(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY REGULAR EXAMINATIONS 2021/2022 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF TECHNOLOGY EDUCATION (CIVIL AND BUILDING TECHNOLOGY)

COURSE CODE: TEB 212

COURSE TITLE: THEORY OF STRUCTURES II

DATE: WEDNESDAY 20TH APRIL 2022 TIME: 12.00 – 2.00 PM

INSTRUCTIONS:

1. This paper contains Four questions
2. Answer Question one and any other two
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 (30 Marks) - COMPULSORY

a) What is a statically indeterminate structure? (2 Marks)

b) Describe the area-moment theorems and how they are used in analysis of structures (5 Marks)

c) Using the area-moment theorems, derive the slope-deflection equations used in analysis of structures. (8 Marks)

d) For the continuous beam shown in Figure Q1, determine the support moments and reactions using Three-Moment equations. Hence draw shear force and bending moment diagrams. (12 Marks)

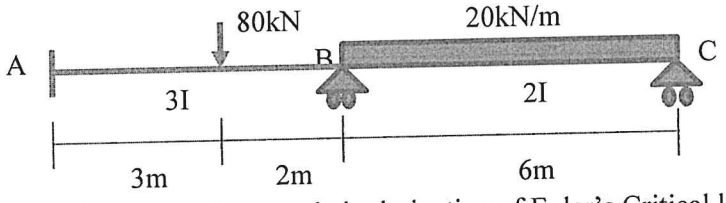


Figure Q1

e) State the assumptions made in derivation of Euler's Critical load for columns. (3 Marks)

QUESTION TWO (20 Marks)

The frame shown in Figure Q2 is acted upon by a uniformly distributed load of 10kN/m and a point load of 10kN. Using the slope-deflection equations, determine the end moments for each member given that EI is constant for the entire structure.

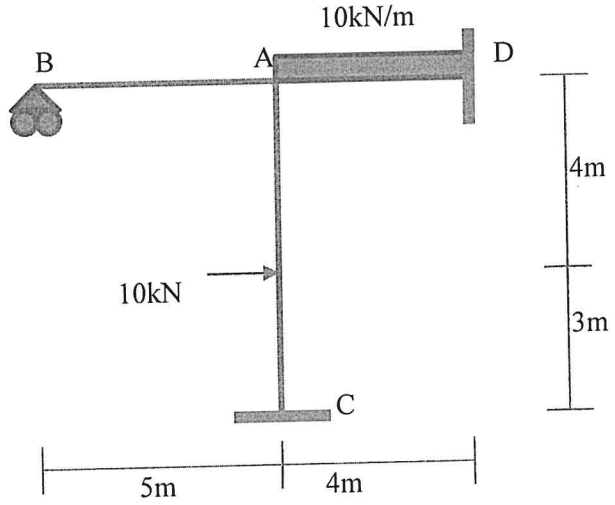


Figure Q2

QUESTION THREE (20 Marks)

By applying the method of Moment Distribution, analyze the beam shown in figure Q3 for support moments and reactions. The modulus of elasticity E is constant throughout the structure.

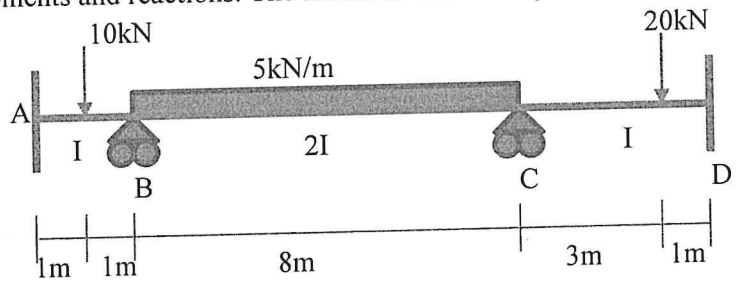


Figure Q3

QUESTION FOUR (20 Marks)

Analyze the frame shown in Figure Q4 for joint moments and reactions at the supports by use of strain energy method.

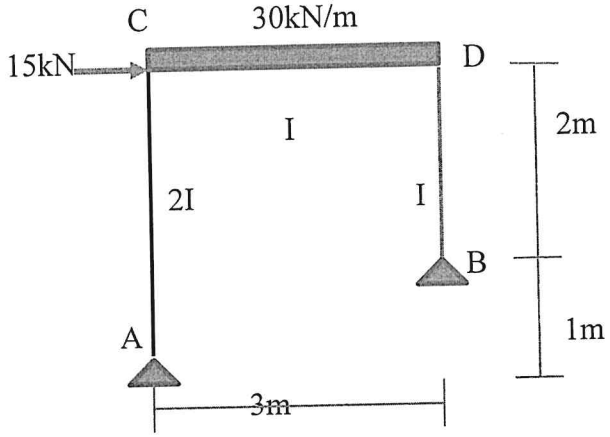
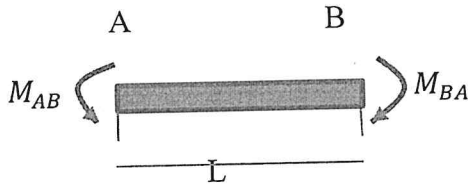


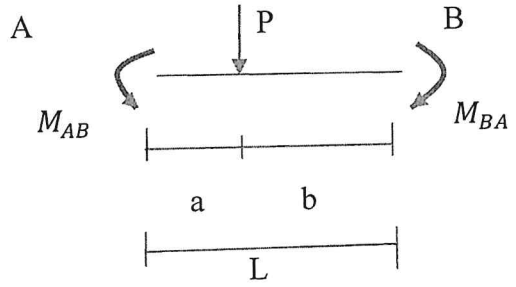
Figure Q4

Hint:

Fixed end moments



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



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