Total number of printed pages–4

53 (CE 702) STAN–III

2021

(Held in 2022)

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)* Analyze the building frame subjected to horizontal loading as shown in *Figure* 1. 10

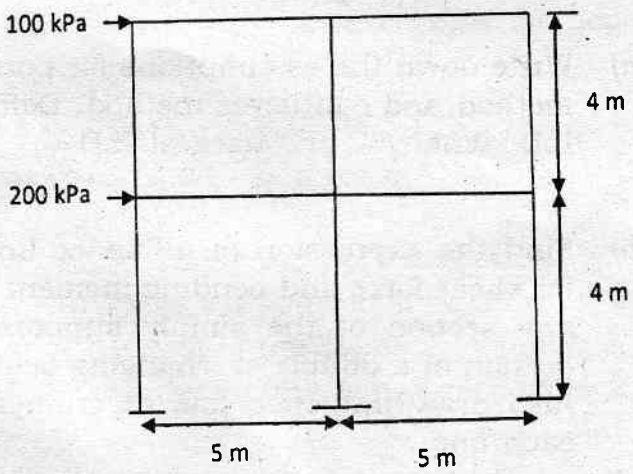

Figure 1

Contd.

(b) Analyze the building frame subjected to vertical loading as shown in *Figure* 2. 10

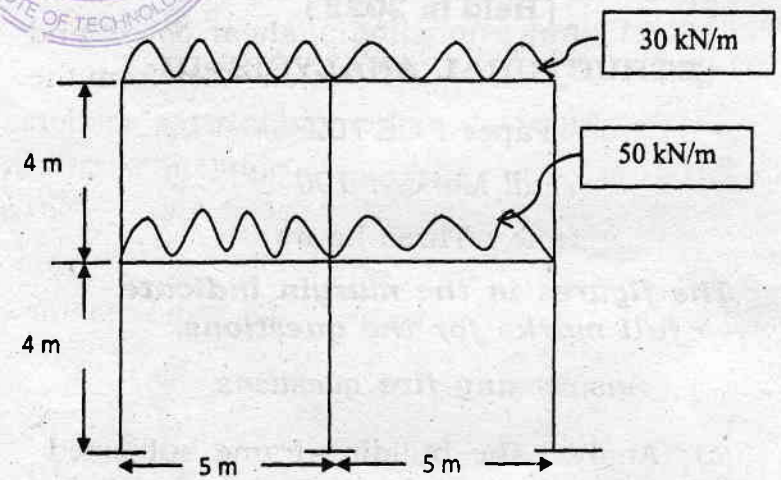

Figure 2

2. (a) Write down the assumptions for portal method and cantilever method. Define ILD. What are the uses of ILD ? 4+2+4=10

(b) Find the expression of influence lines for shear force and bending moment at any section of the simply supported portion of a double overhanging beam. Also draw influence line diagram for each one. 10

3. Two-point loads of $50\,kN$ and $75\,kN$ spaced at $3\,m$ 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. Also find out the section and the magnitude of the absolute maximum B.M. that may occur on the beam. 20

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)* Write *five* basic criteria for occurring plastic hinge. 5

(b) Show that for a rectangular beam section, $M_p = 1.5 M_y$. 5

(c) A simply supported beam of length 'l' carries a point load at centre. Find the length of the plastic hinge, if the shape factor for the beam section is K_s. 10

6. *(a)* How is the structure stiffness matrix developed ? Write down the expression for member stiffness matrix for single member of a truss. 10

(b) Write short notes on : ***(any two)*** 5×2=10

(i) Influence line diagram

(ii) Plastic moment

(iii) Stiffness matrix.