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
SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: JULY 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)

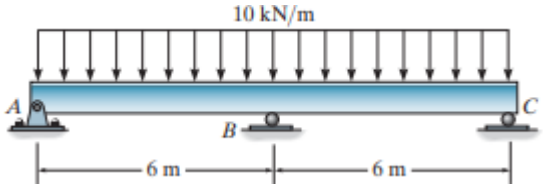
a) A continuous beam ABCD is simply supported at A and continuous over spans Band C. The span AB is 6 m and BC are of length 6 m respectively. An overhang CD is of 1 meter length. A concentrated load of 20 kN is acting at 4 m from support A. A uniformly distributed load of 10 kN/m is acting on the span BC. A concentrated load of 10 kN is acting at D. i.e EI is constant. (20 marks)

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

c) Explain in detail the differences between a determinate and indeterminate structure (5 marks)

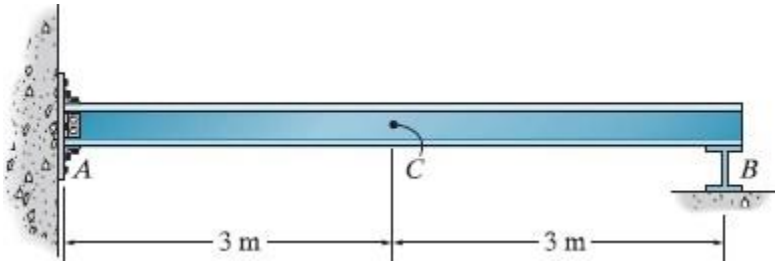
QUESTION TWO (20 MARKS)

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 GPa, I = $300(10^6)$ mm^4 . Draw the bending and shear force diagrams.



(10 marks)

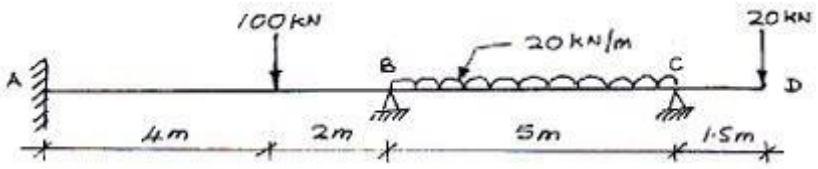
b) Draw the influence line for the shear at point C. Plot numerical values every 1.5m. Assume A is fixed and B is a roller with a constant EI.



(10 marks)

QUESTION THREE (20 MARKS)

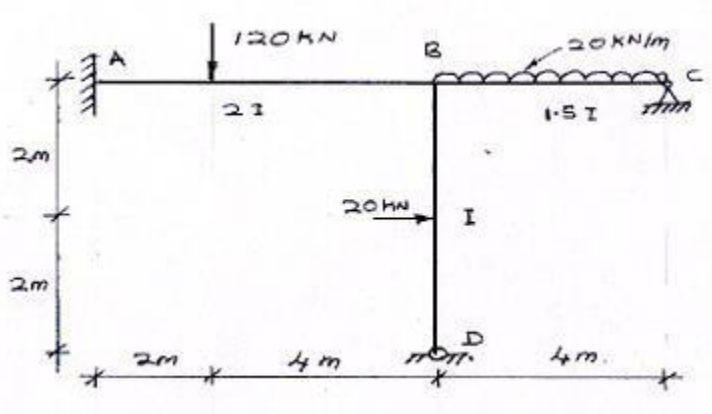
Use moment distribution method to analyze the beam section below. Deduce the final moments and reactions. (5 steps)



(20 marks)

QUESTION FOUR (20 MARKS)

Via slope deflection, Analyze the simple frame shown in figure. End A is fixed and ends B & C are hinged. Draw the bending moment diagram.



(20 marks)