No. of Printed Pages : 4

ET-502(B)

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

Term-End Examination

00753

December, 2016

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, if it is required.*

1. A three-hinge arch has a span of 30 m and a rise of 10 m. The arch carries a uniformly distributed load of 6 kN/m on the left half of its span. It also carries two concentrated loads of 20 kN and 10 kN at 5 m and 10 m from the right end. Determine the reaction at the supports, and the horizontal thrust. *14*

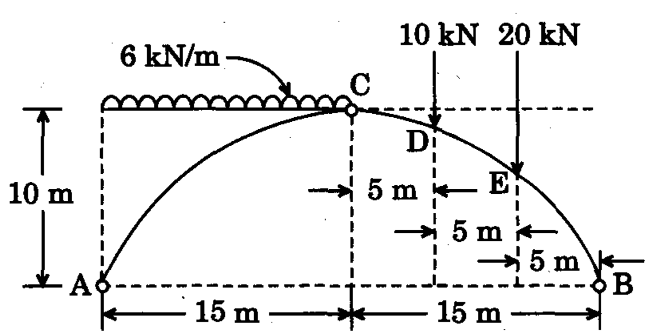

Figure 1

2. Two wheel loads of 10 kN and 30 kN spaced 3 m apart move along the span of girder of 24 m as shown in Figure 2.

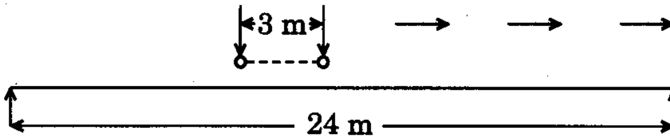

Figure 2

Find the maximum bending moment that can occur at a section 9 m from the left end. It is given that the 10 kN wheel load leads the 30 kN load. Use influence line diagram to solve this problem. *14*

3. A fixed beam of span L is subjected to an eccentric load W as shown in Figure 3.

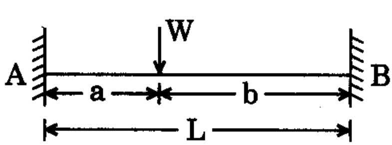

Figure 3

Calculate the moment at the ends. Also draw the bending moment diagram. Use the theorem of three moments for solving this problem. *14*

4. A portal frame ABCD is fixed at A and D, and is loaded as shown in Figure 4.

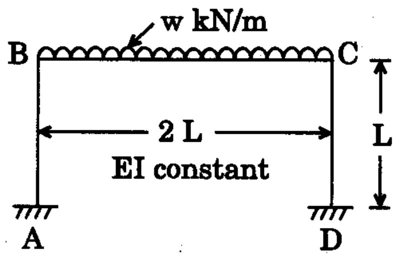

Figure 4

The joints B and C are rigid. Calculate the moments at A, B, C and D using slope deflection method. Also draw the bending moment diagram. *14*

5. A beam of length L is supported at the ends and at its middle point as shown in Figure 5.

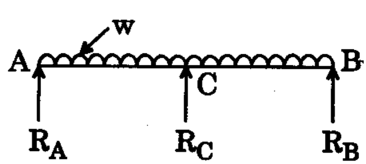

Figure 5

The beam carries a uniformly distributed load of w per unit run over the whole span. Determine the reaction at the supports and at the middle point by the minimum energy principle. *14*

6. (a) Show that the shape factor for a triangular section is 2·34. *7*

(b) Show that the length of a plastic hinge for a simply supported rectangular beam loaded with a uniformly distributed load is equal to $\frac{L}{\sqrt{3}}$. *7*

7. Using Euler's theory, show that the ratio of buckling strength of two long columns of same length, end conditions, material and weight, one of solid circular section 10 mm in diameter and the other of solid square section, is $\frac{3}{\pi}$. *14*

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

(a) Difference between flexibility and stiffness methods of matrix analysis

(b) Euler's buckling load for different end conditions

(c) Strain energy due to shear loading in a member