[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2123)

1349

B. Tech 3rd Semester Examination

Solid Mechanics (O.S.)

CE-3001

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all. Attempt one each from section A, B, C and D. Questions in Section E are compulsory.

SECTION - A

1. (a) Find the diameter of the shaft required to transmit 60 kW at 150 rpm if the maximum torque is likely to exceed mean torque by 25% for a maximum permissible shear stress of 60 N/mm^2. Find also the angle of twist for a length of 2.5m. **(10)**

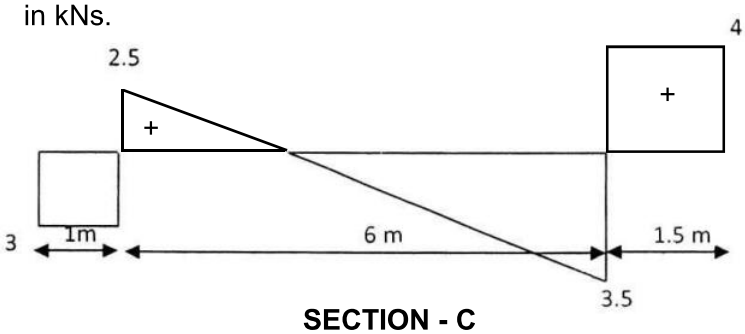
   (b) A bar of 30 mm diameter is subjected to a pull of 80kN. The measured extension on a guage length of 200 mm is 0.092 mm and change in the diameter is 0.0039mm. Calculate the value of Poisson's ratio, Young's modulus, Modulus of rigidity and bulk modulus. **(10)**

2. A plane element is subject to tensile stress of 400 N/mm^2 on one plane and 150N/mm^2 on the other at right angle to the former. Each of the above stresses is accompanied by a shear stress of 100 N/mm^2 such that when associated with minor tensile stress tends to rotate the element in anticlockwise direction, (a) Determine the principal stresses and their directions, (b) Maximum Shearing stresses and the directions of plane on which they act. **(20)**

SECTION - B

3. A column of circular cross section made of cast iron with 250 mm external diameter and 20 mm thick is used as a column 4.2 m long. One end of the column is fixed and other pinned. The column carries a load of 150kN at an eccentricity of 25 mm from the centroidal axis of the column. Determine the extreme stresses on the column. Also find the value of maximum eccentricity that can be allowed so that no tension occurs anywhere on the section of column. Take E= 95000 N/mm^2. **(20)**

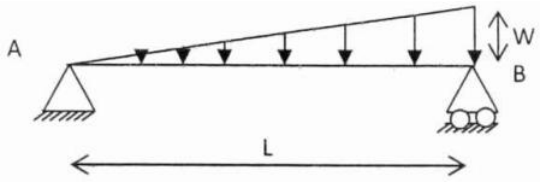
4. Shear force diagram of a beam for a loaded beam is shown in Figure below. Determine loading and draw BMD. All values are in kNs.



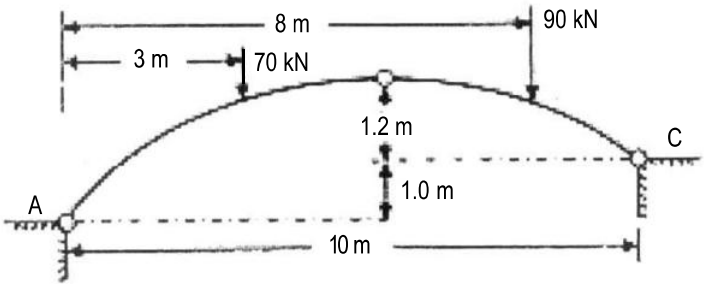
(20)

SECTION - C

5. Using double integration method determine the slope at supports and maximum deflection in the beam shown in Figure. The beam has a uniform flexural rigidity EI. **(20)**

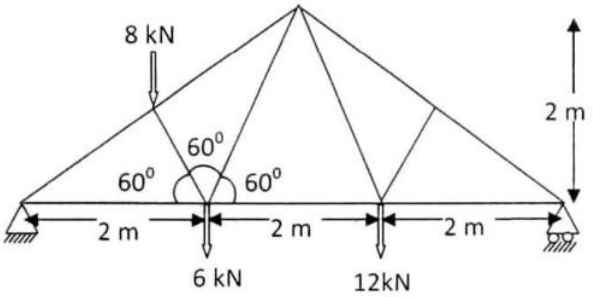


6. Figure shows a three pinned parabolic arch, the hinge B being at the highest point and being the vertex of the parabola. Find (a) the horizontal distance of the hinge B from one end, (b) horizontal and vertical reaction at the abutments A and C, and (c) the bending moment at the point of application of the 70 kN load. **(20)**



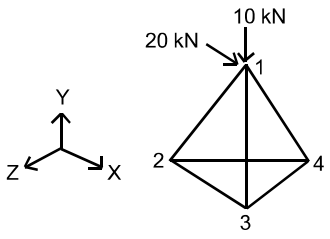
SECTION - D

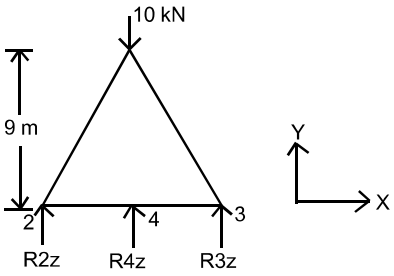
7. Find forces in members of the truss shown using any method.

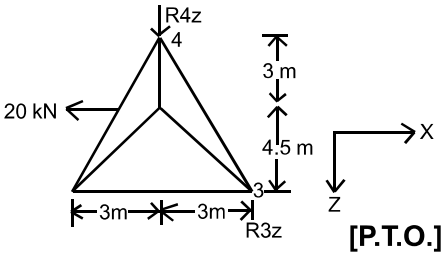


(20)

8. Using method of tension Coefficients determine the forces in the members of the space truss shown below. **(20)**







[P.T.O.]

SECTION - E

9. (a) What is funicular polygon and linear arch?

(b) What is slenderness ratio?

(c) How are curvature, slope and deflection related to each other?

(d) Explain with example what indeterminacy is.

(e) What are the assumptions in theory of pure torsion?

(5x4=20)