



MACHAKOS UNIVERSITY
University Examinations for 2021/2022 Academic Year
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING
THIRD YEAR FIRST SEMESTER EXAMINATION FOR
BACHELOR OF SCIENCE (CIVIL ENGINEERING)
ECV 305: THEORY OF STRCUTURES III

DATE: 24/8/2022

TIME: 8.30-10.30 AM

INSTRUCTIONS:

- This paper comprises of FIVE questions. Answer **THREE** questions
- Question one is **compulsory** and carry 30 marks
- Answer any other **TWO** questions

QUESTION ONE (30 MARKS)

- a) Determine the moments for the beam shown in figure 1 using slope deflection method

(7 marks)

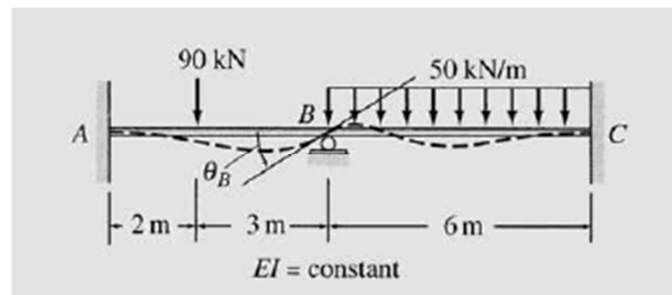


Figure 1

- b) Using moment distribution method, determine the member end moments for the two span continuous beam shown in figure 2. (6 marks)

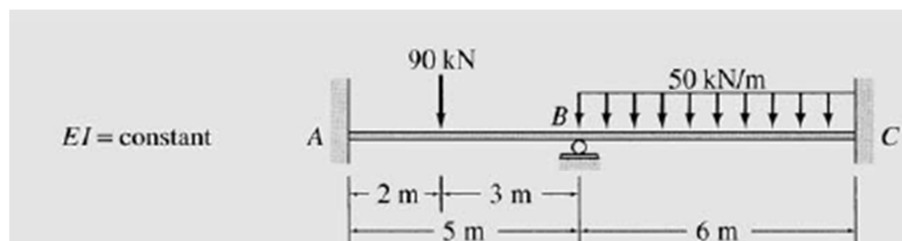


Figure 2

- c) Using castiglianos second theorem, determine the deflection at point B of the beam shown in figure 3 (5 marks)

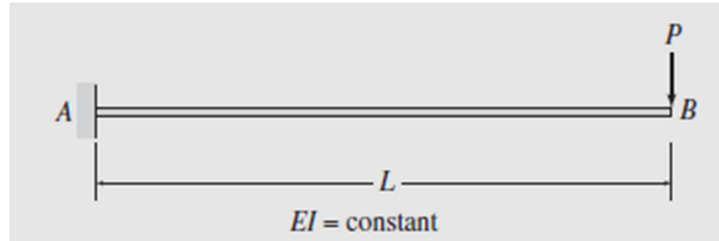


Figure 3

- d) Determine the slope and deflection at point A of the beam shown in figure 4 using method of virtual work (7 marks)

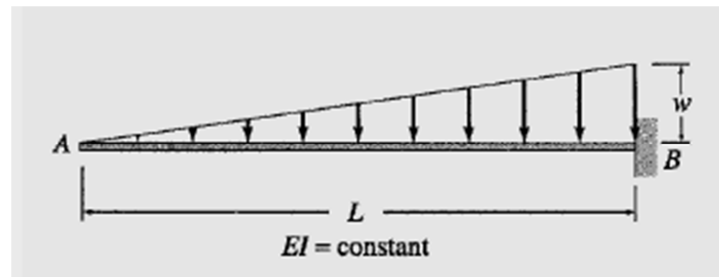


Figure 4

- e) Determine the reaction at point B of the beam shown in figure 5 using method of least work (5 marks)

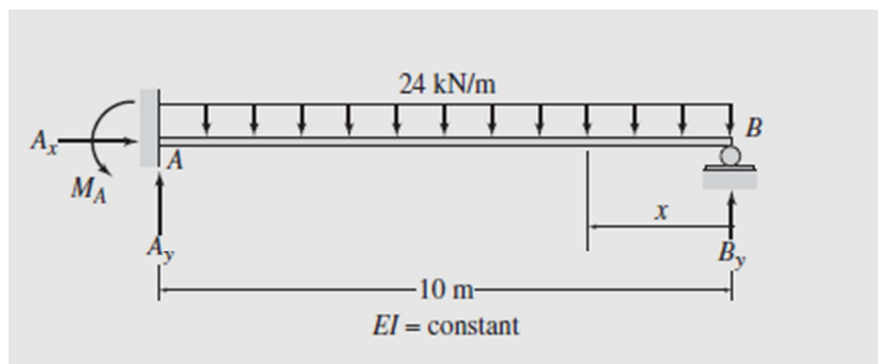


Figure 5

QUESTION TWO (20 MARKS)

