BANGLADESH UNIVERSITY OF PROFESSIONALS
Military Institute of Science and Technology
B.Sc. in Civil Engineering, Term Final (Spring) Examination 2023: Jul-Sep2023

Student Group: Earned Credit Hours ≥108

Subject:CE 411, Structural Analysis and Design-II

Time: 3.00 hours **Full Marks: 180**

INSTRUCTIONS:

a. Use **SEPARATE** answer scripts for each section.
b. **Question-1** in **Section-A** and **Question-5** in **Section-B** are compulsory
c. Answer any other **TWO** questions out of **THREE** from each section.
d. Figures in the margin indicate full **marks**.
e. Assume reasonable data if necessary.
f. **Symbols** and **abbreviations** used have their usual meanings.

SECTION-A

Question 1 (Compulsory)

a. Determine support moments and reactions for the beam shown in Figure 1(a) **15**

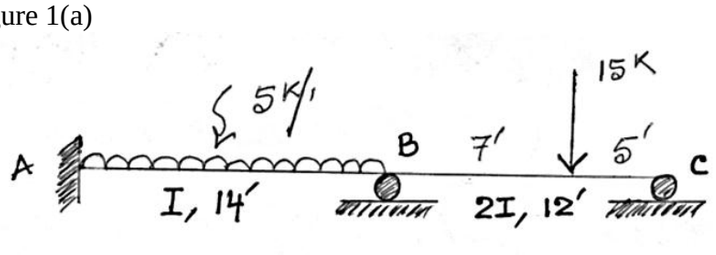


Figure 1(a)

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b. Determine reactions of the frame (Figure 1b) using direct stiffness matrix method. **15**

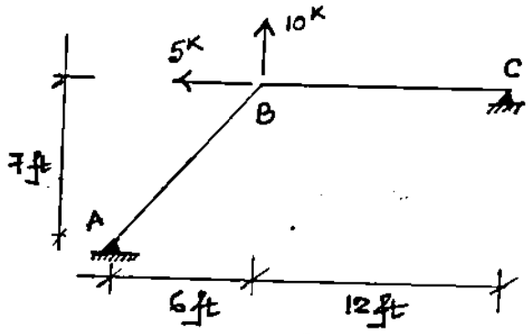


Figure 1(b)

Question 2

a. Determine bar forces of the frame (Figure 2a) using stiffness method. Cross-sectional areas (in square inch) are given in parenthesis. **15**

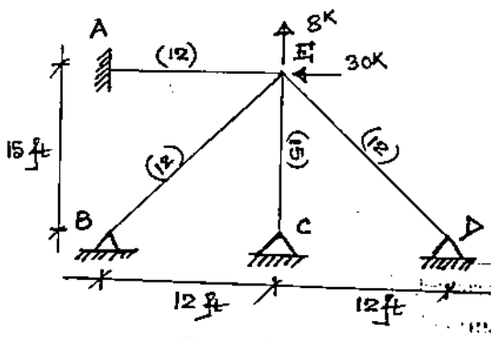


Figure 2(a)

b. Determine support moments for the beam shown in Figure 2b (EI constant) **15**

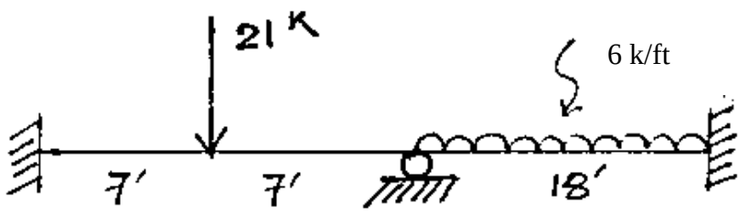


Figure 2(b)

Question 3

a. Determine support moments due to the loading and support movements (Figure 3a). Support 'A' rotates 0.03 radian clockwise and support 'A' moves up by 0.15' (EI= 3000 k-ft^2) **15**

