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

B.E/B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL/MAY 2011

THIRD SEMESTER – (REGULATIONS 2008)

CE 9213 - STRENGTH OF MATERIALS

(Common to Manufacturing, Industrial, Printing and Mining Engineering)

Time: Three hours | Max Marks: 100

Answer ALL Questions

Part A (10x2 = 20 Mark)

1. Define volumetric strain and Principal Plane.
2. Under what axial load, the diameter of a steel bar will be reduced from 60 mm to 58.95 mm. Take modulus of elasticity as 2×10^5 MPa and Poisson's ratio as 0.3.
3. What is point of contra flexure? In which beam will it occur?
4. Draw the shearing force diagram and bending moment diagram for a simply supported beam having a span of 6m subjected to a concentrated moment of 100kNm at the centre.
5. List the assumptions made in the theory of torsion.
6. Distinguish between close coiled and open coiled helical spring.
7. State the conditions for the use of Macaulay's method.
8. Define Maxwell's reciprocal theorem.
9. Distinguish between thick and thin cylinders.
10. What are the various theories of failures for a material?

PART B (5 x 16 = 80 Marks)

11. An overhanging beam is loaded as shown in Fig.11. Draw the Shear Force Diagram and Bending Moment Diagram and find the point of contraflexure, if any.

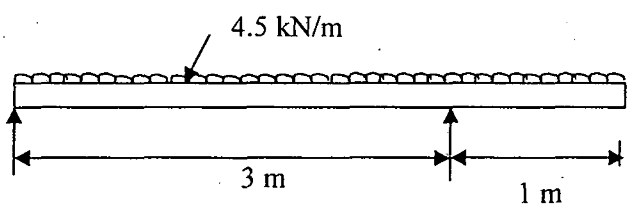

Fig.11

12(a) An aluminium rod 22 mm diameter passes through a steel tube of 25 mm internal diameter and 3 mm thick. The rod and tube are fixed together at the ends at a temperature of 30°C. Find the stresses in the rod and tube when the temperature is raised to 150°C.

$E_S = 200 \text{ kN/mm}^2$, $E_{al} = 70 \text{ kN/mm}^2$

$\alpha_S = 12 \times 10^{-6} /°C$, $\alpha_{al} = 23 \times 10^{-6} /°C$

OR

12(b) The principal stresses at a point in the section of a boiler shell are 80 N/mm^2 and 40 N/mm^2, both tensile. Find the normal, tangential and resultant stresses across a plane through the point inclined at 50° to the plane carrying 60 N/mm^2 stress.

13(a) A solid shaft of 200 mm diameter has the same cross sectional area as a hollow shaft of the same material with inside diameter of 150 mm. Find the ratio of (a) powers transmitted by both the shafts at the same angular velocity, (b) angles of twist in equal lengths of these shafts, when stressed to the same intensity.

OR

13(b) A closely coiled helical spring of round steel wire 5 mm in diameter having 12 complete coils of 50 mm mean diameter is subjected to an axial load of 100 N. Find the deflection of the spring and the maximum shearing stress in the material. Take modulus of rigidity (G) as 80 GPa.

14(a) A beam with variable moment of inertia is loaded as shown in Fig.14.a. Find the deflection at B and C by conjugate beam method. Take E = 2 x 10^5 N/mm^2 and I = 2 x 10^{10} mm^4.

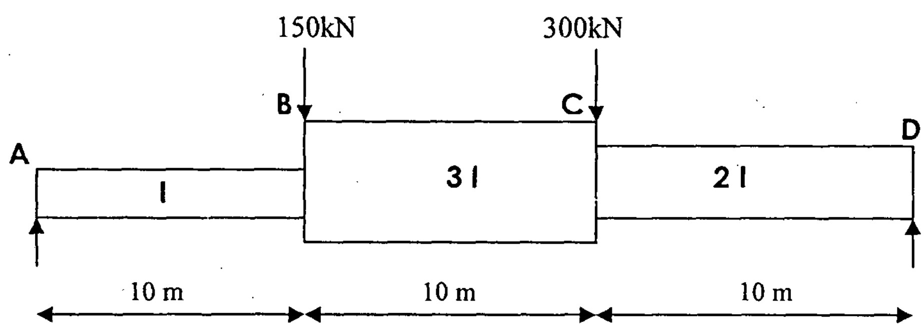

Fig.14.a

OR

14(b) A beam AE of 4 m span is simply supported at the ends as shown in Fig.14.b. Determine (i) deflection at C and (ii) Maximum deflection by Macaulay's method. Take $E = 2 \times 10^5$ N/mm^2, and $I = 1000$ cm^4.

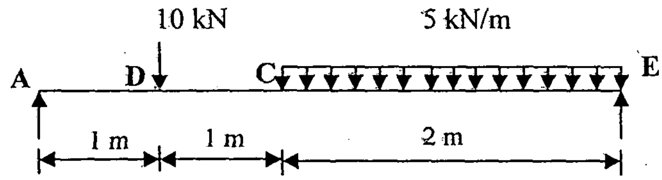

Fig.14.b

15(a) A spherical shell of 2 m diameter is made of 10 mm thick plates. Calculate the changes in diameter and volume of the shell, when it is subjected to an internal pressure of 1.6 MPa. Take E= 200 GPa and Poisson's ratio is 0.3.

OR

15(b) A thick metallic cylindrical shell of 150 mm internal diameter is required to withstand an internal pressure of 8 N/mm^2. Find the necessary thickness of the shell, if the permissible tensile stress in the section is 20 N/mm^2.