

**B.Tech. Civil (Construction Management) /
B.Tech. Civil (Water Resources Engineering)
Term-End Examination**

June, 2016

00100

ET-502(B) : STRUCTURAL ANALYSIS

Time : 3 hours

Maximum Marks : 70

Note : Attempt any **five** questions. All questions carry equal marks. Use of calculator is permitted. Assume any missing data, if it is required.

1. A three-hinged parabolic arch of span 'L' and rise 'h' carries a uniformly distributed load of w per unit run over the whole span. Calculate the horizontal thrust and vertical reactions at support. Also show that the arch is not subjected to any bending moment at any section. 14
2. A simply supported girder has a span of 15 m. A 30 kN wheel load moves from one end to the other end on the span of the girder. Find the maximum bending moment which can occur at a section 5 m from the left end. Use influence line diagram to solve this problem. 14

3. Analyse the continuous beam shown in Figure 1 by slope deflection method. EI is constant throughout.

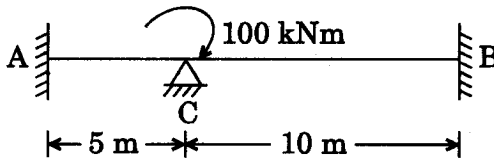


Figure 1

Also draw the bending moment diagram. 14

4. Analyse the portal frame shown in Figure 2 by moment distribution method.

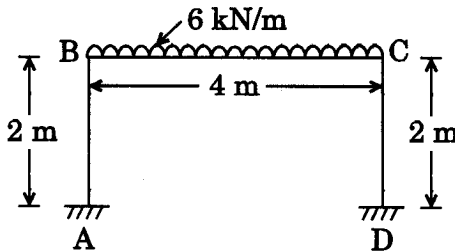


Figure 2

The frame is fixed at A and D and has rigid joints at B and C. Draw the bending moment diagram. 14

5. A beam of span L is fixed at one end and propped at the other end as shown in Figure 3.

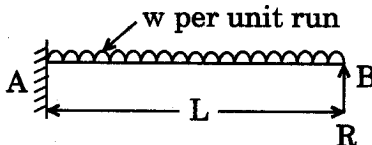


Figure 3

It carries a uniformly distributed load of w per unit run over the whole span. Find the reaction at the prop by the minimum energy principle. 14

6. (a) Show that the shape factor for a rectangular section is $\frac{3}{2}$. 7

(b) Show that the collapse load for the propped cantilever beam shown in Figure 4 is $\frac{11.656 M_P}{L^2}$. The plastic moment of the section is M_P . 7

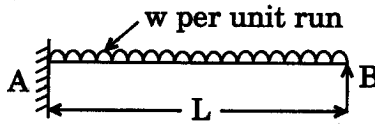


Figure 4

7. A solid column of diameter 100 mm is required to be replaced by a hollow column whose external diameter is 1.40 times the internal diameter. The column is long enough to fail by buckling only. Compare percent saving in material. 14

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

- (a) Difference between determinate and indeterminate structures
- (b) Maxwell's Reciprocal Theorem
- (c) Strain energy due to axial loading in a member