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ET-502(B)

B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering)

Term-End Examination

00615

June, 2017

ET-502(B) : STRUCTURAL ANALYSIS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Use of scientific calculator is permitted. Assume any missing data suitably.*

1. A live load of 20 kN/m moves on a simply supported girder of 20 m. Find the maximum bending moment which can occur at a section 5 m from the left end. The length of load is greater than the span. Use influence line diagram to solve this problem. *14*

2. A three-hinged arch of span 40 m and rise 10 m carries concentrated loads of 20 kN and 15 kN at distance 8 m and 16 m from the left end and a uniformly distributed load of 5 kN/m on the right half of the span (Figure 1). Find the reactions at A and B. Also determine the horizontal thrust. *14*

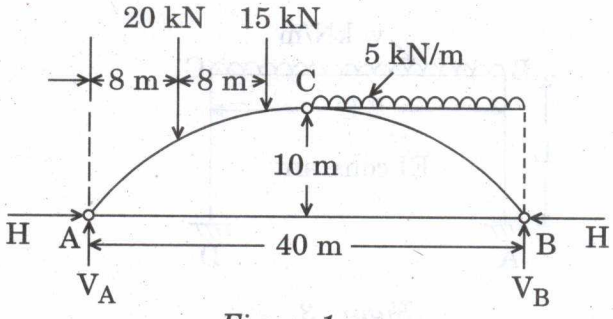

Figure 1

3. Determine the strain energy stored in the aluminium rod ABC as shown in Figure 2.

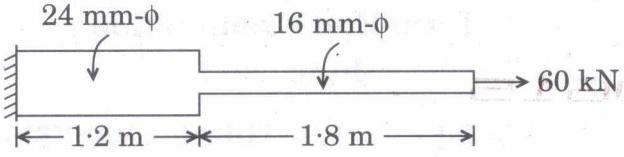

Figure 2

Take E for aluminium as 75×10^9 N/m^2. *14*

4. Show that the ratio of the strength of a solid column to that of a hollow one of the same cross-sectional area is 25/7.

The internal diameter of the hollow column is $\frac{3}{4}$ of the external diameter. The columns have the same length and are pinned at the ends. *14*

5. A portal frame ABCD is fixed at A and D, and is loaded as shown in Figure 3. Treating joints B and C as rigid, calculate the moment at A, B, C and D. *14*

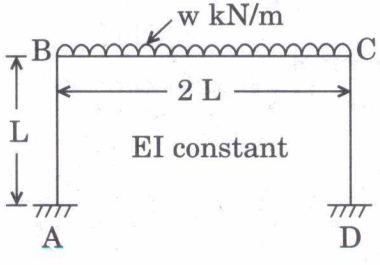

Figure 3

6. Analyse the continuous beam as shown in Figure 4 by moment distribution method.

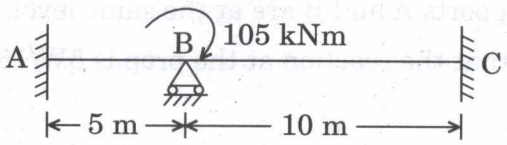

Figure 4

Determine the moments at A, B and C. Also draw the bending moment diagram. *14*

7. (a) Show that the shape factor for a circular section is 1·70. *7*

(b) A simply supported beam of span L carries a uniformly distributed load w (total load) over the whole span as shown in Figure 5. The plastic moment of resistance is M_P. Show that the value of collapse load is $\frac{8\,M_P}{L}$. *7*

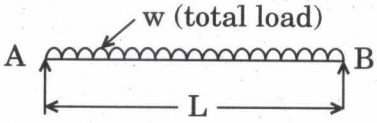

Figure 5

8. A propped cantilever beam of span L is fixed at A and propped at B. The beam carries a concentrated load W as shown in Figure 6. Both the supports A and B are at the same level.

Show that the reaction at the prop is 5W/16. *14*

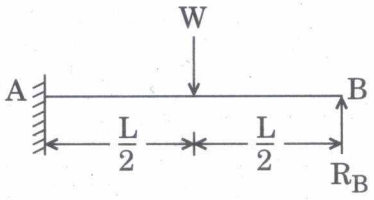

Figure 6