- a) Determine the rotation of joint C of the frame shown in figure 6 using castigliano second theorem (10 marks)

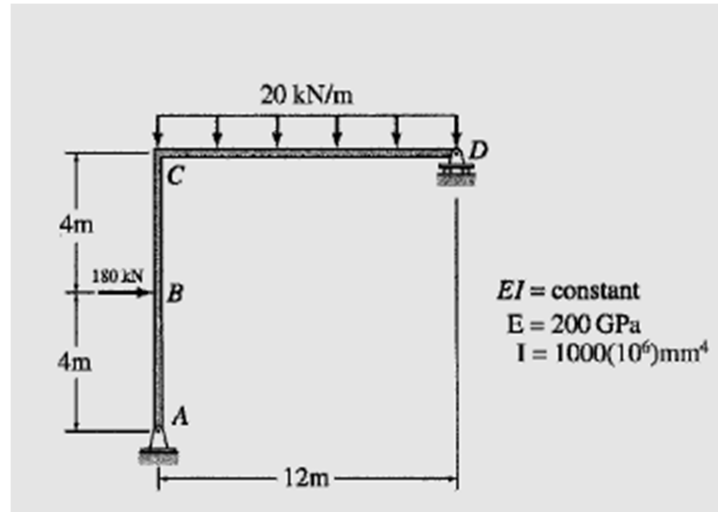


Figure 6

- b) Determine the deflection at point C of the beam shown in figure 7 using the principle of virtual work (10 marks)

QUESTION THREE (20 MARKS)

A combined beam with a constant flexural rigidity EI , fixed supports at its ends A and D, a hinge connection at B, and carrying a concentrated force P at C is shown in figure 7. Determine reaction and moment at A, deflection of the hinge and slopes just to the left and right of hinge B. Also, determine the slope and deflection at C. Use conjugate beam method of analysis.

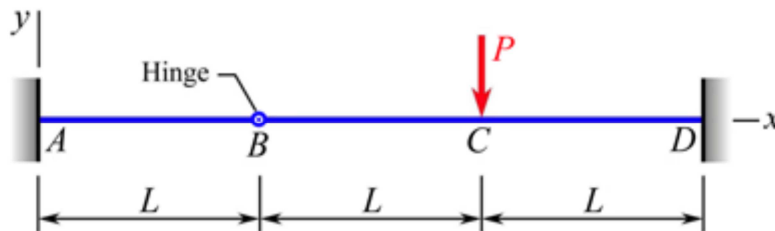


Figure 7

QUESTION FOUR (20 MARKS)

Determine the reactions and draw the shear and bending moment diagrams for the two-span continuous beam shown in figure 8 using moment distribution method

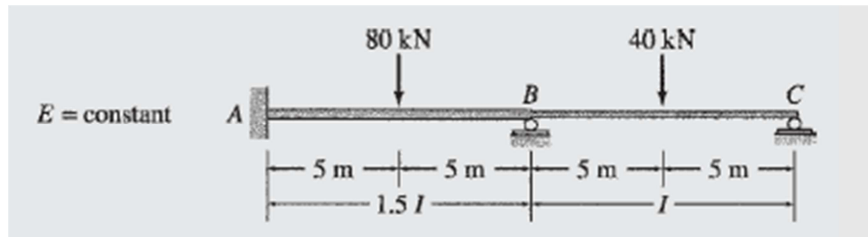


Figure 8

QUESTION FIVE (20 MARKS)

Determine the horizontal and vertical components of the deflection at joint B of the truss shown in figure 9 using the method of virtual work

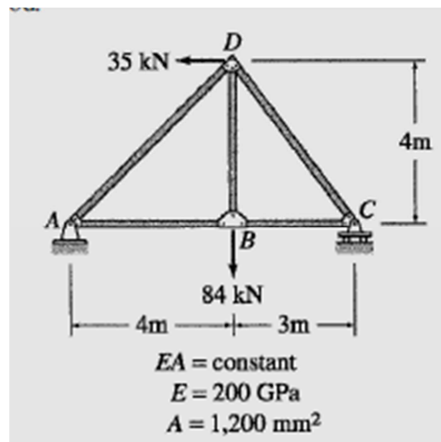


Figure 9