UGANDA MARTYRS UNIVERSITY

FORT PORTAL CAMPUS

FACULTY OF ENGINEERING AND APPLIED SCIENCES

DEPARTMENT OF CIVIL ENGINEERING

END OF SEMESTER I YEAR II ACADEMIC YEAR 2023/2024 EXAMINATIONS
DECEMBER, 2023

PROGRAMME (S) **(BACHELOR OF SCIENCE IN CIVIL ENGINEERING**

COURSE NAME: **BASIC STRUCTURAL ANALYSIS**

COURSE CODE: BCE2105

DATE: 8TH DECEMBER, 2023 **TIME:** 9:00AM -12:00PM

INSTRUCTIONS:

- **Do NOT write on this Question paper**
- Attempt **Any other four (4)** questions
- All questions carry equal marks
- Begin each question on a fresh page.

Question One (25 Marks)

a) With the aid of diagrams define the different types of supports? (3 Marks)

b) An asymmetric portal frame is supported on a roller at A and pinned at support D as shown in Figure 1.1 below. For the loading indicated:

(i). determine the support reactions and (6 Marks)

(ii). sketch the shear force and bending moment diagrams (16 Marks)

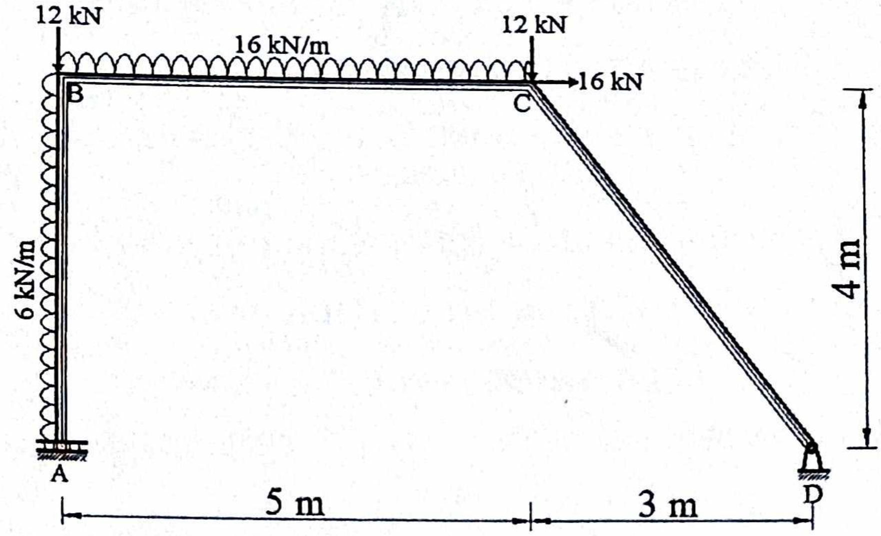


Figure 1.1

Question Two (25 Marks)

a) State the assumptions made during analysis of trusses (3 Marks)

b) Determine the force in each member of the Warren truss shown in Figure. 2 by the method of joints. (22 Marks)

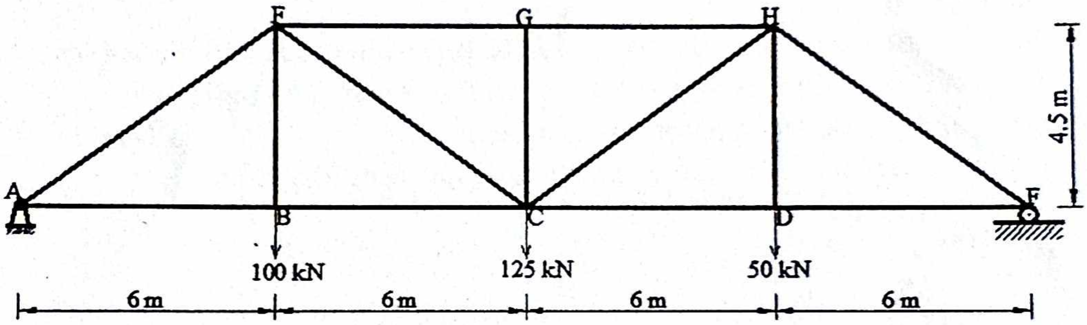
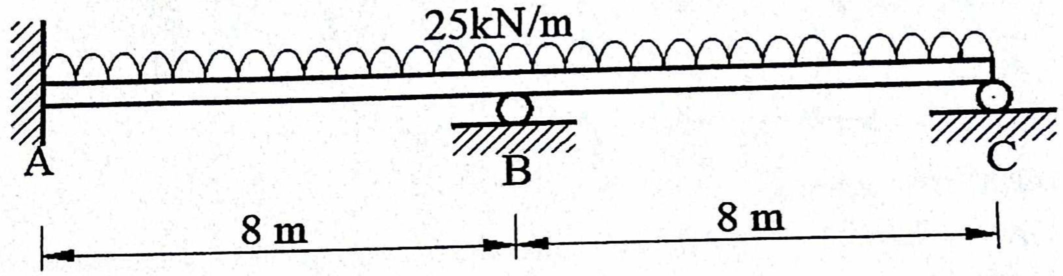


