Question Paper Code : 71852

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Fourth Semester

Mechanical Engineering

ME 2254/ME 45/CE 1259/10122 ME 405/080120018 — STRENGTH OF MATERIALS

(Common to Production Engineering and Automobile Engineering)

(Regulation 2008/2010)

(Common to PTME 2254/10122 ME 405 — Strength of Materials for B.E. (Part-Time) Third Semester, Mechanical Engineering, Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State your inference from point of contra flexure.

2. List the assumptions made in theory of simple bending.

3. Under what conditions two concentric shafts can act as composite shaft? State the conditions.

4. Define torsional rigidity.

5. Define Principal stresses and Principal planes.

6. Write any four applications of thin shells.

7. Define section modulus and explain its physical meaning.

8. What is resilience?

9. Differentiate stiffness and stability.

10. Mention the advantage of Macaulay method.

extension on a gauge length of 200 mm is 0.09 mm and the change in dia is 0.0039 mm. Calculate the poison's ratio and the value of elastic constants. (10)

(ii) A punch with diameter of 25 mm is used to punch a hole in 4 mm steel plate. A force of 100 kN is required. Determine the average shear stress in the plate and the average compressive stress in punch. (6)

Or

(b) A compound tube consists of a steel tube 150 mm internal dia and 10 mm thickness and an outer brass tube 170 mm internal dia and 10 mm thickness. The two tubes are of same length of 150 mm. The compound tube carries an axial load of 1000 kN. Find the stresses and load carried by each tube and the amount it shortens. Take $E_s = 2 \times 10^5$ N/mm^2, $E_b = 1 \times 10^5$ N/mm^2. (16)

12. (a) In an overhanging beam CABD of total length 12 m, the supports A and B are at a distance of 8m from each other. Distance CA is such that the reaction at A is 2/3 of total load. The beam carries UDL of 20 kN/m over its entire length and the point load of 70 kN acts at C and the other point load of 50 kN acts at D. Determine the length of the Overhanging points CA and BD and draw SFD and BMD. Find the maximum and minimum bending moment and the points of contra flexure if any. (16)

Or

(b) Derive the shear stress equation for a rectangular cross section. (16)

13. (a) A hollow shaft having internal dia 0.6 times external dia is to replace a solid shaft of the same material to transmit 500 kW at 200 rpm. The permissible shear stress is 40 N/mm^2. Calculate the diameters of the solid and hollow shafts. Also calculate the percentage saving in material. (16)

Or

(b) Two close-coiled helical springs of the same length, are wound out of the same wire, circular in cross section and supports a compressive load P. The inner spring consists of 20 turns of mean dia 16 cm and the outer spring has 18 turns of mean dia 20 cm. Calculate the max stress produced in each spring if the dia of wire = 1 cm and P = 1000 N. (16)

14. (a) Using Moment area method, derive an expression for deflection of a simply supported beam subjected to uniformly distributed load for entire span. (16)

Or

L = 1.5 m and a = 0.6 m, determine the value of W so that the max. bending stress is 140 N/mm² and calculate the maximum deflection for the loading. Take E = 2×10^5 N/mm². Use double integration method. (16)

15. (a) The like Principal Stresses at a point are 800 N/mm² and 200 N/mm². Calculate the following :

(i) Maximum shear stress (6)

(ii) Normal and shear stress on a plane at 30° with the plane of maximum principal stress (6)

(iii) Resultant stress on that plane. (4)

Or

(b) Derive hoop stress and longitudinal stress formula for a thin cylindrical shell and hence deduce their magnitudes if the fluid pressure is 8 MPa, diameter = 100 cm, thickness = 2 cm. (16)
