(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY REGULAR EXAMINATIONS 2023/2024 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER EXAMINATIONS

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

COURSE CODE: CSE 211

COURSE TITLE: ANALYSIS OF STATICALLY DETERMINATE STRUCTURES

DATE: 5TH DECEMBER 2023 **TIME: 8 A.M. – 10 A.M.**

INSTRUCTIONS:

1. This paper contains **FIVE** 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 4 Printed Pages. Please Turn Over.

QUESTION 1 (COMPULSORY - 30 *MARKS*)

a) In the analysis of beams subjected to moving loads, influence lines are commonly used. Define the term "influence line" and state the principle of Müller Breslau as used in the determination of influence lines. **(5Mks)**

b) Classify the structures shown in Figure Q1(b) in terms of static indeterminacy and where appropriate, indicate the degree of static indeterminacy. **(9Mks)**

c) A simply supported beam with an overhang is loaded by an inclined point load of 75kN and a moment of 50kNm as shown in Figure Q1(c). Determine all the support reactions in the beam. **(4Mks)**

d) A three-hinged parabolic arch of 8m span and 3m central rise as shown in Figure Q1(d) carries two-point loads of 20kN. Determine:
   (i) The support reactions in the arch. **(6Mks)**
   (ii) The bending moment at point B of the arch. **(6Mks)**

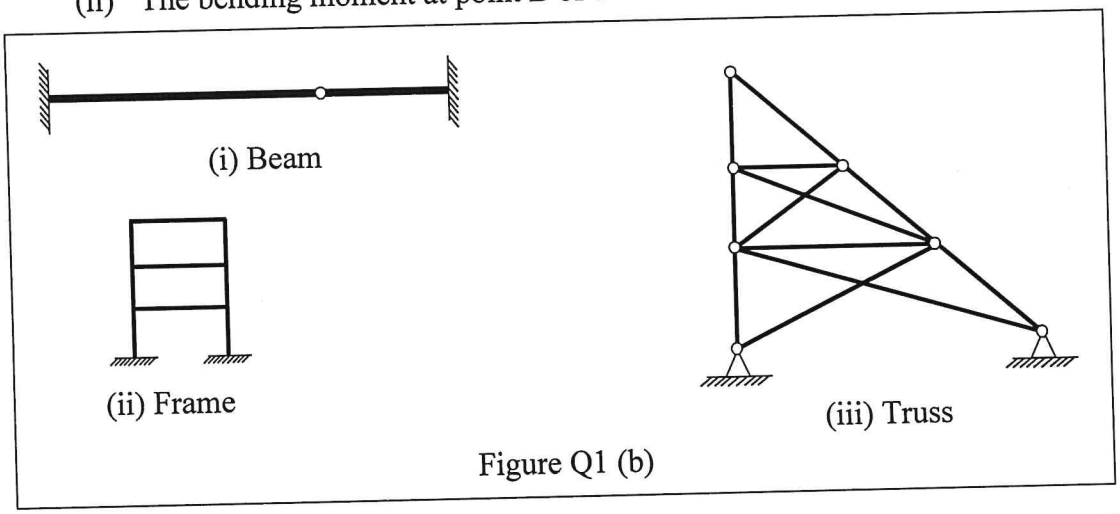

Figure Q1 (b)

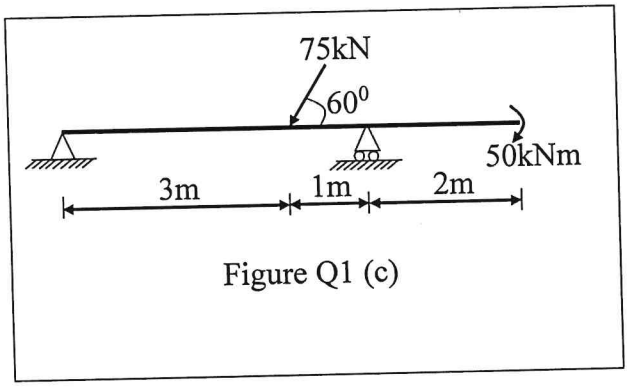

Figure Q1 (c)

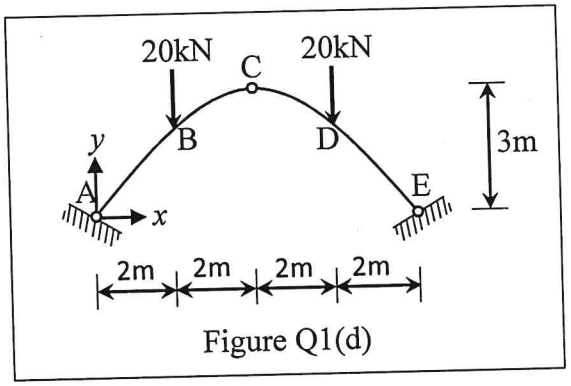

Figure Q1(d)

QUESTION 2 (*20 MARKS*)