Figure 2

Question Three (25 Marks)

a) In slope deflection method rotations and displacements are calculated. Why is it necessary to compute deflection in structures. (3 Marks)

b) The beam below was found in a floor slab containing a wall on top whose weight was 25 kN/m as shown below. The support settlement at B is 50 mm.



$E = 70$ Gpa $\quad I = 1.3\times10^{6}$ mm^{4}

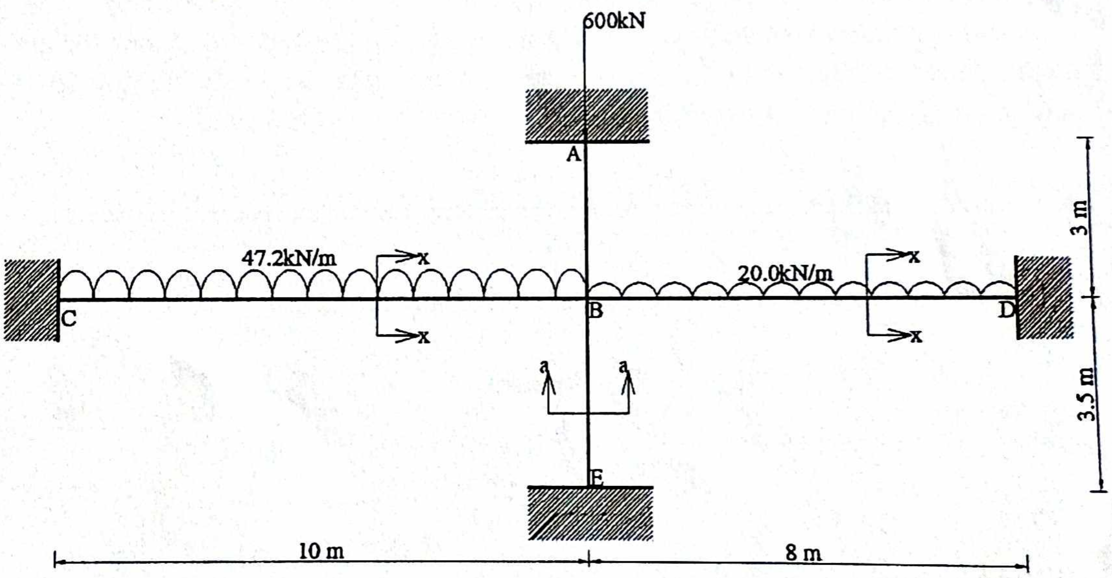
(i). Determine the rotations at B and C (12 Marks)

(ii). Determine the reactions and draw the shear and bending moment diagrams for the beam shown by using the slope-deflection method. (10 Marks)

Question Four (25 Marks)

a) Explain what is meant by carry over factor and moment distribution factor as applied to moment distribution method. (5 Marks)

b) A sub-frame from a monolithic, braced frame is shown in Figure below. Using the data given determine the design moments in columns BE and BA. (20 Marks)



