B 2116

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Third Semester

Chemical Technology

CH 235 — MECHANICS OF SOLIDS

(Common to Leather Technology/Textile Technology)
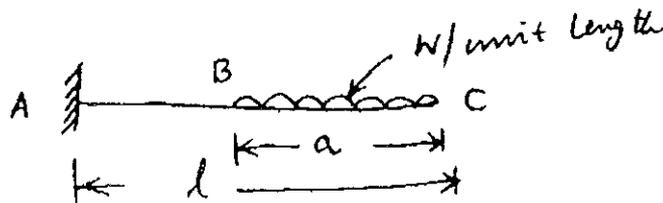
Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define stiffness.

2. Derive a relation for minimum thermal stress induced in a circular bar with uniformaly varying diameter, due to temperature raise.

3. Draw Bending moment diagram for the beam given below.

4. Define point of contraflexure.

5. Draw component bending moment diagrams for the beam given below and find the slope at 'B'.
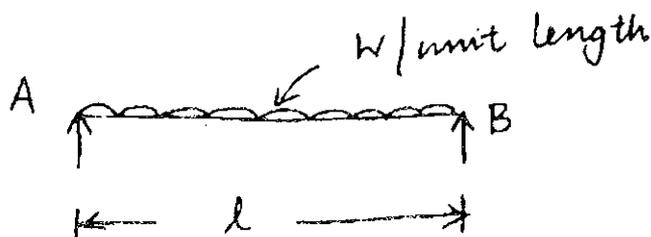
6. What is the slope and deflection at the free end of the beam given below.
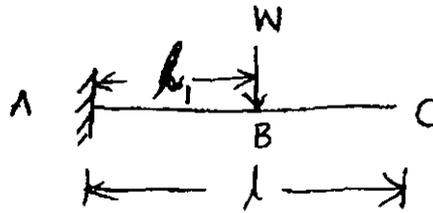
7. State any four assumptions made in the theory of pure bending.

8. What is the section modulus of a hollow circular section.

9. Derive relation for reflection of a closely coiled helical spring subjected to axial load 'W'.

10. Define slenderness ratio.

PART B — (5 × 16 = 80 marks)

11. (a) A steel line rod 50 mm in diameter and 2.5 m long is subjected to a pull of 100 kN. To what length the rod should be bored centrally so that the total extension will increase by 15% under the same pull, the bore being 25 mm diameter? Take $E = 200$ GN/m².

Or

(b) A copper rod of 40 mm diameter is surrounded lightly by a cast iron tube of 800 mm external diameter, the ends being firmly fastened together. When put to a compressive load of 30 kN, what load will be shared by each? Also determine the amount by which the compound bar shortens if it is 2 m long.

12. (a) Draw SFD and BMD for the beam given in fig Q 12 (a). Also determine the maximum bending moment.
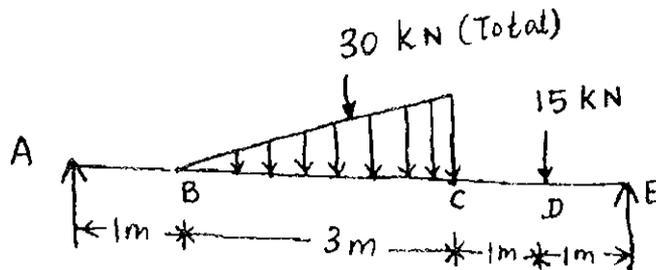

Fig. 12 (a)

Or

(b) Draw SFD, BMD and locate the point of contraflexure if any for the beam given in fig Q.12 (b)
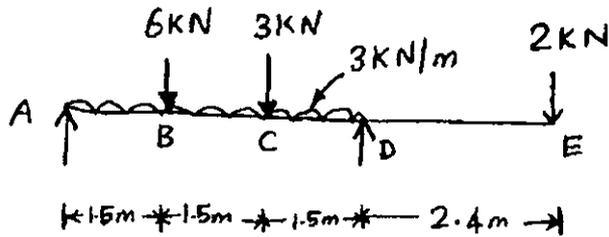

Fig. 12 (b)

13. (a) Derive relations for slope at the supports and maximum deflections for the beam given in Fig.Q 13 (a). using Moment Area Method.
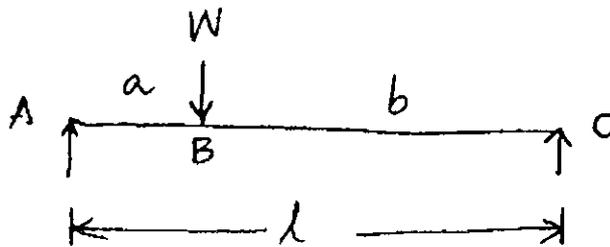

Fig. Q 13 (a)

Or

(b) A simply supported beam ACB of span 4 m, carrying a load of 100 kN at its mid span C has cross sectional moment of Inertia 24×10^6 mm^4 over left half of the span AC and 48×10^6 mm^4 over right half CB. Find the slopes at the two supports and the deflection under the load. Take E = 200 GPa. Use conjugate beam method.

14. (a) Three beams have the same length, the same allowable stress and the same bending moment. The cross sections of the beams are a square, a rectangle with depth twice the width, and a circle. Determine the ratios of weights of the circular and the rectangular beams with respect to the square beam.

Or

(b) An I section beam 340 mm × 200 mm has a web thickness of 10 mm and flange thickness of 20 mm. It carries a shearing force of 100 kN. Sketch the shear stress distribution across the section.

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15. (a) A stepped shaft is shown in Fig.15 (a) what is the total angle of twist at the free end, if the maximum shear stress in the shaft is limited to 70 MN/m²? Assume the modular of rigidity tube 84 GN/m²
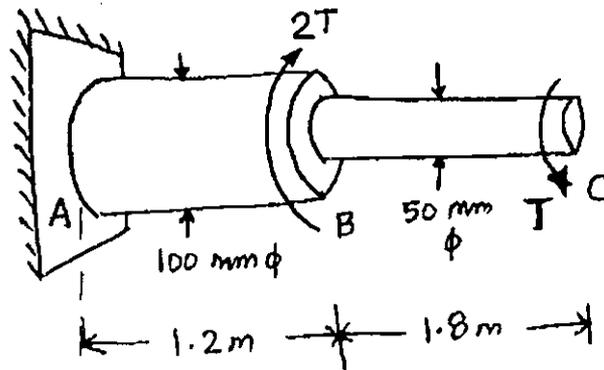

Fig. Q.15 (a)

Or

(b) Compare the ratio of the strength of a solid sted column to that of a hollow of the same cross sectional area. The internal diameter of the hollow column is 3/4 of the external diameter. Both the columns have the same length and are pinned at both ends.