Roll No. | | | | | | | | |

23/5/13

B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, MAY 2013

COMMON TO MECHANICAL ENGINEERING AND MECHANICAL ENGINEERING TAMIL MEDIUM

IV Semester

CE9213 Strength of Materials

(Regulation 2008)

Time : 3 Hours | Answer ALL Questions | Max. Marks 100

PART - A (10 x 2 = 20 Marks)

1. Explain lateral strain with a simple sketch.
2. Write down the relation for change in length of a circular bar with uniformly varying diameter subjected to axial tensile load P.
3. Draw bending moment diagram for a simply supported beam of length 6m carrying a clockwise moment of 6 kN.m at mid span.
4. Draw qualitative bending and shear stress distribution for a T-section.
5. In a hollow circular shaft of outer and inner diameters 200 mm and 100 mm respectively, the shear stress is not exceed 40 N/mm^2. Find the maximum torque which the shaft can safely transmit.
6. Define stiffness of a spring.
7. Write down the boundary conditions of a cantilever beam for solving the integration constants to be used in Double Integration method.
8. Draw the conjugate beam for a cantilever beam of 6 m long carrying a point load of 3 kN at its mid span and sketch the loading for the conjugate beam.
9. What are the possible failures of a thin cylinder due to internal fluid pressure?
10. Write down any two assumptions made in Lame's theory.

PART - B (5 x 16 = 80 marks)

11. A hollow shaft of diameter ratio 3/8 is required to transmit 600 kW power at 110 rpm. The maximum torque may be 20% greater than the mean torque. The shear stress in the shaft should not exceed 63 MN/m^2 and twist 1.4° per 3 m length. Determine the diameters of the shaft satisfying these conditions. Take Modulus of rigidity as 84 GN/m^2.

12. a) A rod of length 1 m and diameter 20 mm is subjected to a tensile load of 20 kN. The increase in length of the rod is 0.30 mm and decrease in diameter is 0.0018 mm. Calculate the Poisson's ratio and three modulii.

OR

b) A 500 mm long bar has rectangular cross section 20 mm x 40 mm. This bar is subjected to (i) 40 kN tensile force on 20 mm x 40 mm faces, (ii) 200 kN compressive force on 20 mm x 500 mm faces, and (iii) 300 kN tensile force on 40 mm x 500 mm faces. Find the change in volume if E = 2 x 10^5 N/mm^2 and Poisson's ratio = 0.3.

13. a) Draw shear force and bending moment diagrams for the beam given in fig Q13.a. Also locate the point of contraflexure if any.

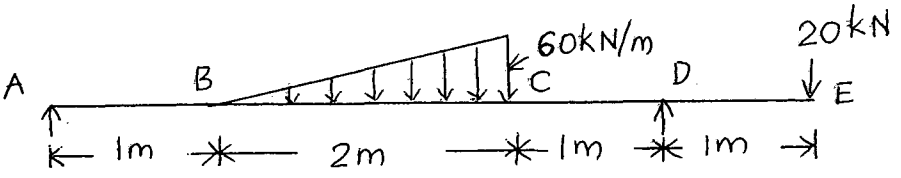

Fig Q 13a

OR

b) A 5 m simply supported beam is having a T-shaped cross section with the following dimensions: flange width 125 mm, flange thickness 25 mm, depth of web 175 mm and thickness of the web 25 mm. The beam carries a U.D.L of intensity 2.5 kN/m over the entire span, sketch the shear stress distribution.

14. a) A beam ACB, simply supported at A and B, carries a U.D.L of 10 kN/m over the whole span and a clockwise moment of 100 kN.m acting at C. If AC=4 m, CB=6 m and EI = 50 MNm^2, find the maximum deflection and deflection at mid span. Use Macaulay's method.

OR

b) Determine the slopes at A, B, C, D and deflections under the loads of a 30 m simply supported beam supported at A and D so that AB=BC=CD=10 m. The beam carries two point loads of 75 kN at B and 150 kN at C. The moment of inertia of AB = I, that of BC = 3I and that of CD = 2I.
Take E = 200x10^6 kN/m^2 and I = 300x10^{-4} m^4. Use conjugate beam method.

15. a) A thin cylindrical shell 1.5 m long internal diameter 300 mm and wall thickness 10mm is filled up with a fluid at atmospheric pressure. If additional fluid of 300 cc is pumped into the shell, find the pressure exerted by the fluid on the shell. Take E=2x10^5 N/mm^2 and Poisson's ratio=0.3. Also calculate the hoop stress induced.

OR

b) A thick cylindrical pipe of 400 mm internal diameter and 100 mm thickness carries water under a pressure of 80 N/mm^2. Determine the maximum and minimum intensities of hoop stress across the section. Also sketch the radial pressure distribution and hoop stress distribution across the section.