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**END SEMESTER EXAMINATIONS, NOVEMBER/ DECEMBER 2011****III SEMESTER, CIVIL/AGRICULTURAL AND IRRIGATION ENGINEERING  
(R-2004)  
CE 271 MECHANICS OF SOLIDS**

Time : Three Hours

Maximum : 100 marks

Answer ALL questions

PART – A (10 x 2 = 20 marks)

1. State Hooke's law.
2. Derive a relation for change in length of a bar hanging freely under its own weight.
3. Write down the relation for the stress induced in a uniform circular bar with both ends fixed and subjected to temperature raise.
4. Define Tension Co-efficient
5. Sketch the bending stress and shear stress distribution in a symmetrical T- section.
6. A cantilever beam of 3 m long carries a clockwise moment of 2 kN-m. at mid span. Sketch the bending moment diagram.
7. What is the section modulus for a solid circular section?
8. Write down the expressions for maximum deflection in an open coiled helical spring due to an axial load.
9. A cantilever beam of 3 m long carries a clockwise moment of 2 kN-m. at mid span. What is the deflection at mid span?
10. Draw the conjugate beam for a cantilever beam of length 2m carrying central point 3kN.

PART-B (5 x 16 = 80 marks)

11. A rod of 30 mm diameter is subjected to a pull 90 kN. The measured extension on a gauge length of 250 mm is 0.15 mm and the change in diameter is 0.005 mm. Calculate the poisson's ratio and the values of the three moduli.
- 12.a) A steel rod of 30mm diameter is subjected to an axial compressive load of 60kN. Find the percentage change in volume if the bar is 500mm long. What are the equal stresses that must be applied to the sides of the bar if the volumetric change is to be zero?  $E=200\text{GPa}$  and  $\text{poisons ratio}=0.3$ .

(or)

- 12.b) A truss is loaded as shown in fig.Q.12.b. Find the forces in the members using method of joints.

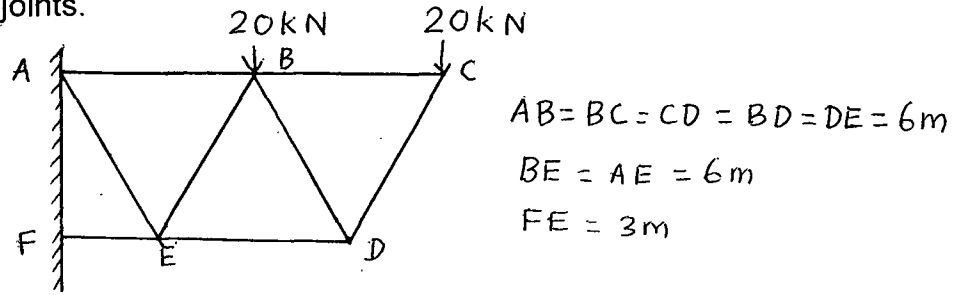


Fig.Q.12.b

- 13.a) An overhanging beam ABC, 8 m long has one support at the end A and other support at B, 6 m from A. It carries a uniformly distributed load of 6 kN/m over the entire length and a point load of 12kN at the end C. Draw the shear force and bending moment diagrams. Also locate the point of contra flexure if any.

(or)

- 13.b) A cast iron beam has an I - section with top flange 80 mm x 40 mm, web 120mm x 20 mm and bottom flange 160 mm x 40 mm. If the section has to carry a shear force of 60kN, sketch the shear stress distribution.

- 14.a) List the assumptions involved in the simple theory of torsion and derive torsion formula

(or)

- 14.b) Prove that a hollow shaft is stronger and stiffer than the solid shaft of the same material, length and weight.

- 15.a) Determine the mid span deflection and maximum deflection for the beam given in Fig Q15.a. Take  $E=2.1 \times 10^4 \text{ N/mm}^2$  and  $I=4.3 \times 10^6 \text{ mm}^4$ . Use Macaulay's method.

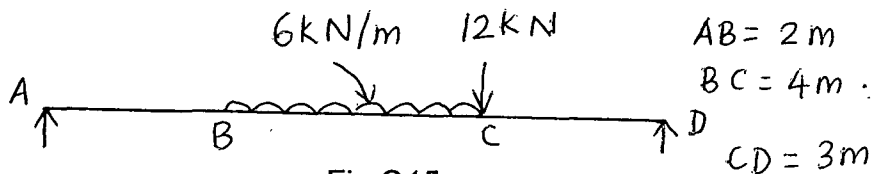


Fig Q15.a

(or)

- 15.b) A cantilever beam of 3 m carries a load of 15 kN/m over its entire span and a point load of 30 kN at its mid span. Calculate the slope and deflection at the free end. Assume  $E = 210 \text{ kN/m}^2$  and  $I = 4.5 \times 10^{-4} \text{ m}^4$ . Use Moment-Area method.