Reg. No. : | | | | | | | | | | | |

Question Paper Code : C 1132

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2010.

Fourth Semester

Mechanical Engineering

CE 1262 — STRENGTH OF MATERIALS

(Common to Automobile Engineering/Mechatronics Engineering/Metallurgical Engineering/Production Engineering)

(Regulation 2004)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Poisson's Ratio.
2. Define: Resilience, proof resilience and modulus of resilience.
3. What do you mean by the point of contraflexure?
4. Sketch the shear stress distribution diagram across the depth of a T — section.
5. What is Polar Modulus? Give the expressions for Polar Modulus for a solid shaft and for a hollow shaft.
6. Define: Torsional rigidity of a shaft.
7. State Area Moment theorem.
8. Give the relations between curvature, bending moment, shear force, slope, deflection etc., at a section.
9. Define: Thin cylinders. Name the stresses set up in a thin cylinder subjected to internal fluid pressure.
10. Give the expressions for strain energy in bending and torsion.

55

PART B — (5 × 16 = 80 marks)

11. (a) (i) The ultimate stress, for a hollow steel column which carries an axial load of 1.9MN is 480 N/mm². If the external diameter of the column is 200 mm, determine the internal diameter. Take factor of safety = 4. (8)

(ii) Draw the stress-strain curve for mild steel subjected to tension and indicate the salient points. (8)

Or

(b) (i) Derive an expression for volumetric strain for a rectangular bar which is subjected to three mutually perpendicular tensile stresses. (8)

(ii) A test element is subjected to three mutually perpendicular unequal stresses. Find the change in volume of the element, if the algebraic sum of these stresses is equal to zero. (8)

12. (a) A square beam 20 mm × 20 mm in section and 2m long is supported at the ends. The beam fails when a point load of 400 N is applied at the centre of beam. What uniformly distributed load per meter length will break a cantilever of same material 40 mm wide, 60 mm deep and 3 m long?

Or

(b) Draw the S.F. and B.M. diagrams for a simply supported beam carrying a uniformly varying load from zero at each end to w per unit length at the centre.

13. (a) A closely coiled helical spring made of 10 mm diameter steel wire has 15 coils of 100 mm mean diameter. The spring is subjected to an axial load of 100 N. Calculate:

(i) the maximum shear stress

(ii) the deflection and

(iii) stiffness of the spring.

Take modulus of rigidity, $C = 8.16 \times 10^4$ N/mm².

Or

(b) A solid circular shaft transmits 75 kW power at 200 rpm. Calculate the shaft diameter, if the twist in the shaft is not exceed 1^0 in 2 metre length of the shaft and the shear stress is limited to 50 N/mm². Take $C = 1 \times 10^5$ N/mm².

14. (a) A cantilever of length 3 m carries two point loads of 2 kN at free end and 4 kN at a distance of 1 m from the free end. Find the deflection at free end using area moment method. Take E = 2×10^5 N/mm^2 and $I = 10^8$ mm^4.

Or

(b) A simply-supported beam of length 4m carries point loads of 3 KN each at a distance of 1m from each end. If $E = 2 \times 10^5$ N/mm^2 and $I = 10^8$ mm^4 for a beam, then using conjugate beam method, determine :

(i) Slope at each end and under each load.

(ii) Deflection under each load and at the centre.

15. (a) Derive the expressions for hoop stress and longitudinal stress in a thin cylinder with ends closed by rigid flanges and subjected to an internal fluid pressure. Take the internal diameter and shell thickness of the cylinder to be 'd' and 't' respectively.

Or

(b) A point in a strained material is subjected to stresses shown in Figure Qn. 15 (b). Using Mohr's circle method, determine the normal and tangential stresses across the oblique plane. Check the answer analytically.

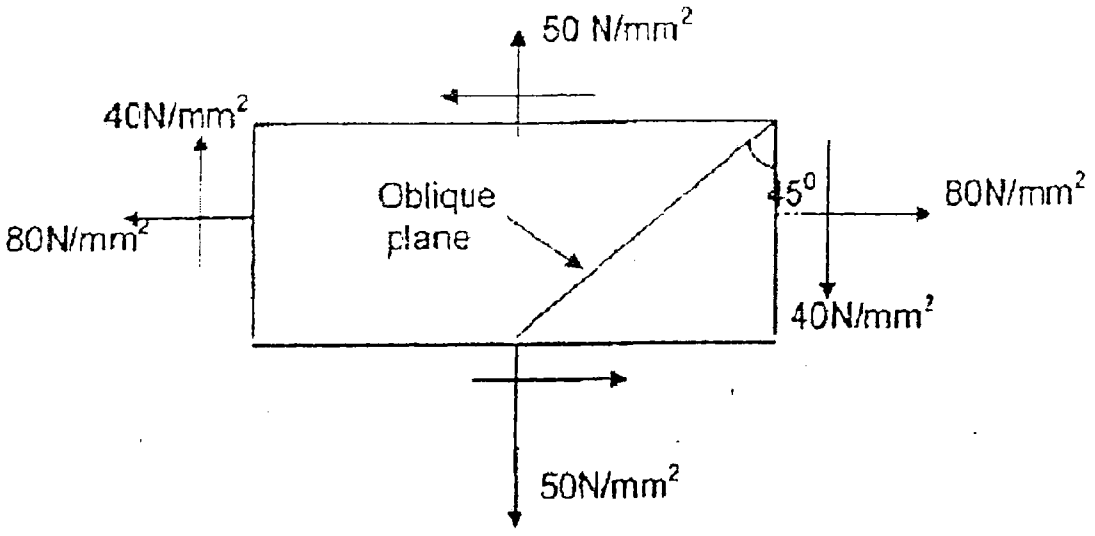

Figure Qn. 15 (b)

57