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

Question Paper Code: 31134

B.E. / B.Tech. DEGREE EXAMINATION, MAY 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. Define stress.
2. Define Poisson's ratio.
3. What is mean by perfect frame?
4. Define principal axes.
5. List out the types of beams.
6. Write the theory of simple bending equation.
7. What is meant by polar moment of inertia?
8. What are the various types of springs?
9. Define principal planes.
10. What is the use of Mohr's circle?

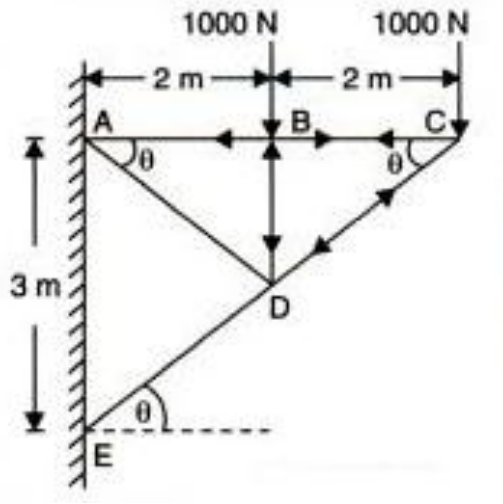
PART - B (5 x 16 = 80 Marks)

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

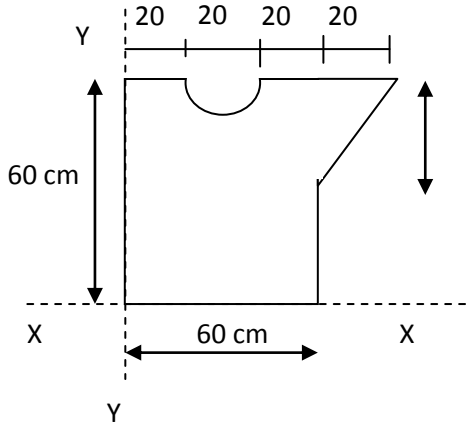
(b) Derive the relation between E and K. (16)

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

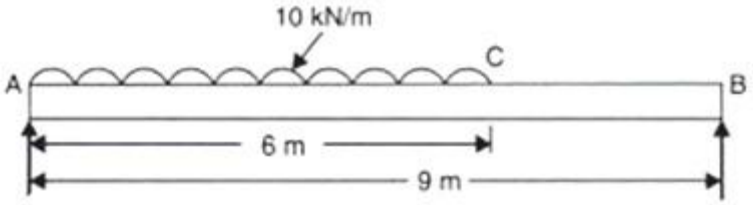


Or

(b) Find the moment of inertia of the section with a semi circular hole shown in Fig. 2 about it's centroidal axis. (16)



13. (a) Draw the shear force and bending moment diagram for a simply supported beam of length 9 m carrying an udl of 10 kN/m for a distance of 6 m from 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 is subjected to a torque of 40 kNm and a bending moment of 30 kNm. The internal diameter of the shaft is one half the external diameters. If the maximum shear stress is not to exceed 80 MN/m^2, find the diameter of the shaft. (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 x 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 tensile stresses at a point across two mutually perpendicular planes are 120 N/mm^2 and 60 N/mm^2. Determine the normal, tangential and resultant stresses on a plane inclined at 30° to the axis of the minor 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)