



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING
ECV4312 & ECV 4411 : THEORY OF STRUCTURES III
END OF SEMESTER EXAMINATION
SERIES: JANUARY 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 **four** questions.

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

Do not write on the question paper.

QUESTION ONE (30 MARKS)

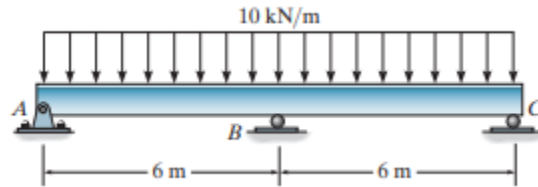
a) A continuous beam ABCD is fixed at A and simply supported at B and C. This point being at the same level $AB=10\text{m}$ $BC=12\text{m}$ and $CD=6\text{m}$. It carries a point load of 100KN at the midspan of BC and uniformly distributed load of 10 KN/m from A to B. Section B to D is also uniformly distributed with a magnitude of 15 KN/m . Find the moments and reactions for each point using the **3 moment theorem**. i.e EI is constant. (20 marks)

b) Explain the Castiglianos first theorem to indeterminate arches. (5 marks)

c) Distinguish between statically determinate and statically indeterminate structures. (5 marks)

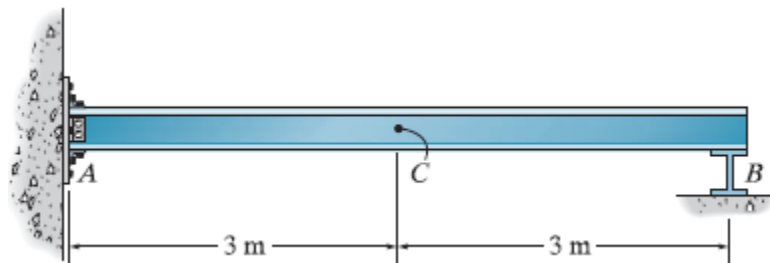
QUESTION TWO (20 MARKS)

a) Determine the moments and reactions at the pin at A and the rollers at B and C on the beam via the force method. Take $E = 200 \text{ GPa}$, $I = 300(10^6) \text{ mm}^4$. Draw the bending and shear force diagrams.



(10 marks)

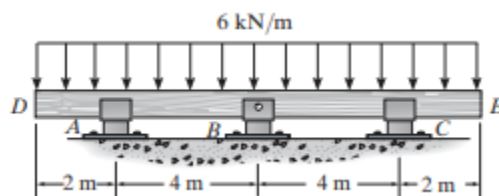
b) Draw the influence line for the shear at point C. Plot numerical values every 1.5 m. Assume A is fixed and B is a roller with a constant EI.



(10 marks)

QUESTION THREE (20 MARKS)

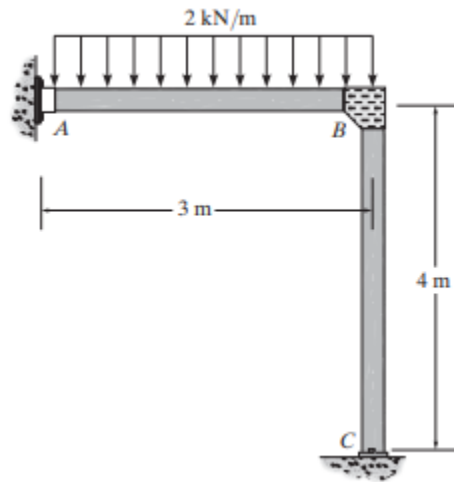
Use moment distribution method to analyze the beam section below. Deduce the final moments and reactions. (5 steps)



(20 marks)

QUESTION FOUR (20 MARKS)

Via slope deflection, Determine the moment at B, then draw the moment diagram for each member of the frame. Assume the support at A is fixed and C is pinned. EI is constant.



(20 marks)