



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

MAIN CAMPUS

**UNIVERSITY REGULAR EXAMINATIONS  
2022/2023 ACADEMIC YEAR**

**SECOND YEAR SECOND SEMESTER EXAMINATIONS**

**FOR THE DEGREE  
OF  
BACHELOR OF SCIENCE IN CIVIL AND STRUCTURAL  
ENGINEERING**

**COURSE CODE: CSE 212**

**COURSE TITLE: THEORY OF STRUCTURES II**

**DATE: 18<sup>TH</sup> APRIL 2023**

**TIME: 3-5 P.M**

**INSTRUCTIONS:**

1. This paper contains Four questions
2. Answer **Question One** and any other **TWO** questions
3. Marks for each question are indicated in the parenthesis.
4. Examination duration is 2 **Hours**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over.

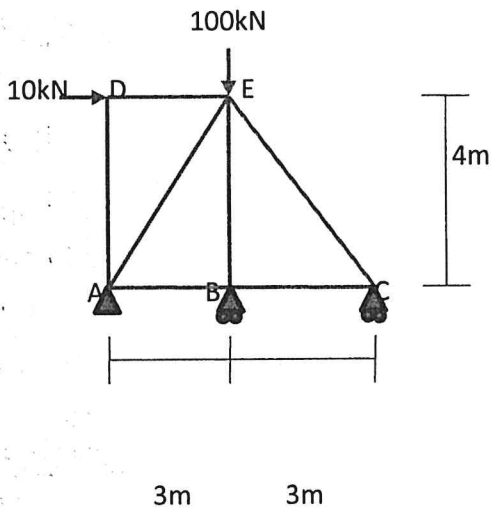
**QUESTION ONE (Compulsory) – 30 Marks**

- (a) What are statically indeterminate structures (2 marks)
- (b) State at least three advantages of statically indeterminate structures (3 marks)
- (c) Derive the slope-deflection equations using the moment area theorem. (10 marks)
- (d) Explain the two Castiglianos strain energy theorems. (5 marks)
- (e) What is second order analysis of structures and why is it important? (2 marks)
- (f) Describe what is Euler’s critical load for axially loaded column with both ends pinned. (3 marks)
- (g) Find an expression for influence lines for the reactions moments and shear force at the supports A and B in the beam shown. (5 marks)



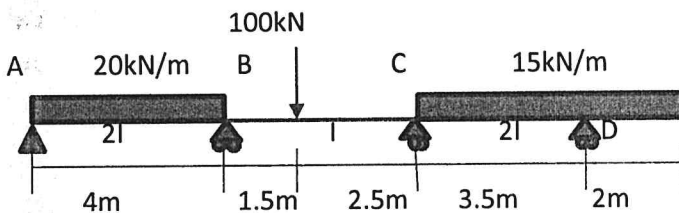
**QUESTION TWO (20 Marks)**

Use strain energy methods to analyze the statically indeterminate truss shown for reactions and member forces. EA is constant.



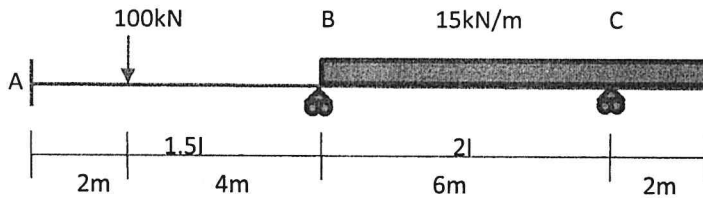
**QUESTION THREE (20 Marks)**

Determine the support moments and vertical reactions for the beam shown using moment distribution method. Hence draw the shear force and bending moment diagrams.

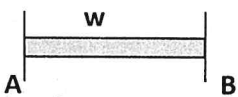


**QUESTION FOUR (20 Marks)**

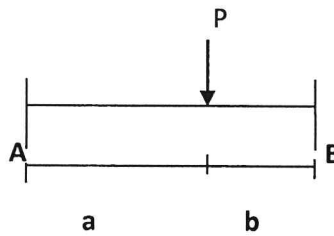
Q4. Use three moment theorem to analyze the beam shown. Hence draw the shear force and bending moment diagrams



Examples of fixed end moments



$$M_{AB} = -\frac{wl^2}{12}, \quad M_{BA} = \frac{wl^2}{12}$$



$$M_{AB} = -\frac{Pab^2}{l^2}, \quad M_{BA} = \frac{Pba^2}{l^2}$$

Three moment equation for non-yielding supports

$$-6 \left[ \frac{A_1 \bar{x}_1}{I_1 L_1} + \frac{A_2 \bar{x}_2}{I_2 L_2} \right] = \frac{M_A L_1}{I_1} + 2M_B \left( \frac{L_1}{I_1} + \frac{L_2}{I_2} \right) + \frac{M_C L_2}{I_2}$$

