ET-502(B)

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

Term-End Examination

01155   **June, 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 allowed. Assume any missing data suitably.*

1. A live load of 12 kN/m moves on a simply supported girder of span 12 m. Find the maximum bending moment which can occur at a section 4 metres from the left end. The length of load is greater than the span. *14*

2. A three-hinged arch has a span of 30 metres and a rise of 10 m. The arch carries a uniformly distributed load of 6 kN per metre on the left half of its span as shown in Figure 1. Determine the reactions at A and B. Also determine the horizontal thrust.   *14*
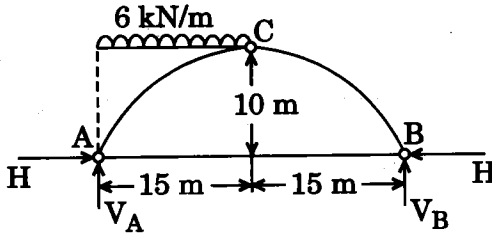

Figure 1

3. Two steel shafts A and B of the same length are subjected to equal torques. Shaft A is of uniform diameter D and shaft B is of diameter D over its half length and diameter D/2 over the other half of the length. Find the ratio of strain energies in the two shafts.   *14*

4. Using Euler's theory compare the buckling strength of two long columns of the same length, material and weight, one of solid circular section 5 cm in diameter, the other of solid square section. Both columns are pinned at ends.   *14*

5. Analyse the frame shown in Figure 2 by slope deflection method. Draw the bending moment diagram. *14*
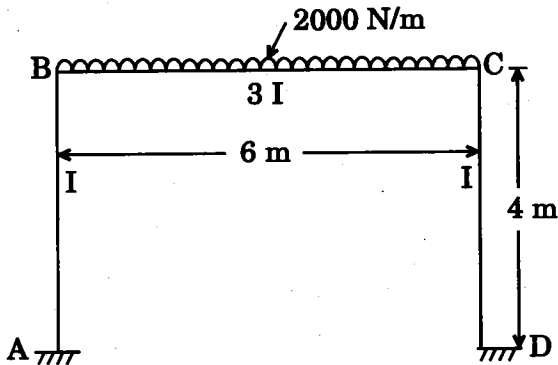

Figure 2

6. A fixed beam of span L is subjected to eccentric point load W as shown in Figure 3. Calculate the fixed end moments M_A and M_B by three moment equation. *14*
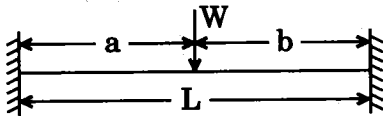

Figure 3

7. (a) Show that the shape factor for a rectangular section is 1·5. *4*

(b) A propped cantilever beam of span L carries a uniformly distributed load w (total load) over the whole length as shown in Figure 4. The plastic moment of resistance is M_P.

Show that the value of collapse load is $\dfrac{11 \cdot 656 \, M_P}{L}$. **10**
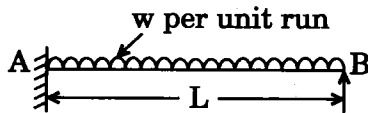
w per unit run

A ———————— B

|← L →|

Figure 4

8. In a simply supported beam of span L carrying a uniformly distributed load of w kN/m, if a central prop is introduced at the same level as the end supports, show that reaction on the prop is $\dfrac{5\,wL}{8}$. **14**
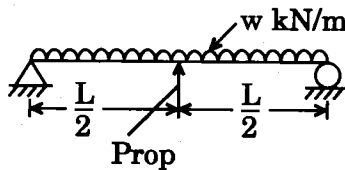
w kN/m

|← $\dfrac{L}{2}$ →|← $\dfrac{L}{2}$ →|

Prop

Figure 5

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