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

Question Paper Code: 33014

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

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. State Hooke's law.
2. Define Poisson's ratio.
3. What is mean by perfect 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 principle stresses and principle plane.
10. What is the use of Mohr's circle?

PART - B (5 x 16 = 80 Marks)

11. (a) A steel rod of 3 cm diameter is enclosed centrally in a hollow copper tube of external diameter 5 cm and internal diameter of 4 cm. The composite bar is then subjected to an axial pull of 45000 N. If the length of each bar is equal to 15 cm, determine:

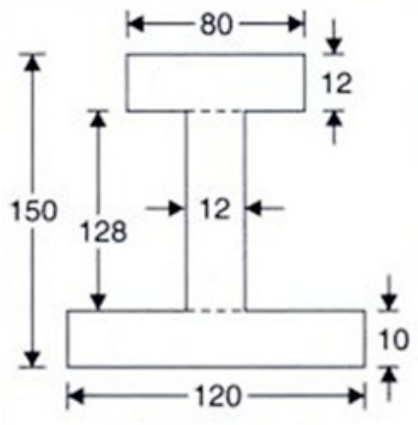
(i) The stress in the rod and tube and
(ii) Load carried by each bar.

Take E for steel = 2.1×10^5 N/mm^2 and for copper = 1.1×10^5 N/mm^2. (16)

Or

(b) Derive the relation between E and K. (16)

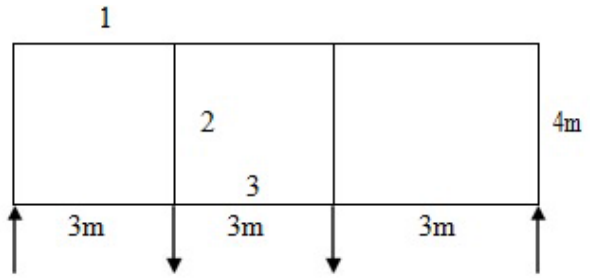
12. (a) Determine the moment of inertia of I section shown in fig. (16)



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 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)

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)