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

Question Paper Code: 31314

B.E. / B.Tech. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Civil Engineering

01UCE304 - MECHANICS OF SOLIDS - I

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Define Poisson's ratio.
2. What is known as resilience?
3. List out the methods to find the force in members of simple truss.
4. Distinguish between centre of gravity and centroid.
5. What are the different types of beams? Differentiate between a cantilever and a simply supported beam.
6. Define the term bending stress in a beam.
7. What do you mean by 'strength of a shaft'?
8. What is a spring? Name the two important types of spring.
9. Define the term obliquity.
10. Write a note on Mohr's circle of stresses.

PART - B (5 x 16 = 80 Marks)

11. (a) A bar of 30 *mm* diameter is subjected to a pull of 60 *kN*. The measured extension on gauge length of 200 *mm* is 0.09 *mm* and the change in diameter is 0.0039 *mm*. Calculate the value of Poisson's ratio and the three moduli. (16)

Or

(b) An unknown weight falls through a height of 10 *mm* on a collar rigidly attached to the lower end of a vertical bar 500 *cm* long and 600 mm^2 in section. If the maximum extension of the rod is to be 2 *mm*, what is the corresponding stress and magnitude of the unknown weight? Take $E = 2.0 \times 10^5$ N/mm^2. (16)

12. (a) Find the forces in the members *AB*, *AC* and *BC* of the truss shown in figure 1. (16)

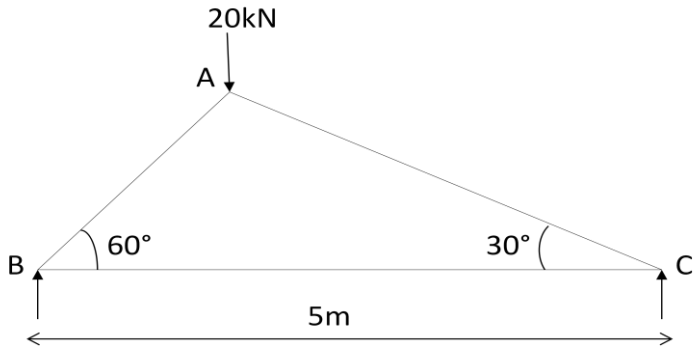

Figure 1

Or

(b) Find the moment of inertia of the section shown in figure 2 about the centroidal axis *X-X* perpendicular to the web. (16)

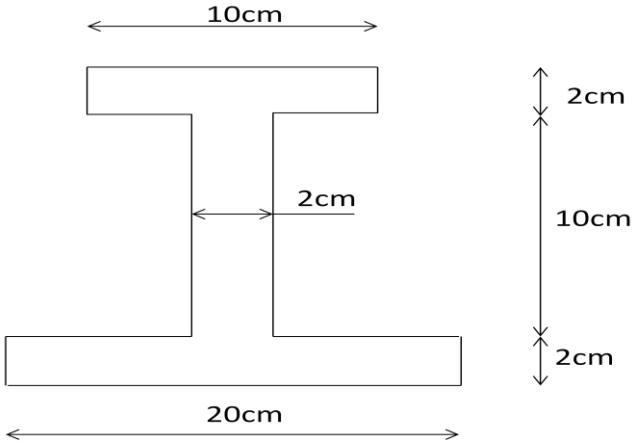

Figure 2

13. (a) Draw the shear force and bending moment diagram for a simply supported beam of length 9 *m* and carrying a uniformly distributed load of 10 *kN/m* from a distance of 6 *m* from the left end. Also calculate the maximum B.M on the section. (16)

Or

(b) A beam is simply supported and carries a uniformly distributed load of 40 *kN/m* run over the whole span. The section of the beam is rectangular having depth of 500 *mm*. If the maximum stress in the material of the beam 120 N/mm^2 and moment of inertia of the section is 7×10^8 mm^4, find the span of the beam. (16)

14. (a) Two shafts of the same material and of same lengths are subjected to a same torque, if the first shaft is of a solid circular section and the second shaft is of hollow circular section, whose internal diameter is 2/3 of the outside diameter and the maximum shear stress developed in each shaft is the same, compare the weights of the shafts. (16)

Or

(b) A closely coiled helical spring of round steel wire 10 *mm* in diameter having 10 complete turns with a mean diameter of 12 *cm* is subjected to an axial load of 200 *N*. Determine: (i) the deflection of the spring (ii) maximum shear stress in the wire (iii) stiffness of the spring. Take $C = 8 \times 10^4$ N/mm^2. (16)

15. (a) The normal stress in two mutually perpendicular directions are 600 N/mm^2 and 300 N/mm^2 both tensile. The complimentary shear stresses in these directions are of intensity 450 N/mm^2. Find the normal and tangential stresses on the two planes which are equally inclined to the planes carrying the normal stresses mentioned above.

(16)

Or

(b) The stresses at a point in a bar are 200 N/mm^2 (tensile) and 100 N/mm^2 (compressive). By using Mohr's circle method determine the resultant stress in magnitude and direction on a plane inclined at 60° to the axis of the major stress. Also determine the maximum intensity of shear stress in the material at the point.

(16)