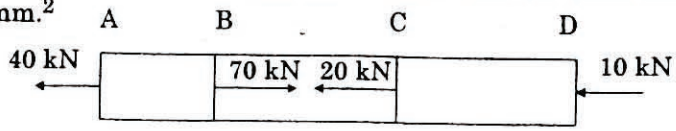

Fig 1

IV. (a) Draw SFD and BMD for the beam shown in Fig. 2. Indicate the position and the magnitude of maximum bending moment.

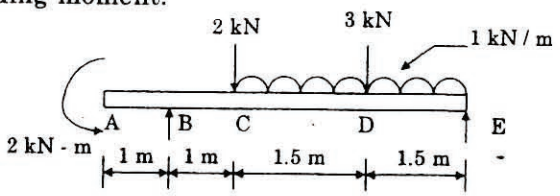

Fig 2

Or

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

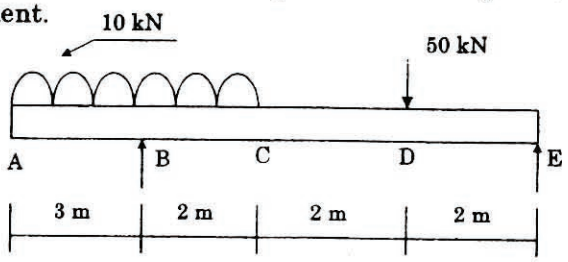

Fig 3

V. (a) A simply supported beam of span 3.0 m. has a cross-section 120 mm. × 180 mm. If the permissible stress in the material of the beam is 10 N/mm.^{2}, determine (i) Maximum u.d.l. it can carry ; (ii) Maximum concentrated load at a point 1 m. from support it can carry. Neglect moment due to self weight.

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 ?

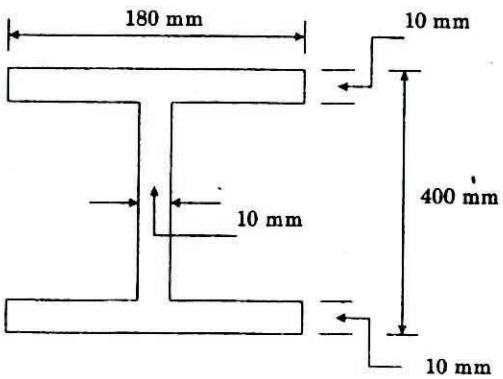

Fig 4

VI. (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 thick cylindrical pipe outside diameter 300 mm. and internal diameter 200 mm. is subjected to an internal fluid pressure of 14 N/mm.^{2} Determine the maximum hoop stres developed in the cross-section. Sketch the variation of hoop stress across the thickness of the pipe.

(4 × 10 = 40 marks)