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53 (CE 702) STAN-III

2019

### STRUCTURAL ANALYSIS-III

Paper : CE 702

Full Marks : 100

Time : Three hours



**The figures in the margin indicate full marks for the questions.**

Answer any five questions.

1. Analyse the building frame subjected to horizontal loading as shown in Figure 1. Find out beam axial forces, beam shear, column shear, beam moments, column moments. Draw Bending Moment diagram. 20

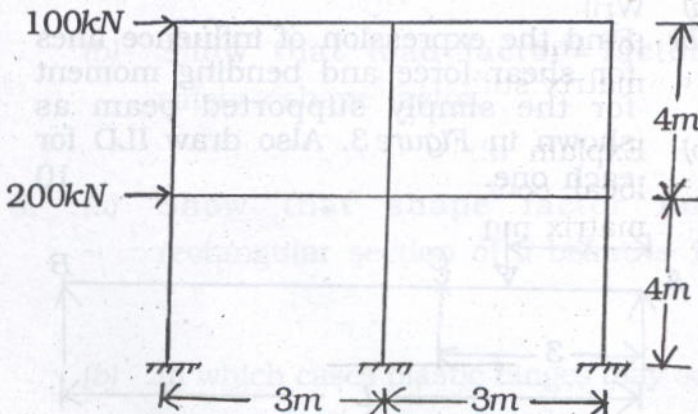


Figure 1

Contd.

2. (a) Approximately analyse the building frame subjected to vertical loading as shown in Figure 2. 10

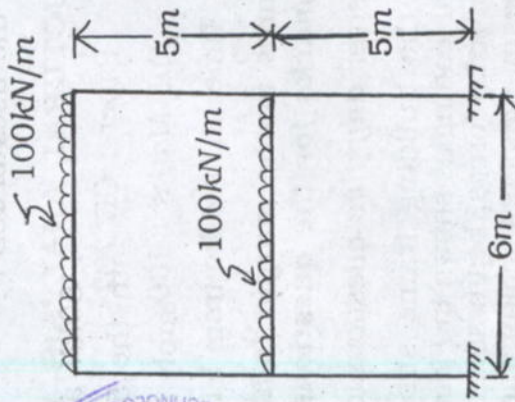


Figure 2

- (b) Find the expression of influence lines for shear force and bending moment for the simply supported beam as shown in Figure 3. Also draw ILD for each one. 10

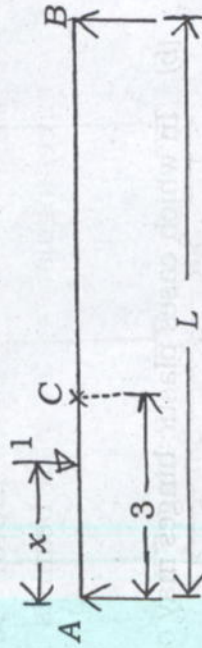


Figure 3

3. (a) Write down the assumptions for portal method and cantilever method. What are the uses of ILD? 10

- (b) Two point loads of 50kN and 75kN spaced 3m apart with the 50kN load leading passes over a simply supported beam of span of 12m from left to right. Using ILD calculate the maximum shear force and bending moment at a section 4.8m from the left hand support. 10

4. (a) Derive the expression for shape factor due to section modulus. 10

- (b) Show that load factor = factor of safety  $\times$  shape factor. 10

5. (a) Show that shape factor for a rectangular section of a beam is 1.5. 5

- (b) In which cases plastic hinges may occur in a structural member? 5

- (c) Determine the shape factor for the beam section shown in Figure 4. Find also the fully plastic moment of the beam section. Take  $f_y = 250\text{N/mm}^2$ .

10

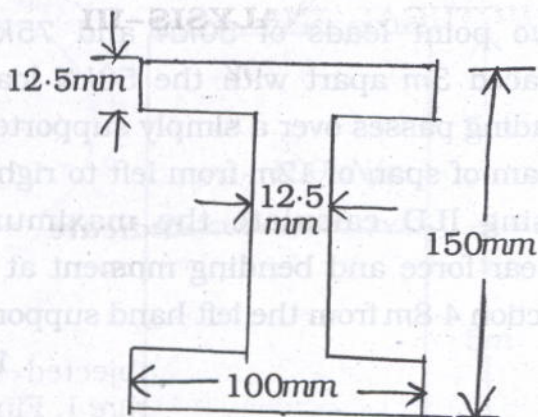


Figure 4

6. (a) Write down the step-by-step procedure for the analysis of structure by the matrix stiffness method. 10
- (b) Explain about global coordinate and local coordinate system in stiffness matrix method. 10

