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

Question Paper Code: 33104

B.E. / B.Tech. DEGREE EXAMINATION, NOV 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 stress.
2. State Hooke's law.
3. What is mean by perfect frame?
4. Define Centre of Gravity.
5. List out the types of beams.
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 principal planes.
10. What is the purpose of drawing Mohr's circle.

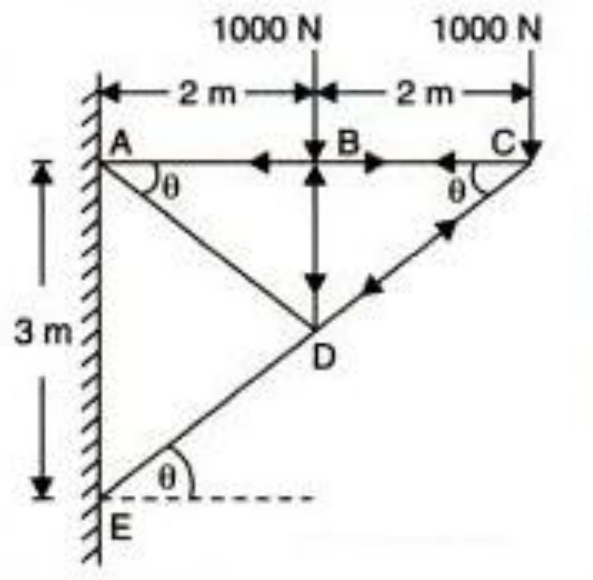
PART - B (5 x 16 = 80 Marks)

11. (a) 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. (16)

Or

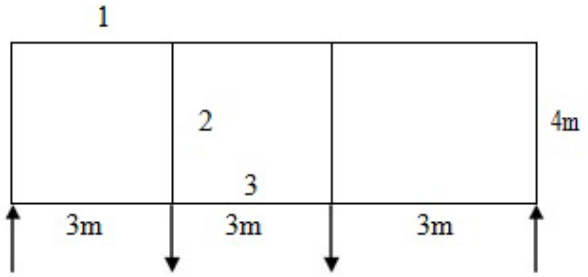
(b) Three bars made of copper, zinc and aluminium are of equal length and have cross section 500, 700, and 1000 *sq.mm* respectively. They are rigidly connected at their ends. If this compound member is subjected to a longitudinal pull of 250 *kN*, estimate the proportional of the load carried on each 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) 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 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 hollow shaft, having an inside diameter 60% of its outer diameter, is to replace a solid shaft transmitting the same power at the same speed. Calculate the % saving in material, if the material to be used is also the same. (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) 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) 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)