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BICE-008

B.Tech. CIVIL ENGINEERING (BTCLEVI)

00786

Term-End Examination

June, 2016

BICE-008 : STRUCTURAL ANALYSIS – I

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. Use of calculators is allowed. Assume missing data, if any.*

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1. Three wires of the same material and cross-section support a rigid bar which further supports a weight of 5 kN. The length of the wires is 5 m, 8 m and 6 m in order. The spacing between the wires is 2 m and the weight acts 1·6 m from the first wire. Determine the load carried by each wire. *14*

2. Figure 1 shows a section of a beam. Determine the ratio of its moment of resistance to bending in the y–y plane to that in the x–x plane, if the maximum bending stress remains same in the two cases. *14*

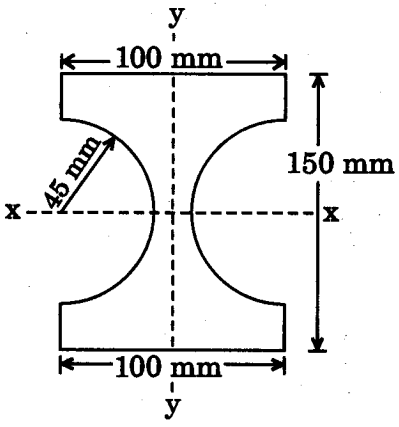

Figure 1

3. Draw SFD and BMD of the beam shown in Figure 2. *14*

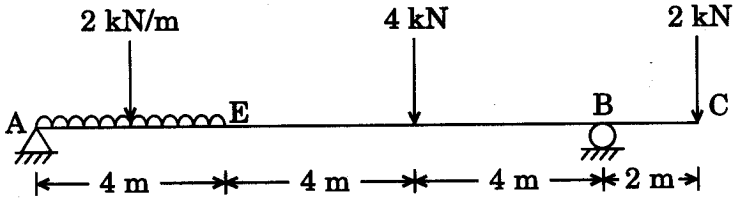

Figure 2

4. (a) Derive the equation of bending

$$\frac{M}{I} = \frac{f}{y} = \frac{E}{R}.$$ *7*

(b) Show that a body subjected to a pure shear is also acted upon by tensile and compressive stresses as well. *7*

5. (a) Determine the product of inertia about x and y axes for a triangular section shown in Figure 3. *7*

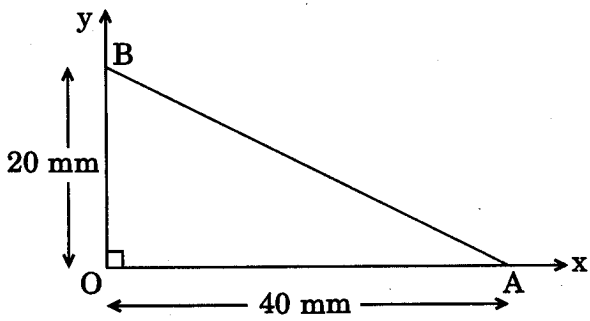

Figure 3

(b) What are the assumptions made in the analysis of struts and columns by Euler's buckling theory ? 7

6. An axially loaded column, 6 m high with both ends fixed, is made up of a wide flange with the following properties :

Section = 30 cm × 20 cm,

Area = 70 cm^2

I_{xx} = 12400 cm^4

I_{yy} = 1760 cm^4

E = 2×10^4 kN/cm^2

FOS = 4

Find the working load of the column using Euler's formula. If one end is fixed and the other end is hinged, what will be the working load ? 14

7. (a) What is the Izod test of impact ? How is it different from the Charpy impact test ? 7

(b) What is hardness of a material and how can it be measured ? 7

8. Write short notes on any ***two*** of the following : 2×7=14

(a) Shear centre

(b) Non-destructive testing

(c) Mohr's circle

9. (a) Calculate the section modulus of a triangular section as shown in Figure 4. 7

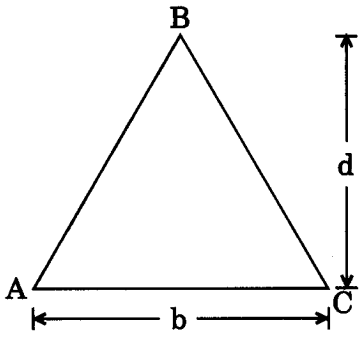

Figure 4

(b) A steel bar of 25 mm ϕ is acted upon by forces as shown in Figure 5. What is the total elongation of the bar ?

Take E = 190 GPa. 7

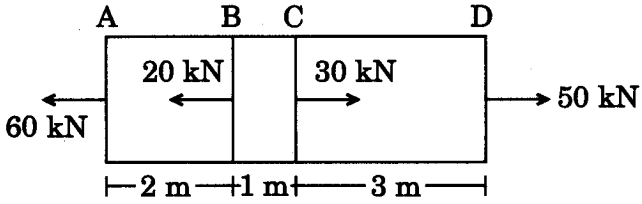

Figure 5