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

Question Paper Code: 33104

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

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 stress.
2. Define Poisson’s ratio.
3. Define frame.
4. Define Centre of Gravity.
5. List out the types of beams.
6. Define shear force and bending moment..
7. Define Torsion.
8. What are the various types of springs?
9. Define principal planes.
10. What is the use of Mohr’s circle?

PART - B (5 x 16 = 80 Marks)

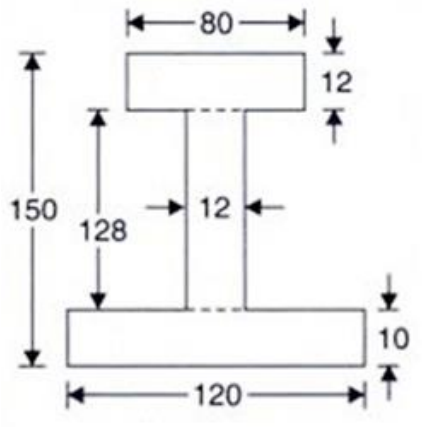
11. (a) Determine the value of Young's modulus and Poisson's ratio of a metallic bar of length 30 cm, breadth 4 cm and depth 4 cm when the bar is subjected to an axial compressive load of 400 kN. The decrease in length is given as 0.075 cm and increase in breadth is given as 0.03 cm. (16)

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)

(16)

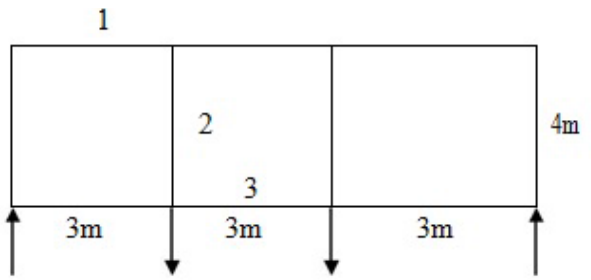
12. (a) Determine the moment of inertia of I section shown in fig. (16)



All dimension are in 'mm'

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) 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) Derive an expression for theory of simple bending. (16)

14. (a) 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)

Or

(b) It is required to design a close coiled helical spring which shall deflect 1mm under an axial load of 100*N* at a shear stress of 90*MPa*. The spring is to be made of round wire having shear modulus of 0.8×10^5 *MPa*. The mean diameter of the coil is 10 times that of the coil wire. Find the diameter and length of the wire. (16)

15. (a) The principal stress in the wall of a container are 40 MN/m^2 and 80 MN/m^2. Determine the normal, shear and resultant stresses in magnitude and direction in a plane, the normal of which makes an angle of 30^o with the direction of maximum principal stress. (16)

Or

(b) 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)