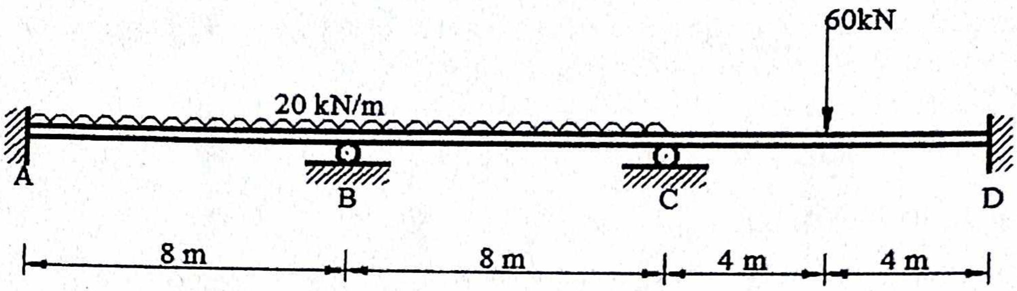
Section a-a = 300 mm × 300 mm $\quad$ Section x-x = 575 mm × 325 mm

E = Constant

Question Five (25 Marks)

a) Distinguish between statically determinate and statically indeterminate structures. (4 Marks)

b) Determine the reactions, and draw the shear and bending moment diagrams for the beam shown in Figure below by using the moment-distribution method. (21 Marks)

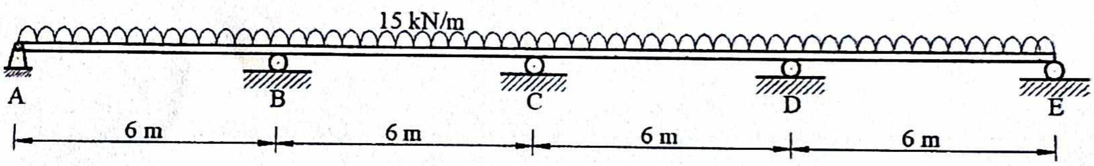


EI = Constant

Question Six (25 Marks)

a) By aid of diagrams explain the sign convention of rotations and settlement of support in the slope deflection method (5 Marks)

b) Determine the reactions and draw the shear and bending moment diagrams for the beams shown in Figures by using the moment-distribution method. The support settlement is 60 mm at B and 40 mm at C. (20 Marks)

