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

Question Paper Code: 33104

B.E. / B.Tech. DEGREE EXAMINATION, NOV 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. State Hooke's law.
2. Define Poisson's ratio.
3. Define principal axes.
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 purpose of drawing Mohr's circle.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) A rod of 250 *cm* long and 3.0 *cm* diameter is subjected to an axial pull of 30 *KN*. If the modulus of elasticity of the material is 2x 10^5 N/mm^2; determine (1.) the stress (2.) the strain and (3.) the elongation of the rod. (6)

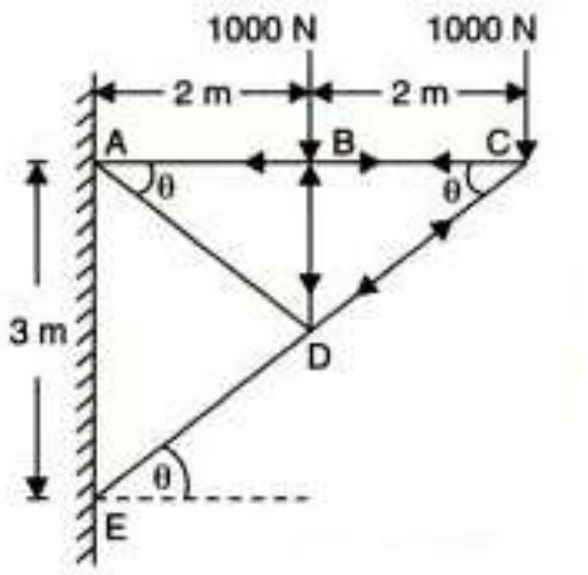
(ii) A bar of cross section 8 *mm* x 8 *mm* is subjected to an axial pull of 7 *KN*. The lateral dimension of the bar is found to be changed to 7.9985 *mm* x 7.9985 *mm*. If the modulus of rigidity of the material is 0.8 x10^5 N/mm^2, determine the Poission's ratio and modulus of elasticity. (10)

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)

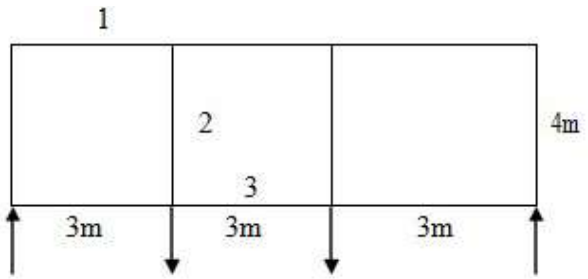
(16)

12. (a) Determine the forces in all the members of a cantilever truss shown in fig. (16)

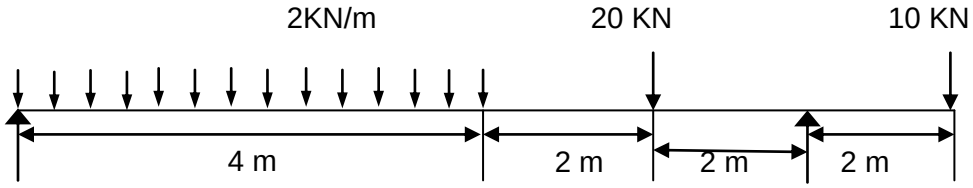


Or

(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) Draw the *SF* and *BM* diagram for the beam shown in Fig.3. Find the maximum values and their positions. (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) 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 $C = 8.16 \times 10^4$ N/mm^2 . (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) 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)