

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

Term-End Examination

June, 2008

ET-502(B) : STRUCTURAL ANALYSIS

Time : 3 hours

Maximum Marks : 70

Note : Answer any **five** questions. All questions carry equal marks. Assume any missing data, if required, and state it clearly.

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. Determine the horizontal thrust and show that the arch is not subjected to any bending moment at any section.

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2. A beam ABC, 10 m long, fixed at ends A and B is continuous over joint B and is loaded as shown in Fig. 1.

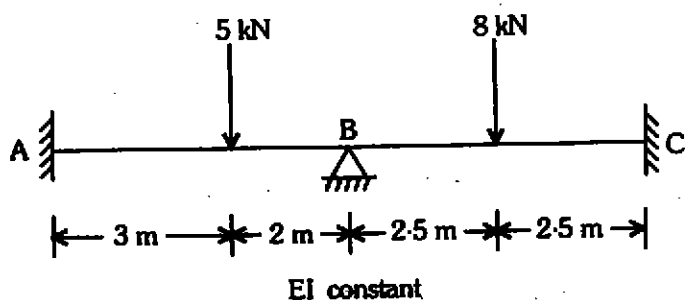


Figure 1

Using the slope deflection method, compute the end moments and plot the bending moment diagram. 14

3. Analyse the rigid frame shown in Fig. 2 by moment distribution method and draw bending moment diagram. 14

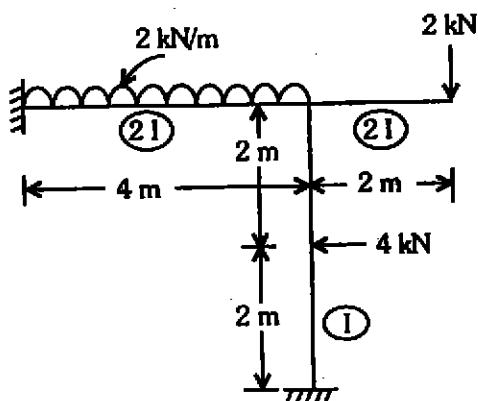


Figure 2

4. A beam AB, as shown in figure 3, of span L is simply supported at A and B and carries a point load W at the centre of the span. The moment of inertia is $2I$ for the central half portion and I for the remaining portions. Calculate the deflection at the centre by using conjugate beam method.

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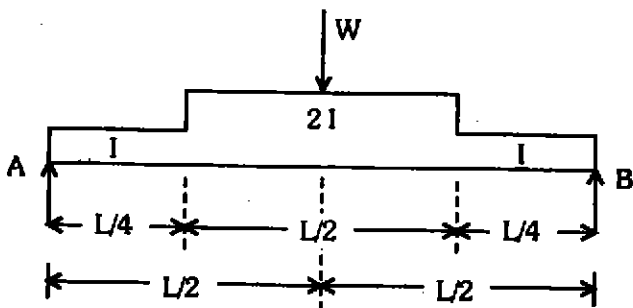


Figure 3

5. 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 strain energies in the two shafts.
6. Two wheel loads of 8 kN and 20 kN spaced at 2 m apart move along the span of a simply supported girder of span 16 metres. Find the maximum bending moment that can occur at a section 6 metres from the left end. Any wheel load can lead the other.

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7. (a) Show that shape factor for a circular section is 1.7. 7
- (b) A propped cantilever beam of span l carries a uniformly distributed load on the whole span. The total value of the load is W . The plastic moment of resistance of the beam is M_p . Show that the value of W at collapse

$$W_c = \frac{11.656 M_p}{l}$$

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8. Calculate the safe compressive load on a hollow cast iron column with one end hinged and other rigidly fixed. The external and internal diameters are 120 mm and 90 mm respectively and length of the column is 9 m.

Take factor of safety as 3 and $E = 95$ GPa. Also calculate critical stress.

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