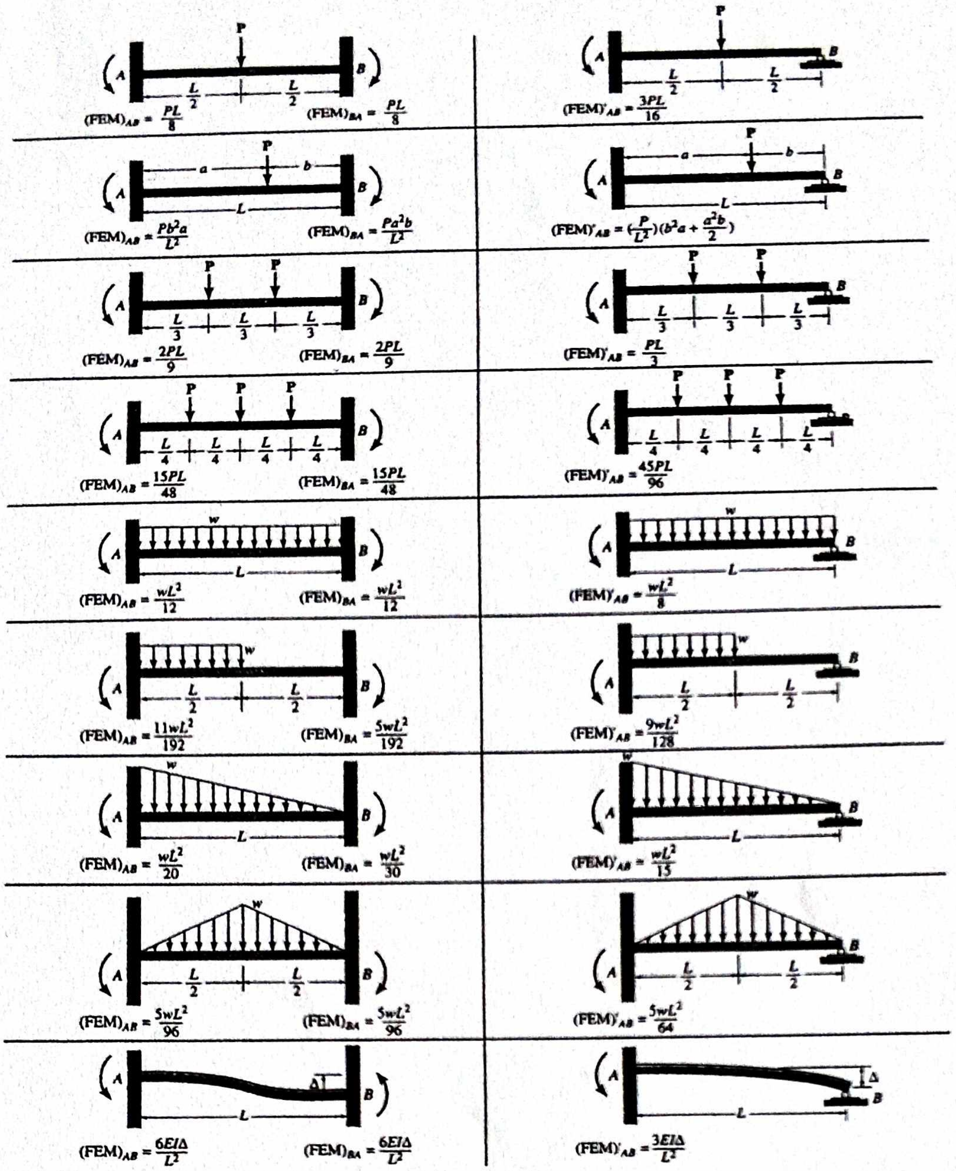


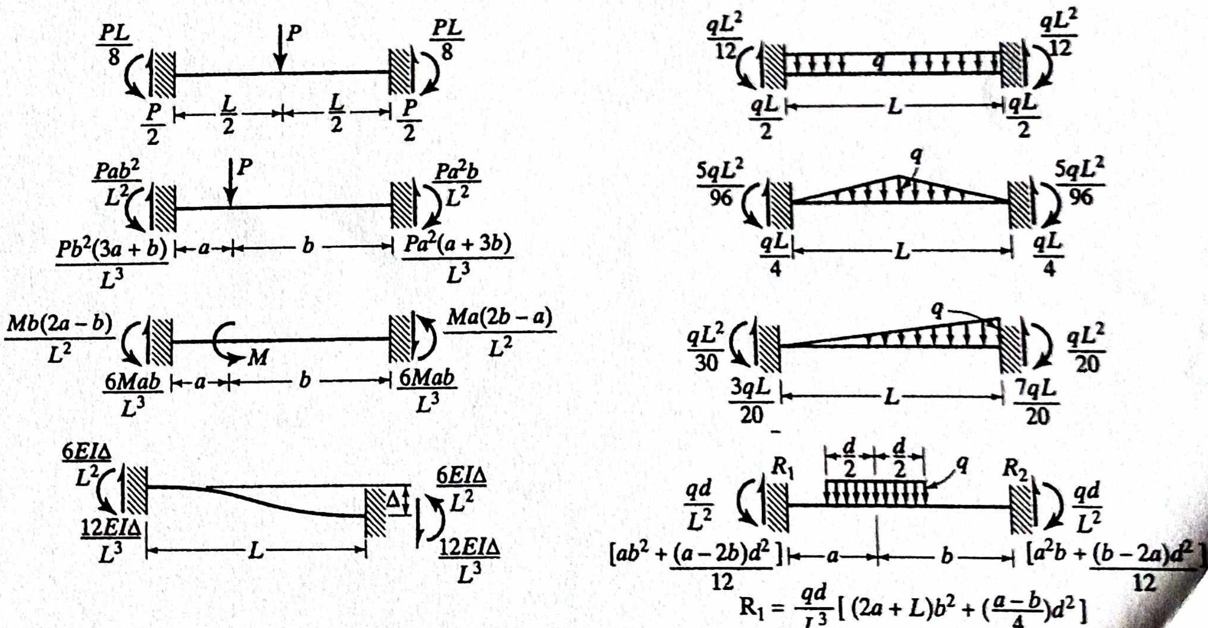
EI = Constant

E = 60 Gpa $\quad$ $I = 1.3\times10^{6}\ mm^{4}$

Appendix: Fixed End Moments

Fixed End Moments





$$R_1 = \frac{qd}{L^3}[(2a+L)b^2 + (\frac{a-b}{4})d^2]$$

$$R_2 = \frac{qd}{L^3}[(2b+L)a^2 - (\frac{a-b}{4})d^2]$$