53 (CE 702) STAN-III

2019

STRUCTURAL ANALYSIS–III

Full Marks : 100

Time : Three hours

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

*Answer **any five** questions.*

1. (a) Analyse the building frame using approximate method as shown in *Figure* 1. Also draw the BMD. 10
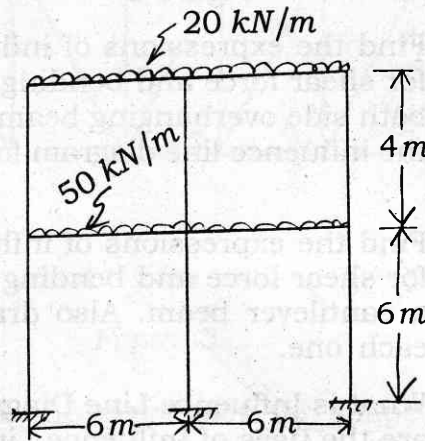

Figure 1

(b) Analyse the building frame subjected to horizontal loading as shown in Figure 2. Find out beam axial forces, beam shear, column shear, beam moments, column moments. Draw bending moment diagram.　10
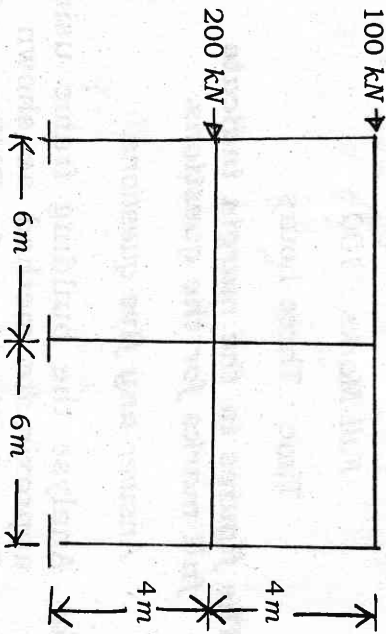

Figure 2

2. (a) Find the expressions of influence lines for shear force and bending moment of both side overhanging beam. Also draw the influence line diagram for each one.　10

(b) Find the expressions of influence lines for shear force and bending moment of a cantilever beam. Also draw TLD for each one.　10

3. (a) What is Influence Line Diagram ? What are the uses of Influence Line Diagram (ILD) ?　1+4=5

(b) Write down the assumptions for portal method and cantilever method.　5

(c) Two-point loads of 50 kN and 75 kN spaced 3 m apart with the 50 kN load leading passes over a simply supported beam of span of 12 m from left to right. Using ILD, calculate the maximum shear force and bending moment at a section 4·8 m from the left-hand support.　10

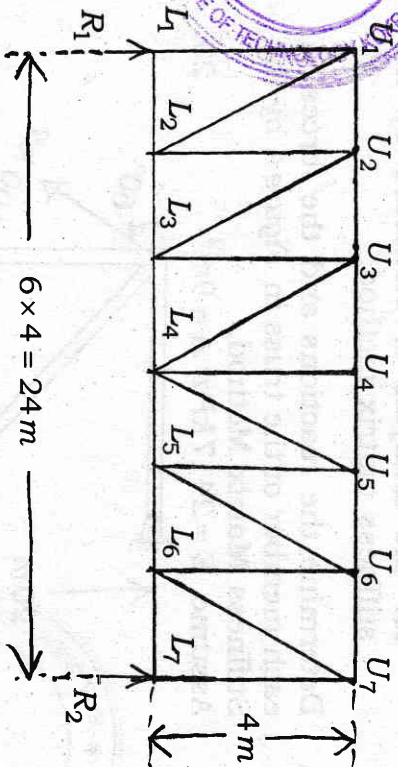4. Draw ILD for the forces in the members of the bridge truss as shown in the Figure 3.　20

Figure 3

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

(b) A cantilever of length '*l*' reaches a collapse state when subjected to a vertical load '*w*' at the free end. If the cantilever is subjected to an upward vertical load *nw* at a distance '*nl*' from the fixed end, find what vertical load at the free end will produce the collapse. Assume $n < 1$. 10

6. (a) Show that the shape factor for a rectangular section of a beam is 1·5.

5

(b) Determine the shape factor of a triangular section of a beam. 5

(c) Write down the step-by-step procedure for the analysis of structure by the stiffness matrix method. 10

7. Determine the reactions and the forces in each member of the truss in *Figure* 4 by the Stiffness Matrix Method. Assume $E = 2417\,kPa; A = 9m^2$ 20
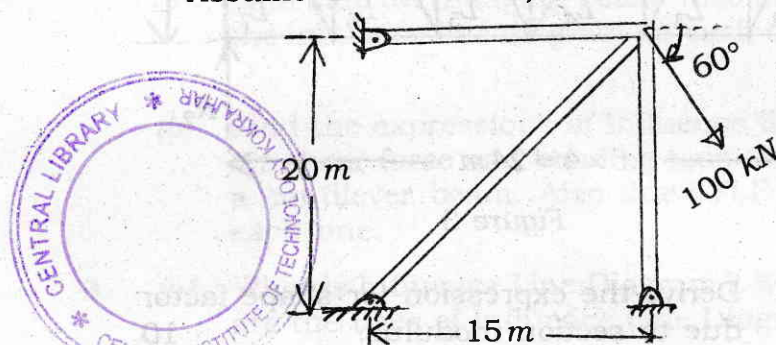

Figure 4