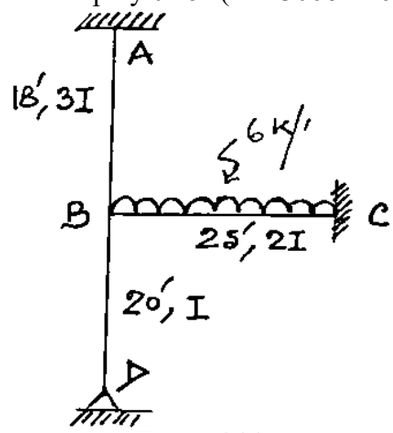


Figure 3(a)

b. Determine bar forces of the truss (Figure 3b) using stiffness method. Cross-sectional areas (in square inch) are given in parenthesis.

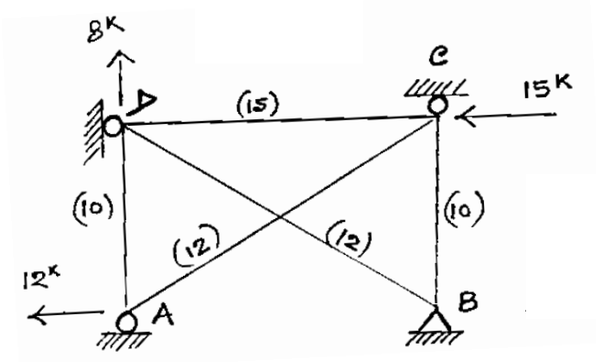


Figure 3(b)

Question 4

a. Determine the internal moments of the frame as indicated in Figure 4a. **15**

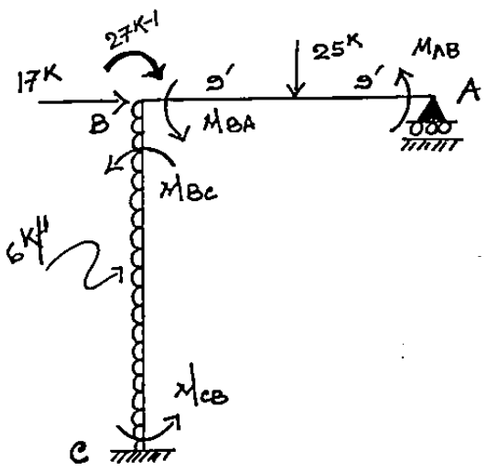


Figure 4(a)

b. Determine the deflection at the mid span for the members AB and BC for the beam (Figure 4b) using direct stiffness method.

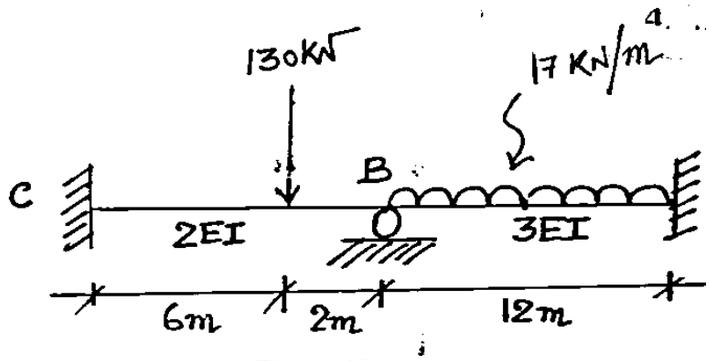


Figure 4(b)

SECTION-B

Question 5 **(Compulsory)**

a. Using flexibility method, determine the reactions and the forces in each member of the truss, shown in Figure 5a. Also find the horizontal deformation of point E. **20**

The cross-sectional area of each member is shown in Figure 5a. Points A and C are hinge and roller support, respectively. Consider, the members are pin connected at their ends and modulus of elasticity, E= 29×10^3ksi.

