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

Question Paper Code: 31014

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2015.

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. Differentiate Centroid and Centre of gravity.
5. List out the types of beams.
6. Write the relationship between load, shear force and bending moment.
7. What is meant by polar moment of inertia?
8. Differentiate the closed coil helical spring and open coil helical spring.
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) (i) Derive the relation between E and K. (10)

(ii) Draw the stress-strain diagram for MS rod with salient points. (6)

12. (a) Determine the forces in all the members of the truss shown in Fig 1. by method of joints (16)

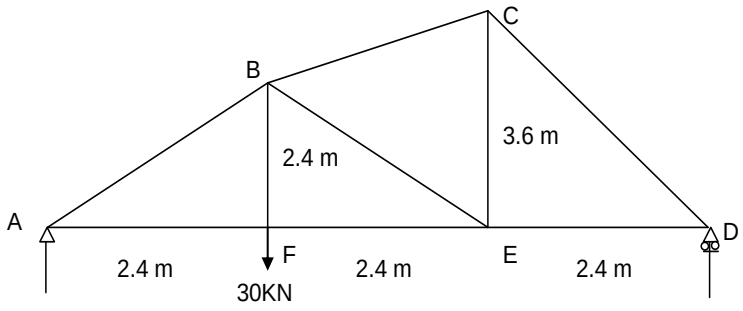

Fig. 1

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)

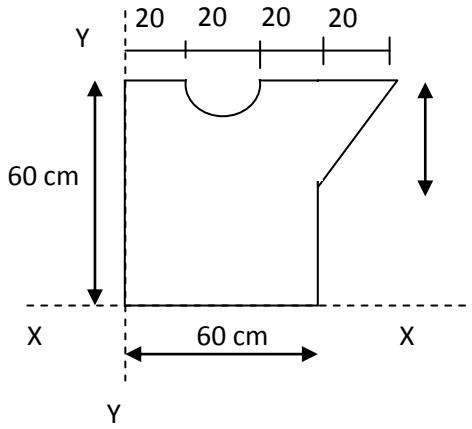

Fig. 2

13. (a) Draw the *SF* and *BM* diagram for the beam shown in Fig.3. Find the maximum values and their positions. (16)

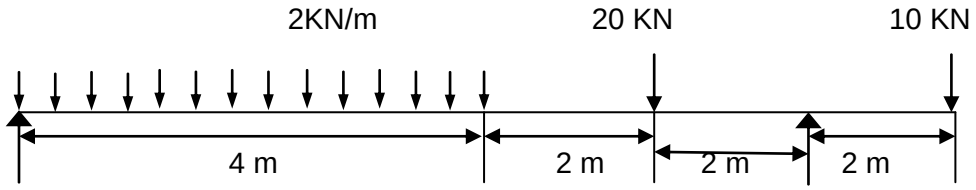

Fig. 3

Or

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

14. (a) A hollow shaft, having an internal diameter 50% of its external diameter, transmits 600 *kW* at 150 *rpm*. Determine the external diameter of the shaft if the shear stress is not to exceed 65 N/mm^2 and the twist in a length of 3 *m* should not exceed 1.4 degrees. Assume maximum torque = 1.2 times the mean torque and modulus of rigidity = 1×10^5 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 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) 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)

Or

(b) A point in a strained material is subjected to two mutually perpendicular tensile and compressive stress of 200 *MPa*, 120 *MPa* along with a shear stress of 30 *MPa*. Determine the followings by Graphical method (Mohr's Circle method).

(i) The principal normal stresses along with its inclination.

(ii) The principal shear stresses with their plan.

(iii) The stresses acting on an element inclined at an angle 50° to the horizontal.

(16)

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