Given the truss structure shown in Figure Q2, carryout out the following:

a) Determine the reactions and all the member forces using the method of tension coefficients. **(12mks)**

b) In order to determine the horizontal displacement at joint C, a virtual horizontal force of 1kN was applied at joint C as shown in Figure Q2(b) and the resulting member forces were as follows: F_{AC} =+1.0kN; F_{AB} =+0.13kN; and F_{BC} =-0.52kN. Using these results and those obtained in part (i), determine the horizontal displacement at joint C given that all members have constant cross-sectional area (A = 536mm^2) and constant Young's Modulus (E = 200GPa). **(8mks)**

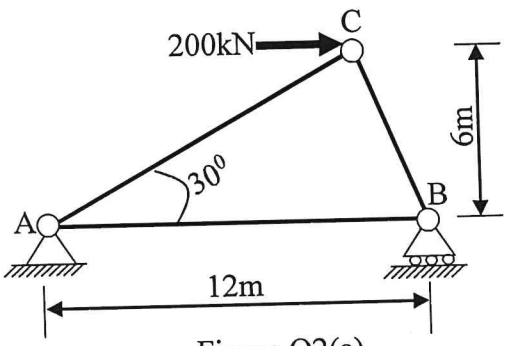

Figure Q2(a)

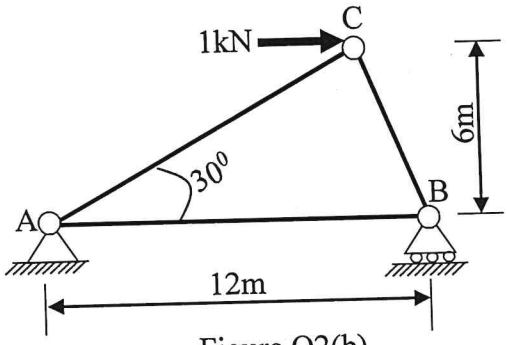

Figure Q2(b)

QUESTION 3 (20 *MARKS*)

Consider a beam supported and loaded as shown in Figure Q3. Carryout the following:

a) Determine the reactions at the supports A and C. **(7Mks)**
b) Draw the shear force and bending moment diagrams indicating all the peak values. **(13Mks)**

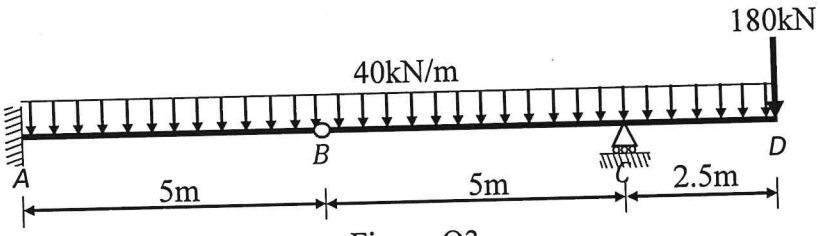

Figure Q3

QUESTION 4 (20 *MARKS*)

A cantilever beam is loaded as shown in Figure Q4. Given that the Young's Modulus, E = 200GPa and Moment of Inertia, I = 360x10^{-6} m^4, determine:

a) The support reactions. **(4Mks)**
b) The slope and deflection at point B using moment-area method. **(9Mks)**
c) The slope and deflection at point B using direct integration method. **(7Mks)**

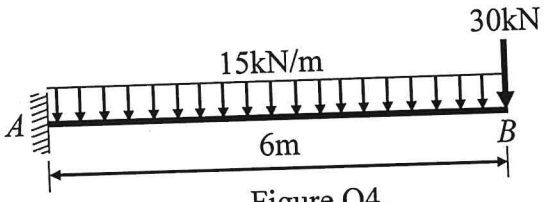

Figure Q4

QUESTION 5 (20 *MARKS*)

Consider a cable suspended from support *A* to support *B* spanning 16 m apart and loaded at points *C*, *D* and *E* as shown in Figure Q5. For the analysis of the cable, carryout the following:

c) Calculate the reactions at the supports *A* and *B*. **(6Mks)**
d) Calculate the sag at points *D* and *E*. **(5Mks)**
e) Calculate the total length of the cable. **(5Mks)**
f) Calculate the cable tension at supports *A* and *B*. **(4Mks)**

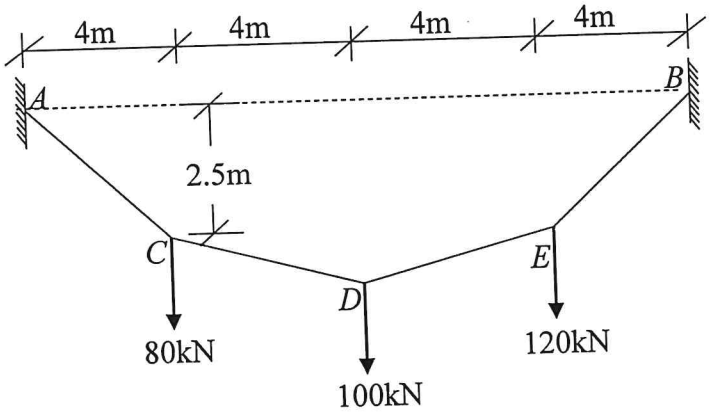

Figure Q5

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