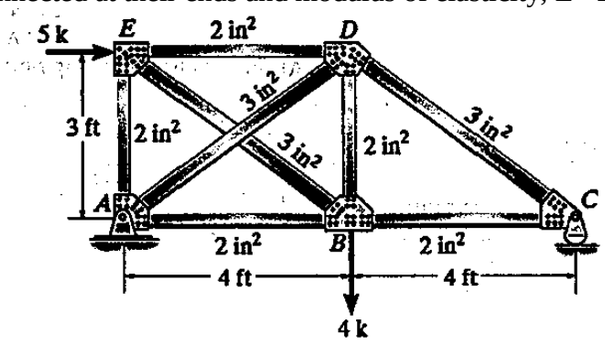


Figure 5(a)

b. For the beam shown in the Figure 5b: **20**

i) draw the qualitative influence line for shear at C.

ii) draw the quantitative influence line for moment at C, plotting numerical values at every 2m.

iii) find the value of moment, M_c when a 10 kN force (downward) acting on the beam at 8m distance from support A.

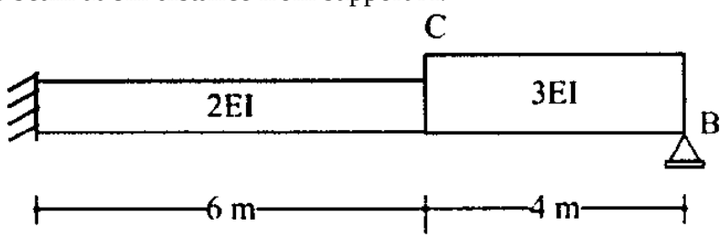


Figure 5(b)

Question 6

a. Draw the shear force diagram for the sway frame as shown in Figure 6a. Consider, E= constant. Use moment distribution method. **15**

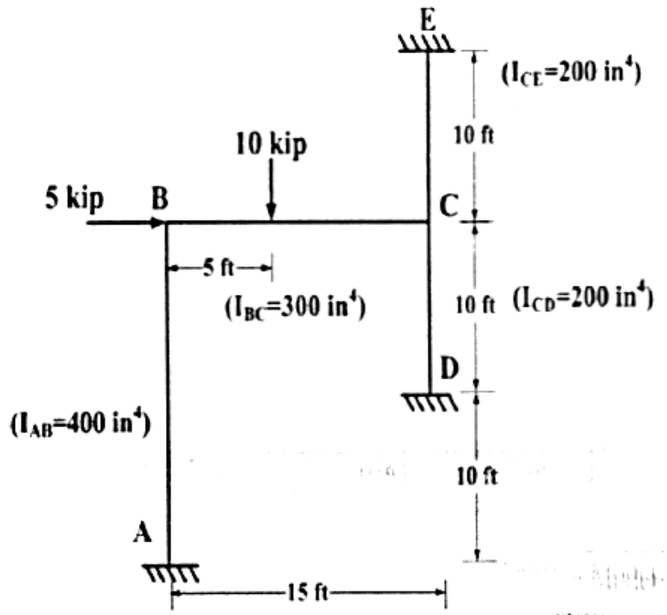


Figure 6(a)

b. Using moment distribution method, compute the reactions of each support of the beam (Figure 6b) and draw the shear force diagram. Given that EI= constant. **10**

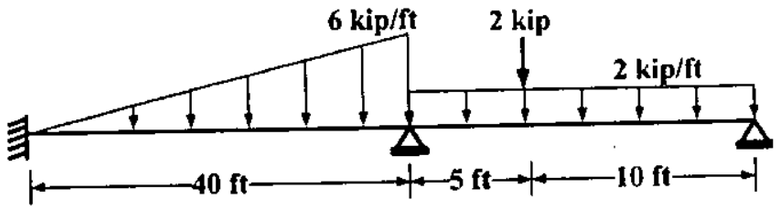


Figure 6(b)

Question 7

a. For the frame (Figure 7a), draw the quantitative influence line for shear at point P with numerical values at every 10ft of the beam, NQ. Assume E is constant. Unit load moves over the beam NQ. **15**

