

PAPER A



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING
TCV 4224 : ANALYSIS OF STRUCTURES II
END OF SEMESTER EXAMINATION

SERIES: APRIL 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of five questions.

Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE (COMPULSORY) 20 marks

Analyse the continuous beam shown in **Figure Q1** below using three moments equation and draw the shear force and bending moment diagrams.

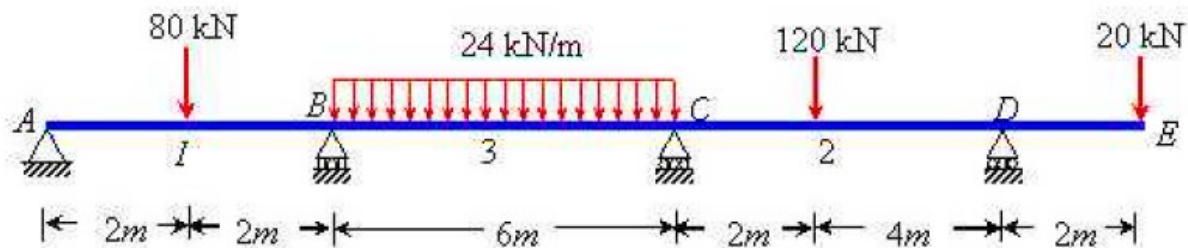


Figure Q1

(20 Marks)

QUESTION TWO (20 Marks)

- a) Derive Euler's critical load for columns with both ends hinged and give the relationship between equivalent length (l_e) and actual length (l) for the following end conditions, giving the crippling load (P) for each case.
- Both ends hinged
 - One end fixed and other free
 - Both ends fixed
 - One end fixed and the other hinged

(10 Marks)

- b) A T-section 150 mm by 120 mm by 20 mm shown in **Figure Q2b** is used as a strut of 6 m long, one end fixed and other free. Calculate Euler's crippling load, if young's modulus for the material is 180 Gpa.

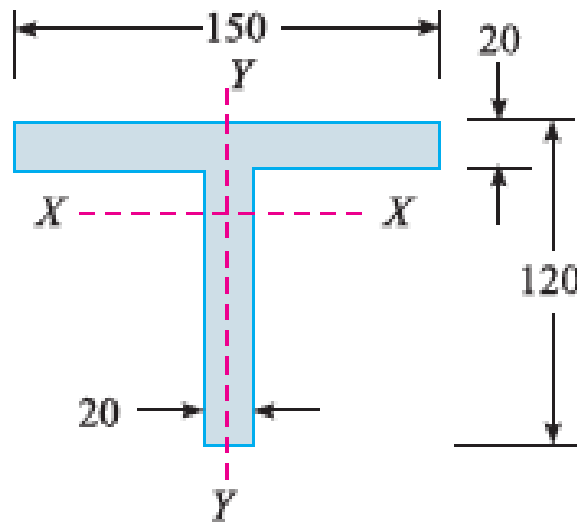


Figure Q2b

(10 Marks)

QUESTION THREE (20 Marks)

Analyse the three span beam shown in **Figure Q3** below using moment distribution method and draw the shear force and bending moment diagrams. EI is constant.

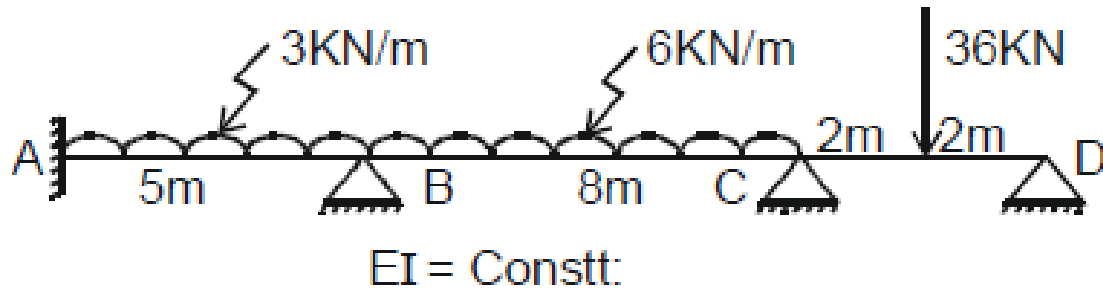


Figure Q1

(20 Marks)

QUESTION FOUR (20 Marks)

- a) Analyse the two-span continuous beam shown in **Figure Q4** by slope deflection method and draw the bending moment and shear force diagrams. EI is the same throughout.

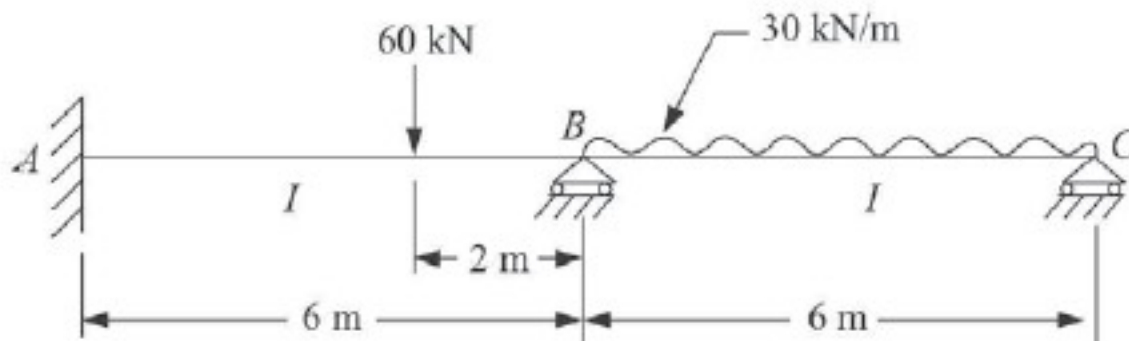


Figure Q4

(16 Marks)

- b) Discuss four differences between determinate and indeterminate structures

(4 Marks)

QUESTION FIVE (20 Marks)

Figure Q5 below shows an indeterminate beam simply supported at A and fixed at B. Using moment distribution;

- i. Construct the influence lines for the reactions at supports A and B of the beam by placing the unit load at six points (distance of $0.2 L$ apart)
- ii. Construct the influence lines for the moment at B.

- iii. Given that $L = 30\text{m}$, determine the moment created at support B by 26 kN and 34 kN set of wheel loads, when they are positioned at points 2 and 5.

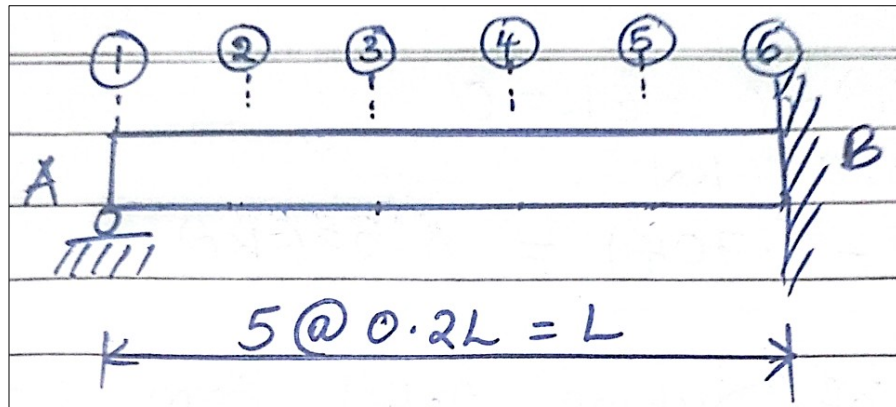


Figure Q5

(20 Marks)