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

Question Paper Code: 33104

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

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. List out the types of beams.
6. Define shear force and bending moment..
7. Define Torsion.
8. Classify the springs employed for various purposes.
9. Define principal stresses and principal planes.
10. Write the uses of Mohr's circle.

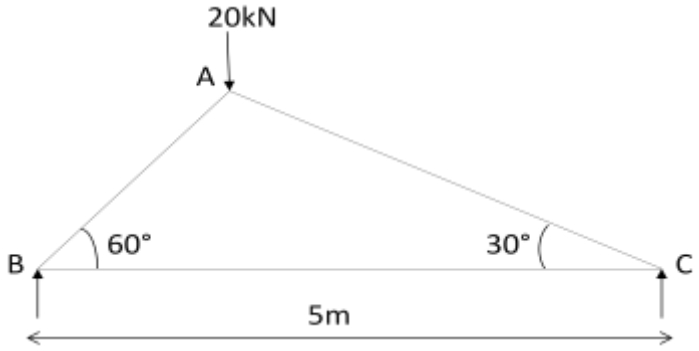
PART - B (5 x 16 = 80 Marks)

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

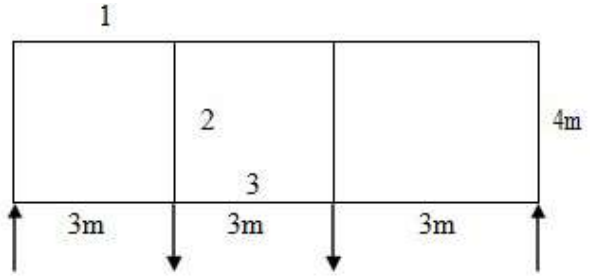
(b) Three bars made of copper, zinc and aluminium are of equal length and have cross section 500, 700, and 1000 *sq.mm* respectively. They are rigidly connected at their ends. If this compound member is subjected to a longitudinal pull of 250 *kN*, estimate the proportional of the load carried on each rod and the induced stresses. Take the value of E for copper = 1.3×10^{5} N/mm^2, for zinc = 1×10^{5} N/mm^2 and for aluminium = 0.8×10^{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)



Or

(b) A truss of span 9*m* is loaded as shown in figure. Find the reaction and forces in the members marked 1, 2, and 3 by using method of section. (16)



13. (a) A beam of length 10 *m* is simply supported at ends and carries point loads of 5 *kN* each at a distance of 3 *m* and 7 *m* from the left support and also a UDL of 1 *kN/m* between the point loads. Draw the shear force and bending moment diagram for the beam. (16)

Or

(b) Derive an expression for theory of simple bending. (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 made of 10 mm diameter steel wire has 15 coils with the mean diameter of 100 mm. The spring is subjected to an axial load of 100 N. Calculate:

(i) The maximum shear stress induced
(ii) The deflection
(iii) Stiffness of the spring.

Take rigidity modulus C = 8.16×10^4 N/mm^2 . (16)

15. (a) At a point in a strained material, the principal stresses are100 *N/mm*^{2} (Tensile) and 40 *N/mm*^{2} (Compressive). Determine the resultant stress in magnitude and direction in a plane inclined at 600 to the axis of major principal stress. What is the maximum intensity of shear stress in the material at the point? (16)

Or

(b) A rectangular block of material is subjected to a tensile stress of 110 N/mm^2 on one plane and a tensile stress of 47 N/mm^2 on the plane at right angles to the former. Each of the above stresses is accompanied by a shear stress of 63 N/mm^2 and that associated with the former tensile stress tends to rotate the block anticlockwise. Find

(i) The direction and magnitude of each of the principal stress and
(ii) Magnitude of the greatest shear stress. (16)