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ET-502(B)

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

Term-End Examination

December, 2015

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.*

1. A simply supported girder has a span of 12 metres. A 27 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 4 metres from the left end. *14*

2. 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.

Show that

(a) the horizontal thrust is $\frac{wL^2}{8h}$, and

(b) the arch is not subjected to any bending moment at any section. *7+7=14*

3. Compare the strain energy of the two bars as shown in Figure 1. D is the diameter. *14*

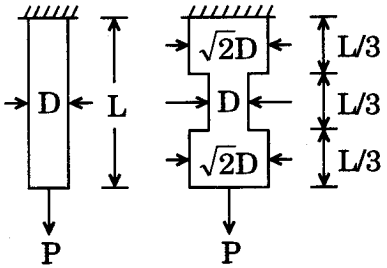

Figure 1

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

5. Analyse the continuous beam shown in Figure 2 by slope deflection method. The beam is of constant section throughout its length and supports remain at same level after loading. *14*

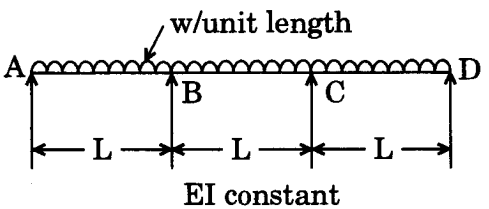

Figure 2

6. 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. Draw the bending moment diagram. *14*

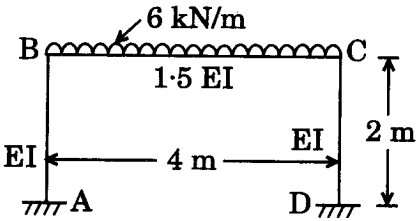

Figure 3

7. (a) Show that the shape factor for a circular section is 1·7. *4*

(b) A fixed beam of span L carries a uniformly distributed load w (total load) on the left half as shown in Figure 4. The plastic moment of resistance of the beam is M_P. Show that the value of collapse load is $14{\cdot}2\ M_P / L$. *10*

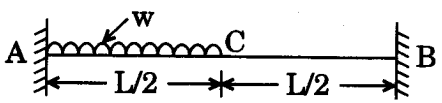

Figure 4

8. A cantilever has prop P at a distance L from the fixed end and on this length there is a uniformly distributed load w per unit run. If the prop is rigid and holds its point of application on the horizontal, find the reaction R_A on the prop as shown in Figure 5. *14*

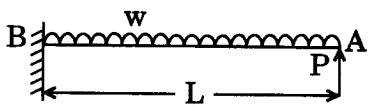

Figure 5