



MACHAKOS UNIVERSITY

UNIVERSITY EXAMINATIONS 2024/2025

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

**THIRD YEAR FIRST SEMESTER EXAMINATION FOR BACHELOR OF
SCIENCE IN CIVIL ENGINEERING**

ECV 305: THEORY OF STRUCTURES III

Date:

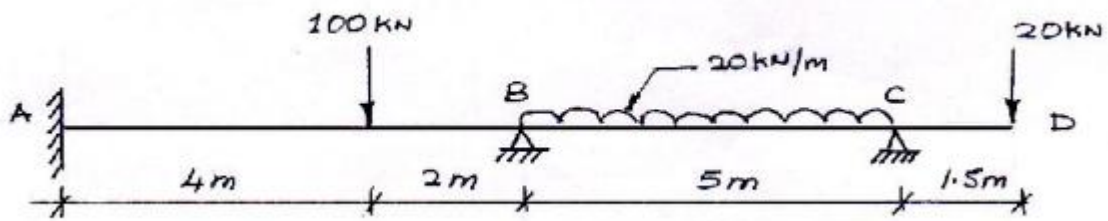
Time :

INSTRUCTIONS

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

QUESTION ONE

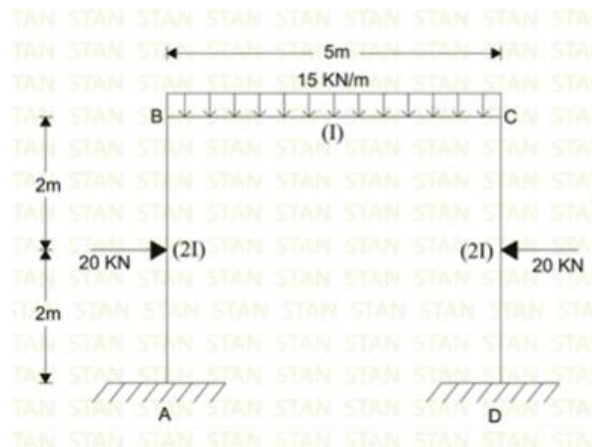
- a) State the two theorem of moment area method (4Marks)
- b) Analyze continuous beam ABCD by slope deflection method. Draw the shear force and bending moment diagram. Take EI constant. (20 Marks)



- c) Derive the equation for total strain energy of variable load or variable cross-section due to pure bending moment (6 Marks)

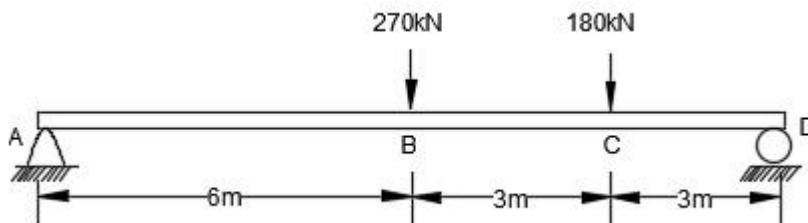
QUESTION TWO

Analyse the frame below using moment distribution method and draw the shear force diagram (20 Marks)

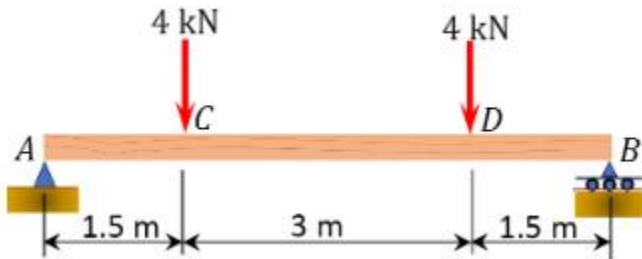


QUESTION THREE

- a) Use the conjugate beam method to determine the deflection at point B (12 Marks)



- b) A prismatic timber beam is subjected to two concentrated loads of equal magnitude, as shown in Figure . Using the moment-area method, determine the slope at A and the deflection at point C .
(8Marks)

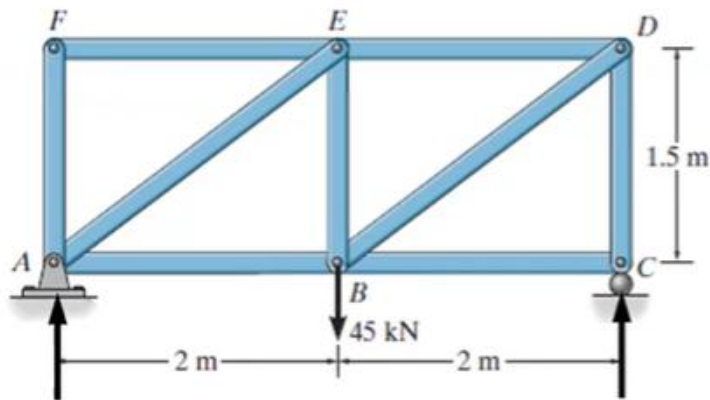


QUESTION FOUR

Using virtual work method determine the vertical displacement of joint E

For each member $A = 400 \text{ mm}^2$ and $E = 200 \text{ GPa}$.

(20 Marks)



QUESTION FIVE

Find the reactions of the frame in the figure below using castiglianos theorem

(20 Marks)

