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Question Paper Code : P 1136

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Third Semester

(Regulation 2004)

Civil Engineering

CE 1201 — MECHANICS OF SOLIDS

(Common to B.E. (Part-Time) - Second Semester - Civil Engineering – Regulation 2005)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Hookes Law.

2. How the thermal Stress is induced?

3. List the assumption made in the analysis of plane determinate trusses.

4. A thin spherical shell of 1.5 m internal diameter and 5 mm wall thickness is subjected to an internal pressure of 2 N/mm^2. Determine the hoop stress induced in the shell.

5. A cantilever beam of span 3 m carries a vertical downward load of 50 kN at its free end. Calculate the shear force and bending moment at its mid span.

6. A strip of steel 150 mm wide and 20 mm thick is bent in to a circular arc of radius 50 m. Find the maximum bending stress induced in the strip. Assume E = 200 kN/mm^2.

7. State any four methods to evaluate the slope and deflection of determinate beams.

8. Sketch the shear stress distribution for symmetrical I section.

9. Find the power that can be transmitted by a shaft of 60 mm diameter at a speed of 100 rpm. The torque to be taken by the shaft is 200 kN-m.

10. What are the main uses of springs?

PART B — ($5 \times 16 = 80$ marks)

11. (a) Two vertical rods, one of steel and other of bronze are supported by a horizontal ceiling, the horizontal distance between them is 60 cm. Each rod is 2.5 m long and 12.5 mm in diameter. A horizontal cross piece connects the lower end of the bar. Where should a load of 16 kN be placed on the cross piece so that it remains horizontal after being loaded? Calculate the stresses in each rod. Assume $E_s = 200$ kN/mm^2 and $E_b = 110$ kN/mm^2. Neglect any bending in the cross piece.

Or

(b) At a certain point in a strained material there is a tensile stress of 85 N/mm^2 upon the horizontal plane and a tensile stress of 40 N/mm^2 upon the vertical plane. There is also a shear stress of 50 N/mm^2 upon each of this planes determine graphically or otherwise (i) the principal stresses (ii) the maximum shear stress (iii) the principal planes.

12. (a) Analyse the truss shown in fig.Q.12 (a) using method of joints and verify the force in the member BC by the method of sections.

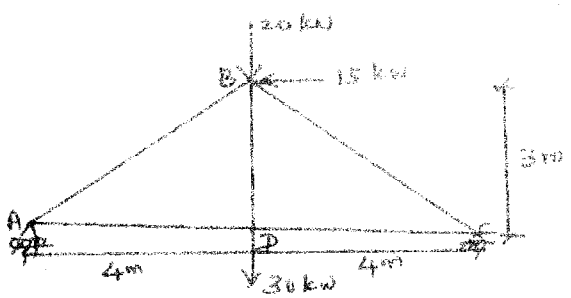

Fig. Q. 12 (a)

Or

(b) A cylindrical shell 3 m long, which is closed at the ends has an internal diameter of 1 m and a wall thickness of 15 mm. It is subjected to internal pressure of 1.5 N/mm^2. Compute the following

(i) The circumferential and longitudinal stresses.

(ii) The change in internal diameter and length.

(iii) The change in volume. Assume $E_s = 120$ kN/mm^2 and poisons ratio is 0.3.

13. (a) A beam of span 10 m is simply supported at its ends and carries point loads of 5 kN each at a distance 3 m and 7 m from the left support and also a uniformly distributed load of 1 kN/m between the point loads. Draw the shear force and bending moment diagrams and determine the maximum bending moment.

Or

(a) A beam is simply supported at its ends and carries a uniformly distributed load of 30 kN/m run over the whole span. The section of the beam is rectangular having depth as 500 mm. If the maximum stress induced in the material of the beam is 120 N/mm^2 and the moment of inertia of the cross section is 7×10^8 mm^4. Find the span of the beam.

11. (b) A simply supported beam of span 10 m carries two point loads 100 kN and 60 kN at a distance of 2 m and 5 m from the left support. Calculate the slope and deflection under each load. Assume EI= 2.15×10^5kN-m^2.

Or

(b) A T section beam of flange 200 mm × 20 mm and web 250 mm × 25 mm is subjected to a shear force of 50 kN. Find the shear stress at (i) the junction of flange and web (ii) the neutral axis. Also sketch the shear stress distribution across the section.

12. (a) A steel shaft is transmitting 150 kW power at 75 rpm. If the allowable shear stress in the shaft is not to exceed 100 N/mm^2 and the allowable twist is not to exceed 3 degrees per meter length of the shaft, find the minimum diameter of the shaft. Assume shear modulus of the steel bar 80 kN/mm^2.

Or

(b) Design a closed coil helical spring which when put a load of 400 N may deflect 80 mm. The diameter of each coil is to be 10 times that of the wire of the spring and the maximum shear stress is not to exceed 55 N/mm^2. Assume the shear modulus of the spring material as 75 kN/mm^2.