Code No: 155DC **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, January - 2025
STRUCTURAL ANALYSIS – II
(Civil Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A (25 Marks)

1.a) Define the term 'distribution factor'. [2]
b) List out the advantages of arches over beams. [3]
c) Distinguish between Kani's and Moment Distribution methods. [2]
d) Derive the expression for the length of a suspension cable with support at different levels and subjected to uniformly distributed load. [3]
e) What is the Factor Method used for in frame analysis? [2]
f) Elaborate the Substitute Frame Method in gravity load analysis. [3]
g) Define flexibility matrix. [2]
h) Derive the stiffness matrix for the cantilever beam with co-ordinates as shown in figure 1. [3]

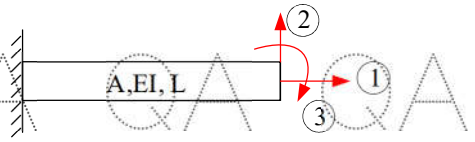
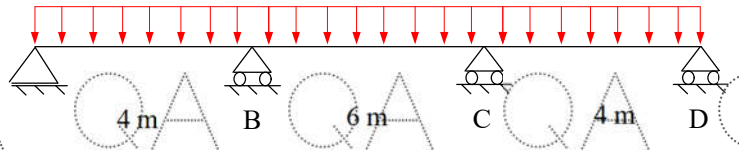


Figure 1

i) What principle is used to construct the influence line diagram for indeterminate beams? [2]
j) Distinguish between influence line diagram and shear force diagram. [3]

PART – B (50 Marks)

2. Analyse the continuous beam as shown in figure 2, if the support B and C sinks by 2 mm and 5 mm respectively. [10]



$I_{AB} = 2 \times 10^7$ mm^4 $I_{BC} = 4 \times 10^7$ mm^4 $I_{CD} = 2 \times 10^7$ mm^4

Figure 2

OR

3. A two-hinged parabolic arch with a varying section, where the moment of inertia is proportional to the secant of the slope of the arch axis, has a span of 36 m and a rise of 8 m. Determine the maximum positive and negative bending moments at a section 12 m from the left support when a point load of 120 kN rolls over the arch. [10]

4. Use Kani's method to analyze the frame as shown in figure 3. Draw BMD. [10]

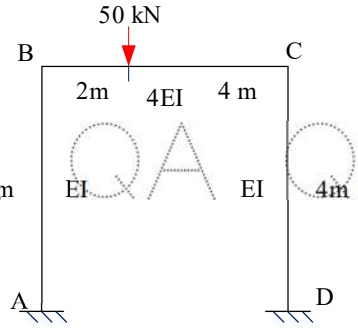


Figure 3

OR

5. A three-hinged stiffening girder of a suspension bridge with a span of 120 m carries two-point loads of 180 kN and 220 kN positioned at 30 m and 70 m from the left end, respectively. Calculate the shear force and bending moment in the girder at a section 50 m from the left end. The supporting cable has a central dip of 12 m. Determine the maximum tension in the cable and sketch the bending moment diagram for the girder. [10]

6. Use the cantilever method to perform an approximate analysis for the frame in figure 4. Assume that the cross-sectional area of columns to be the same. Draw BMD. [10]

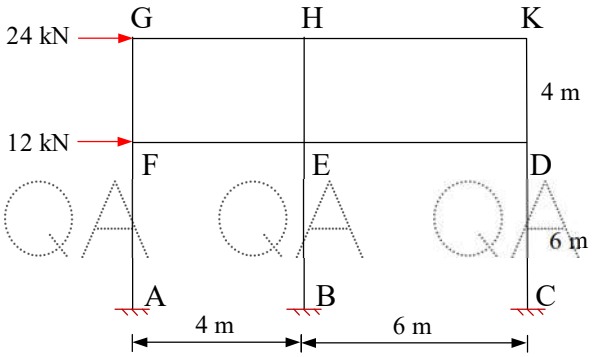


Figure 4

OR

7. Using approximate method, to analyse the building frame as shown in figure 5. Approximately sketch the deflected shape. Draw BMD. [10]

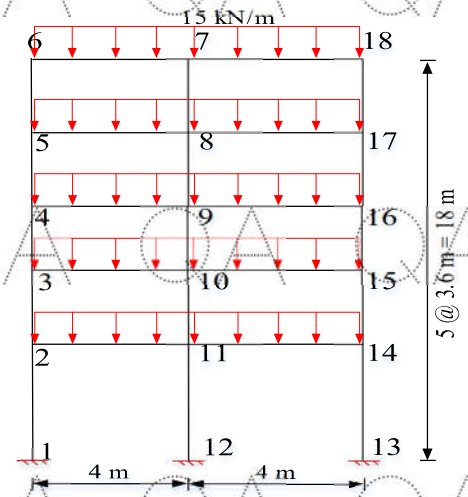


Figure 5

8. Determine the reactions and the member end forces for the three-span continuous beam as shown in figure 6 by using the matrix stiffness method. Draw BMD and elastic curve. [10]

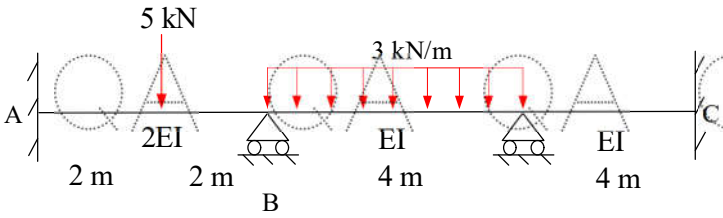
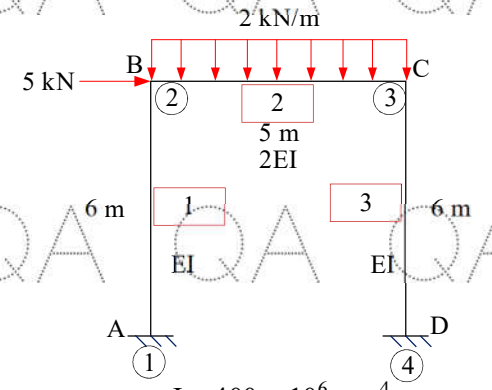


Figure 6

OR

9. Determine the reactions and the member end forces in local coordinates for the frames shown in figure 7 by using the matrix stiffness method. Draw BMD. [10]



$I = 400 \times 10^6\ mm^4$

$E = 200\ GPa \qquad A = 4000\ mm^2$

Figure 7

10. Determine the ordinates of the influence line for R_A and R_B at 1 m interval for the continuous beam as shown in figure 8. Assume EI is constant. [10]

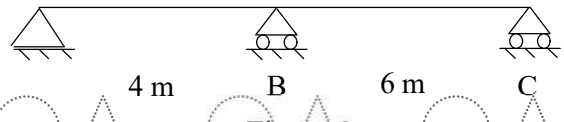


Figure 8

OR

11. Draw the influence lines for reactions at supports and the shear force and bending moment at point B of the beam as shown in figure 9. Use 1 m as interval for the influence line ordinates and select the reaction at C to be redundant. Assume EI is constant. [10]

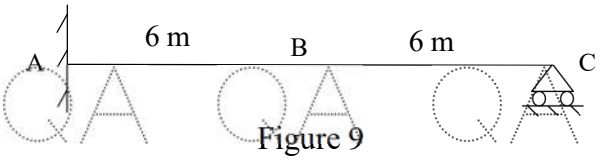


Figure 9

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