BANGLADESH UNIVERSITY OF PROFESSIONALS
Military Institute of Science and Technology
B.Sc. in Environmental, Water Resources, and Coastal Engineering, Term Final (Spring) Examination 2025: Oct - Nov 2025

Student Group: Earned Credit Hours > 108

Subject: EWCE 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** out of the remaining **THREE** questions 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. Compute the support reactions of the frame shown in Figure 1, using consistency deformation/ flexibility matrix method. Assume EI is constant for all members. **15**

b. Sketch the SFD and BMD of the frame represented in Fig 1 after completing the part (a) of Question 1. **15**

Question 2

a. Differentiate between the determinate and the indeterminate structure and also briefly describe the available methods for solving the indeterminate structures. **15**

b. Distinguish between the various available methods in terms of solving indeterminate structures and identify among the best one to be selected for analyzing indeterminate beams, frames or trusses with clear justification of the answer. **15**

Question 3

a. Calculate the support reactions of the beam shown in Fig 2 using the slope deflection method. Assume E = 200 GPa and I= 0.0022 m^4. **15**

b. Draw the SFD and the BMD of the beam ABCD depicts in Fig 2 after completing the part (a) of Question 3. **15**

Question 4

Formulate the qualitative influence line diagram of R_D, R_C, R_E, V_B, V_G, M_A and M_B for the indeterminate flexural beam shown in the Fig 3. **30**

SECTION-B

Question 5 **(Compulsory)**

a. Analyze the bam shown in Figure-4 using the moment distribution method and draw the SFD and BMD of the beam. Consider, EI = Constant. **20**

b. Using Stiffness method, determine the end moments of the members of the frame as illustrated in Figure-5. Consider, EI = Constant. **10**

Question 6

a. Determine the bar forces of the truss as illustrated in Figure-6 using Stiffness method. Cross-sectional areas in square millimeters are in parenthesis. Given: E = Constant. **15**

b. For the beam shown in Figure-7, support at 'C' is subjected to a clockwise rotation of 0.0015 radians. Calculate the moment at support 'A'. Given E = $30x10^3$ Ksi and I = 1000 in^4. Use Moment Distribution Method. **15**

Question 7

a. Analyze the sway frame in Figure-8 using Moment distribution method, and compute the moments at the end of each member of the frame. Consider, EI = Constant **10**

b. Analyze the beam shown in Figure-9 using direct stiffness matrix method and find the reactions and moments for member AB. Consider, EI = Constant. **20**

Question 8

a. Determine the bar forces of the member BC of the truss shown in Figure-10 using direct stiffness matrix method. Given: E = Constant. **20**

b. Compute the end moments of the member AB of the beam shown in Figure-11 using Stiffness method. Consider, EI = Constant **10**

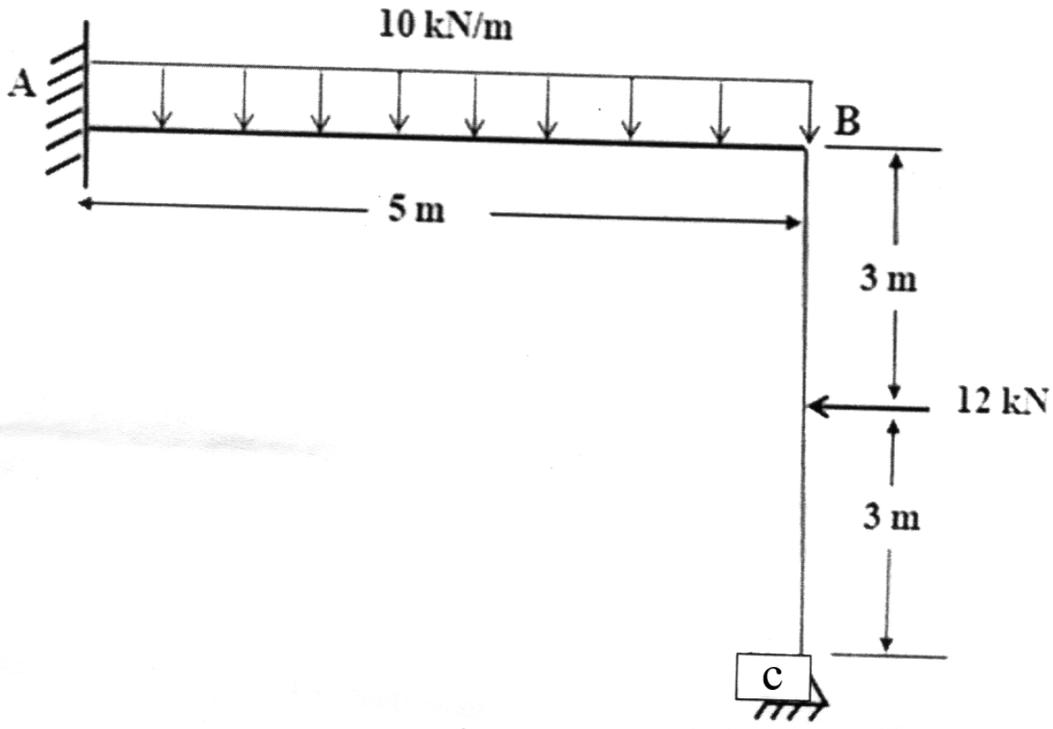


Figure- 1

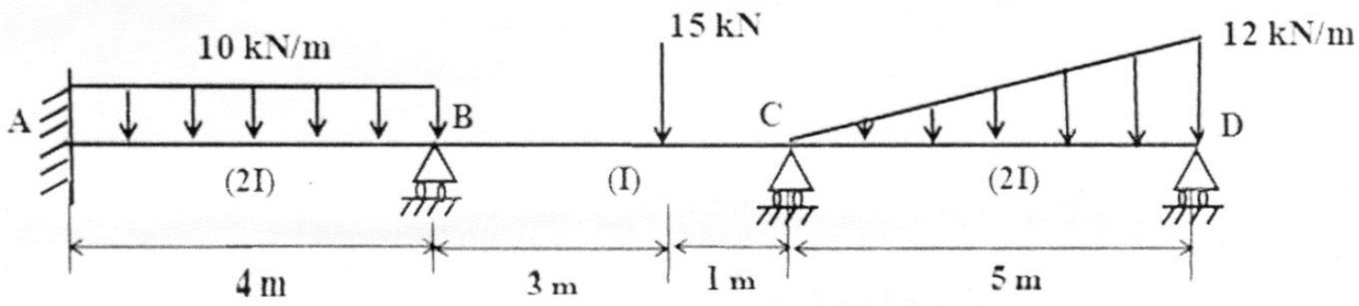


Figure 2

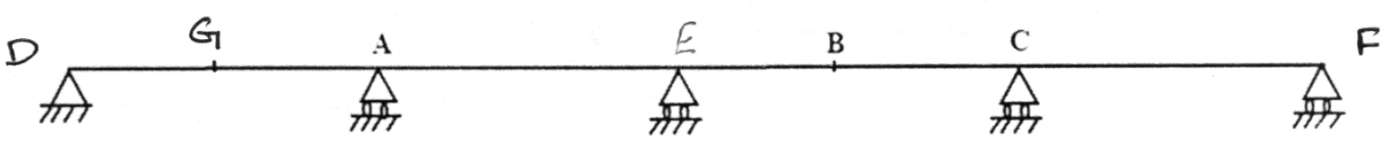


Figure 3