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**ET-502(B)**

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

00007

## Term-End Examination

## December, 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.** Two wheel loads 10 kN and 25 kN, spaced 2 m apart, move along the span of a simply supported girder of span 25 m. Find the maximum bending moment that can occur at a section 5 m from the left end. Any wheel load can lead the other. Use the influence line diagram to solve this problem. *14*

2. A three-hinged parabolic arch of span 10 m and rise 2·5 m carries a point load of 10 kN at 2·5 m from the left end and a uniformly distributed load of 6 kN/m on the right half of the span as shown in Figure 1. Determine the reactions at A and B. Also determine the horizontal thrust. *14*

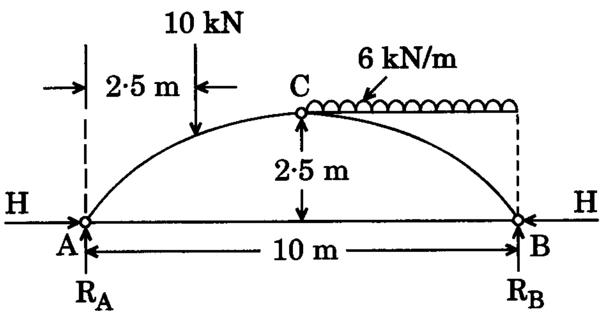


*Figure 1*

3. Show that the strain energy stored in the bar, as shown in Figure 2 is $\frac{7}{6} \times \frac{P^2 L}{\pi E D^2}$. *14*

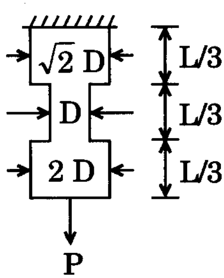


*Figure 2*

4. A solid column of diameter D is required to be replaced by a hollow column whose external diameter is 1·25 times the internal diameter. The column is long enough to fail by buckling only. Compute the percent saving in the material. *14*

5. Analyse the continuous beam as shown in Figure 3 by slope deflection method. The supports are at the same level and the beam is of constant stiffness throughout. Also draw the bending moment diagram. *14*

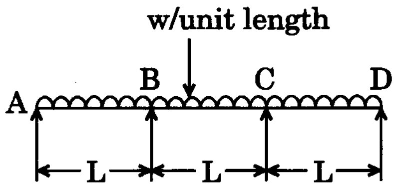


*Figure 3*

6. Analyse the portal frame as shown in Figure 4 by moment distribution method. The frame is fixed at A and D and has rigid joints at B and C. EI is constant. Also drawn the bending moment diagram. *14*

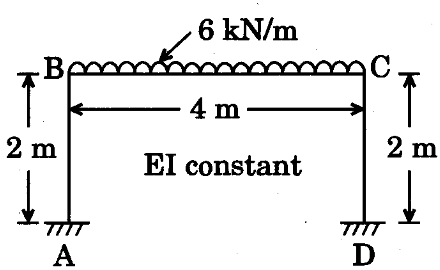


*Figure 4*

7. (a) Show that the shape factor for a rectangular section is 1·5. *7*

(b) A simply supported beam of span L carries a concentrated load of W at a distance 'a' from the left support and 'b' from the right support as shown in Figure 5. The plastic moment of resistance of the section is $M_P$. Show that the value of collapse load is $\frac{M_P L}{ab}$. *7*

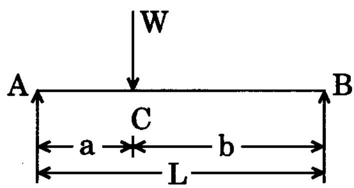


*Figure 5*

8. A propped cantilever beam of span L carries a uniformly distributed load of w per unit run as shown in Figure 6. Show that the reaction on the prop is $\frac{7\,wL}{64}$. *14*

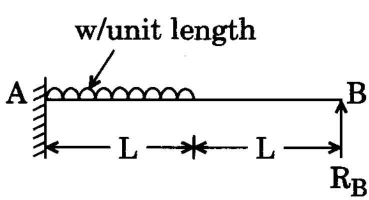


*Figure 6*