2018

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. (a) 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
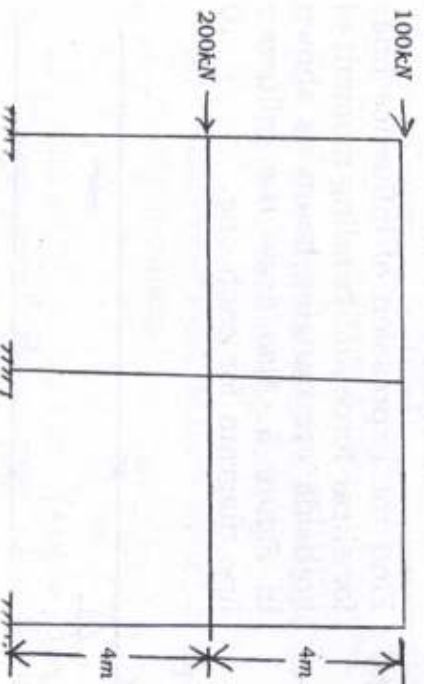bending moment diagram. 10

Figure 1

(b) Analyse the building frame using approximate method as shown in Figure 2.   10
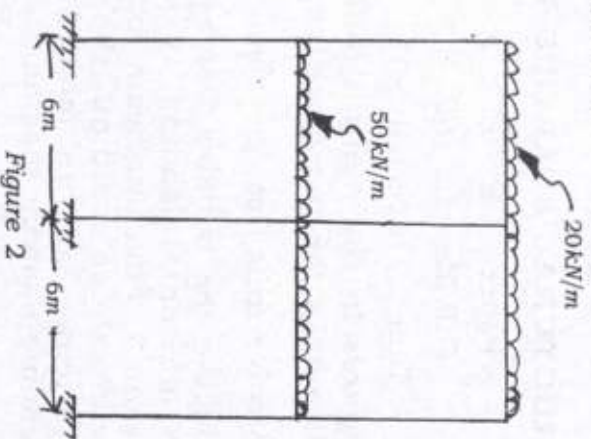

50kN/m

20kN/m

6m — 6m

Figure 2

2. (a) Find the expression of influence lines for shear force and bending moment of bothside overhanging beam as shown in Figure 3. Also draw the influence line diagram for each one.   10
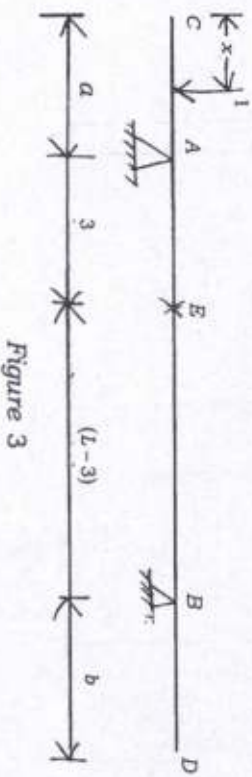

C   A   E   B   D

x→ 1

a   3   (L−3)   b

Figure 3

(b) Two wheel loads 80kN and 20kN, spaced 2m apart move on a girder of span 16m. Find the maximum positive and negative shear force at a section 4m from the left end. Any wheel load can lead the other.   10

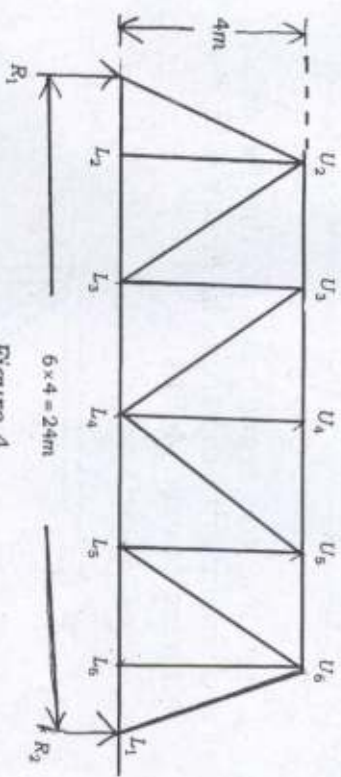3. Draw ILD for the forces in the members of the bridge truss as shown in the Figure 4.   20

4m

R_1 U_2 U_3 U_4 U_5 U_6

L_2 L_3 L_4 L_5 L_6 L_1 R_2

$6 \times 4 = 24m$

Figure 4

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

(b) Show that load factor = factor of safety × 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) A simply supported beam of span 8m carries the load system as shown in Figure 5. Design the beam by Plastic theory. Allow a load factor of 1·75.
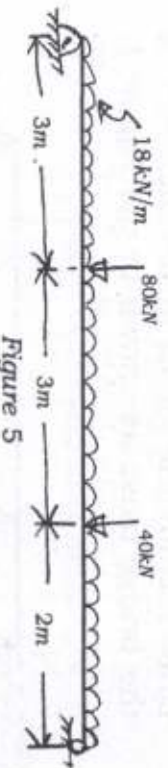
Take $Ay = 250N/mm^2$. 10

Figure 5

6. Determine the reactions and the forces in each member of the truss in Figure 6 by the Stiffness Matrix Method.
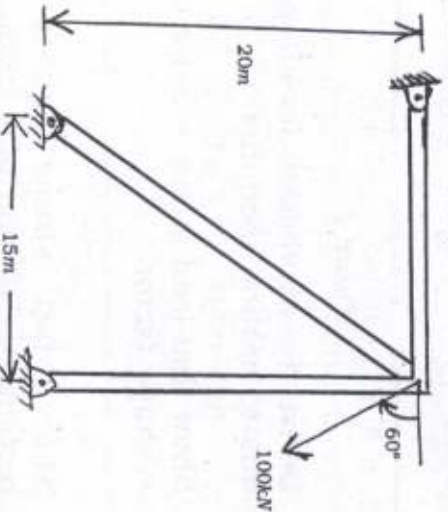
Take $E = 2417 kPa$, $A = 9m^2$ 20

Figure 6