

No. of Printed Pages : 3

ET-502(B)

**B.Tech. CIVIL (Construction Management) /
B.Tech. CIVIL (Water Resources Engineering)**

Term-End Examination, 2019

ET-502(B) : STRUCTURAL ANALYSIS

Time : 3 Hours]

[Maximum Marks : 70

Note : Answer any five questions. All questions carry equal marks. Use of Scientific Calculator is permitted.

1. A three hinged semicircular arch of radius R carries a uniformly distributed load of w per unit run over the whole span. Show that horizontal thrust is $\frac{wR}{2}$. [14]
2. Two wheel loads of 5kN and 15kN spaced 3m apart move along the span of girder of 24m as shown in figure-1. Find the maximum bending moment that can occur at a section 9m from the left end. Use influence line diagram to solve this problem. [14]

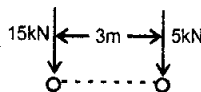
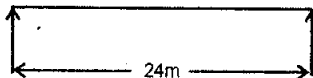


Figure - 1



3. A fixed end beam of span L is subjected to uniformly distributed load of intensity w per unit run over the whole span as shown in figure-2. Calculate the fixed end moments at A and B by three moment equation. [14]

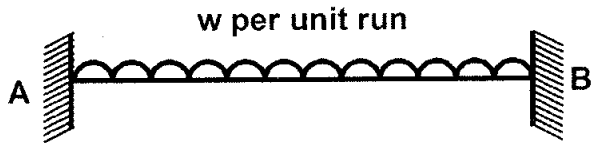


Figure - 2

4. Analyse the portal frame shown in figure-3 by moment distribution method. The frame is fixed at A and D and has rigid joints at B and C. EI is constant. Draw the bending moment diagram also, [14]

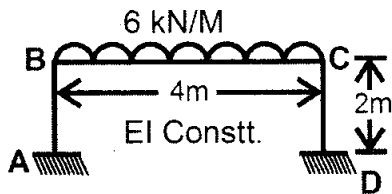


Figure - 3

5. Show that the strain energy stored in the bar as shown in the figure - 4 is : [14]

$$\frac{7}{6} \times \frac{P^2 L}{\pi D^2 E}$$

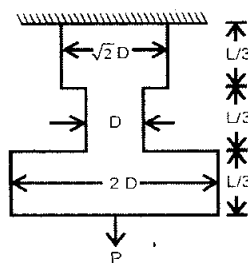


Figure - 4

6. A long column fixed at one end and hinged at the other is 150cm long and has a solid rectangular section. Calculate the depth of the section, if it is 10cm wide. Euler's crippling load is 30000N. Assume, $E=10^6\text{N/cm}^2$ [14]

7. A propped cantilever beam of span L is fixed at A and propped at B. The beam carries a concentrated load P and uniformly distributed load of intensity of w per unit run as shown in figure-5. Both the supports are at the same level. Show that the reaction at the prop is : [14]

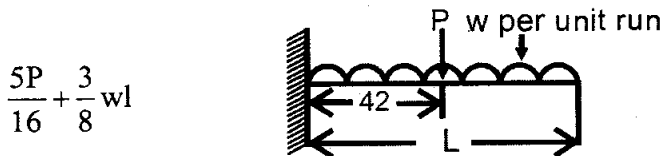


Figure - 5

8. (a) Show that the shape factor 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]

----- x -----