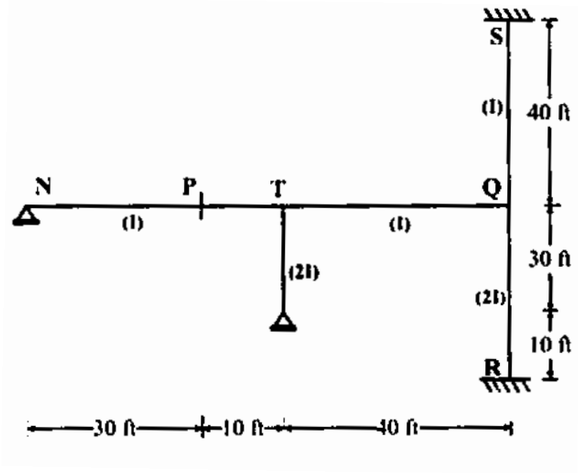


Figure 7(a)

b. Determine the member end moments for the three span continuous beam shown in Figure 7b due to the uniform distributed load and due to the support settlements of 5/8 in at B, 1.5 in at C and ¾ at D. Use the moment distribution method. Assume, EI= constant. **10**

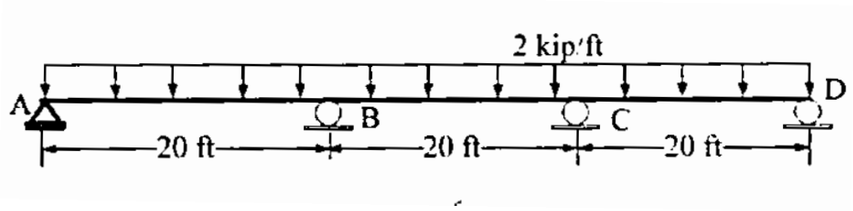


Figure 7(b)

Question 8

a. Draw the bending moment diagram of the frame, shown in Figure 8a, considering E= constant. Also, find the reactions at support, F. Use moment distribution method. **13**

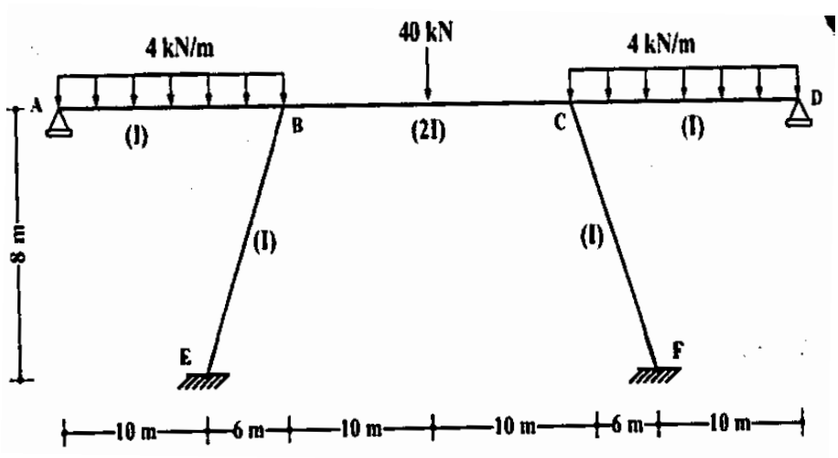


Figure 8(a)

b. Draw the influence lines for the forces in members EF, CE of the truss shown in Figure 8b. Live loads move over the bottom chord of the truss. Here, AE= constant. **12**

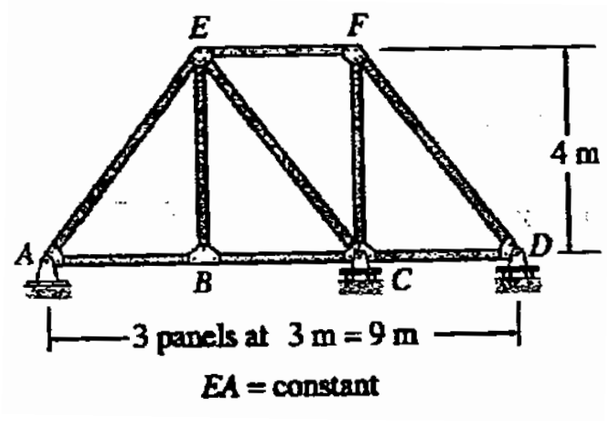


Figure 8(b)

