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Q 2129

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Third Semester

Chemical Engineering

CH 235 — MECHANICS OF SOLIDS

(Common to Leather Technology and Textile Technology)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

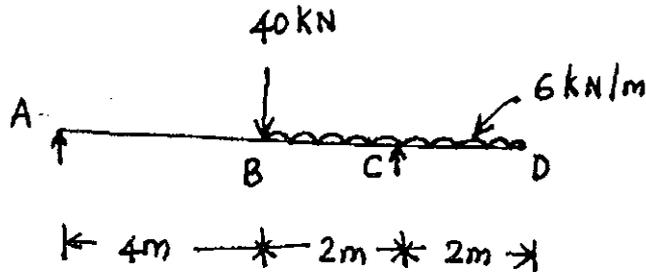
1. Derive the relationship between Young's Modulus and bulk modulus.
2. Define "stability" and classify.
3. What is the fixing moment at the fixed end of a cantilever beam with uniformly distributed load over entire span?
4. Explain why some overhanging beams have point of contra flexure.
5. State Moment Area Mohr's theorem I.
6. Give the relation for Maximum deflection of a beam, simply supported at its ends, carrying uniformly varying load with zero intensity at one end and W per unit length at the other end.
7. How do you calculate the load carrying capacity of beams?
8. What is meant by section modulus?
9. What is (a) Torsional Rigidity? (b) Flexural Rigidity?
10. Explain the failure of long and short columns due to axial loads.

PART B — (5 × 16 = 80 marks)

11. (a) A flat plate tapers uniformly from 200 mm to 80 mm width in a length of 600 mm and uniform thickness of 20 mm. Determine the elongation of the plate if it is subjected to an axial pull of 60 kN.
Take $E = 2.1 \times 10^5 \text{ N/mm}^2$.

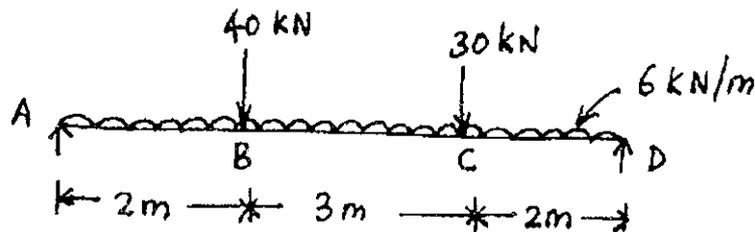
Or

- (b) A metallic rod is 10 mm diameter, tested under an axial pull of 16 kN. The diameter of the rod is reduced by 0.0035 mm. The modulus of rigidity of the rod is $0.65 \times 10^5 \text{ N/mm}^2$. Find the other moduli.
12. (a) Draw SFD and BMD for the beam given below.

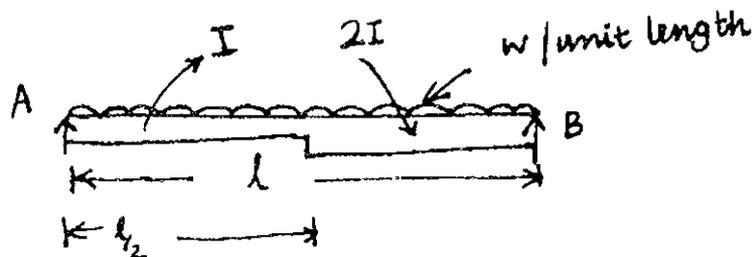


Or

- (b) Derive relations for maximum deflection and slope at the supports in terms of EI for the beam given below. Use Macaulay's Method.



13. (a) Derive relations for maximum deflection and slope at the supports in terms of EI for the beam given below. Use Conjugate beam method.



Or

- (b) A cast iron pipe of external diameter 200 mm, 20 mm thickness and 7.5 m long is simply supported at its ends. The pipe carries a uniformly distributed load of 5 kN/m (excluding the self weight) over the full length. Calculate the maximum flexural stress induced. Assume the unit weight of material of a pipe as 80 kN/m³.
14. (a) The shear stress acting on a beam at a section is 'F'. The section of the beam is triangular with base 'b' and altitude 'h'. The beam is placed with its base horizontal. Find the maximum shear stress and the shear stress at neutral axis.

Or

- (b) Derive Torsion formula.
15. (a) Find the maximum torque that can be safely applied to a shaft of 100 mm diameter. The permissible shear stress and the allowable twist are respectively 200 N/mm² and 3° per 10 diameter length of the shaft. Take $C = 1 \times 10^5$ N/mm².

Or

- (b) A T-section column of length 2.5 m with flange of width 120 mm and thickness 20 mm and web of depth 130 mm and thickness 20 mm is subjected to an axial load. Find the crippling load using Euler's formula if both the ends are fixed. $E = 210$ kN/mm².