R18

Code No: 154CB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year II Semester Examinations, February - 2024

STRUCTURAL ANALYSIS – I

(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 tension coefficient. [2]
b) Distinguish between perfect and imperfect plane frames. [3]
c) State the Castigliano's theorems. [2]
d) Obtain an expression for strain energy stored in a flexural member subjected to pure bending. [3]
e) Define the kinematic indeterminacy. [2]
f) Explain the effect of sinking of a support on shear force and bending moment at any section of a continuous beam. [3]
g) What is an Elastic curve? [2]
h) What are the factors influencing the side sway of portal frames? [3]
i) Define an Influence Line Diagram. [2]
j) What is the condition for maximum bending moment at any section of a simply supported beam if it is subjected to a moving udl shorter than the span? [3]

PART – B

(50 Marks)

2. A plane truss consists of equilateral triangles of side 2 m is supported and loaded as shown in Figure.1. Analyse the truss using the method of sections. [10]

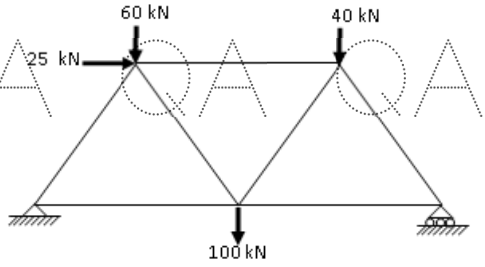

Figure 1

OR

3. Analyse the truss shown in Figure.2, using Tension coefficient method. [10]

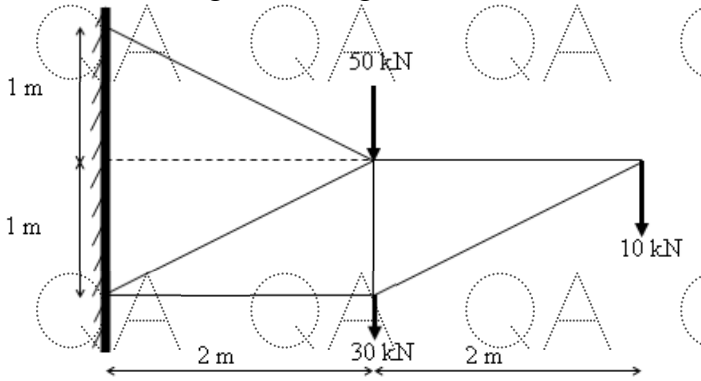

Figure 2

4. Using Unit load method, determine the rotation and deflection at the free end of a beam supported and loaded as shown in Figure.3. [10]

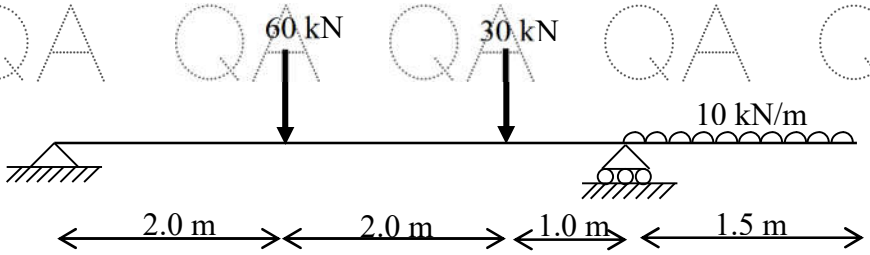

Figure.3

OR

5. A three-hinged parabolic arch of span 20 m and a central rise of 4 m is subjected to two concentrated loads 90 kN and 60 kN at a distance of 5 m and 15 m from the left hinge and uniformly distributed load of 80 kN/m on the right half of the span. Find the horizontal thrust, bending moment and the radial shear at a section 8 m from the right support. Also determine the location and magnitude of maximum bending moment. [10]

6. Draw the shear force and bending moment diagrams for the beam supported and loaded as shown in Figure.4. [10]

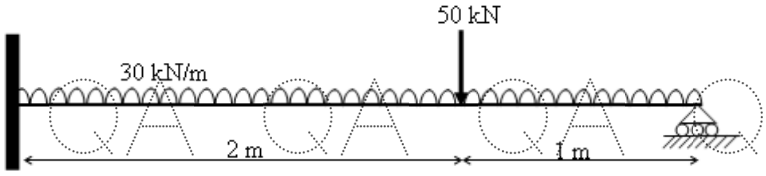

Figure .4

OR

7. Draw the shear force and bending moment diagrams for the beam loaded as shown in Figure.5. [10]

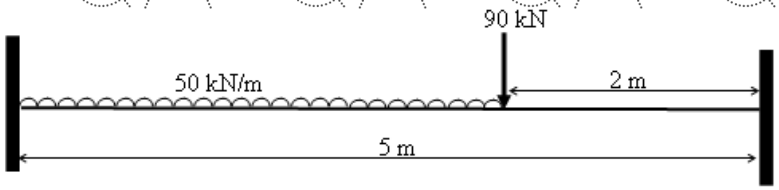

Figure 5

8. Analyse the continuous beam supported and loaded as shown in Figure.6. Use Clapeyorn's theorem of three moments. [10]

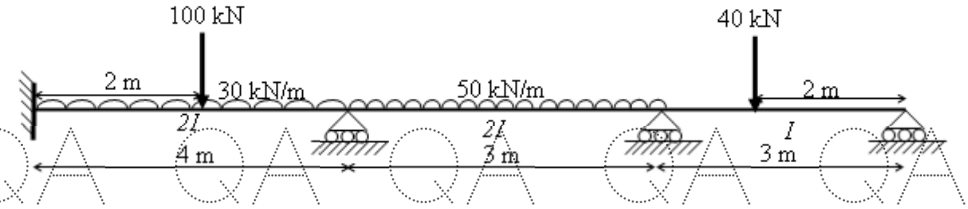

Figure 6

OR

9. Analyse the beam loaded as shown in Figure. 7, by the slope-deflection method if the support '***C***' sinks by 20 mm. And draw the bending moment diagram. [10]

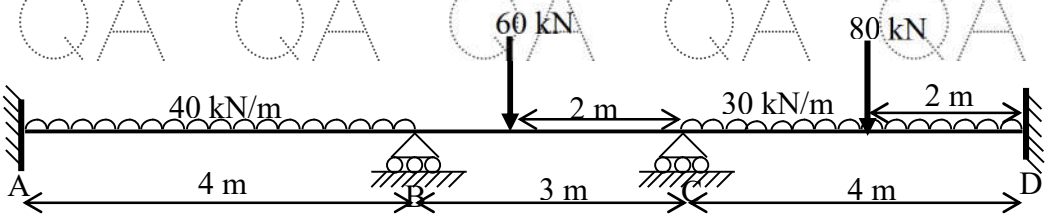

Figure. 7

10. An uniformly distributed load of intensity 25 kN/m and 5 m long crosses a simply supported girder of span 20 m from right to left. Determine the maximum bending moment and maximum positive and negative shear forces at a section 9 m from the left support. [10]

OR

11. Draw the influence line diagrams for shear force and bending moment at a section 8 m from the left support of a simply supported beam of span 18 m. Also determine the maximum shear force and the bending moment at the same section, if two point loads 180 kN and 150 kN, 3m apart crosses the girder from left to right with 180 kN load leading. [10]

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