



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

MAIN CAMPUS

**UNIVERSITY REGULAR EXAMINATIONS
2022/2023 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: THEORY OF STRUCTURES I

DATE: 6TH DECEMBER 2022

TIME: 8 – 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 3 Printed Pages. Please Turn Over.

QUESTION ONE (30 MARKS)

- a) As an upcoming structural engineer, you are required to fully understand structural analysis as a fundamental step in structural designs. Describe structural analysis using illustrations of a typical truss. **(5Mks)**
- b) Name and describe any FIVE (5) basic structural elements. **(10Mks)**
- c) With illustrations, discuss the relationship between applied force and the resulting shear force and bending moment. **(5Mks)**
- d) For the beam shown in Figure Q1, draw the shear force and bending moment diagrams. **(10Mks)**

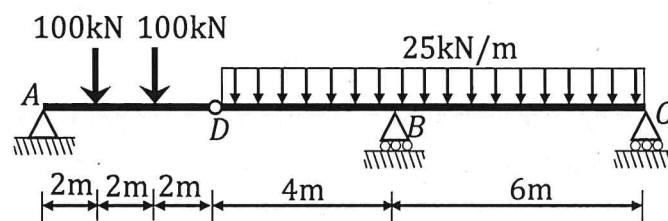


Figure Q1

QUESTION TWO (20 Marks)

- a) State the assumptions used in the analysis of trusses. **(3Mks)**
- b) State Castigliano's first theorem as used in analysis of structures. **(2Mks)**
- c) A pin-jointed truss ABCD is subjected to a vertical of 15kN at joint B as shown in Figure Q2. Determine the vertical displacement at joint B. All members have constant cross-sectional area, $A = 6 \times 10^{-4} \text{m}^2$ and Young's Modulus, $E = 210 \times 10^9 \text{N/m}^2$. **(15Mks)**

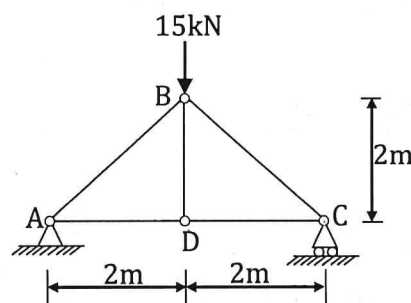


Figure Q 2

QUESTION THREE (20 Marks)

- a) Given a three-hinged parabolic arch of span L and central rise of h , determine the equation of curve for structural analysis. **(6Mks)**
- b) Show that for a three-hinged parabolic arch subjected to a uniformly distributed load throughout its span is not affected by bending moment. **(14Mks)**

QUESTION FOUR (20 Marks)

Consider a cable suspended from support *A* to support *B* spanning 40 m apart and loaded at points *C*, *D* and *E* as shown in Figure Q4. For the analysis of the cable, carryout the following:

- Calculate the reactions at the supports *A* and *B*.
- Calculate the sag at points *D* and *E*.
- Calculate the total length of the cable.
- Calculate the cable tension at supports *A* and *B*.

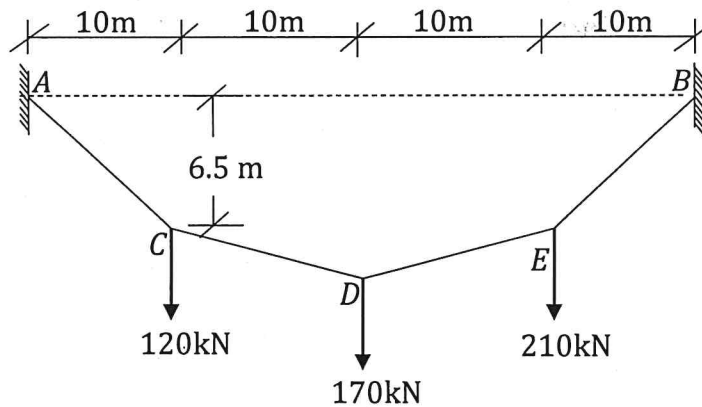
(6Mks)**(5Mks)****(5Mks)****(4Mks)**

Figure Q4

QUESTION FIVE (20 Marks)

For the beam-column shown in Figure Q5, carryout the following:

- Determine the reactions at the supports.
- Draw the shear force, axial force and bending moment diagrams.

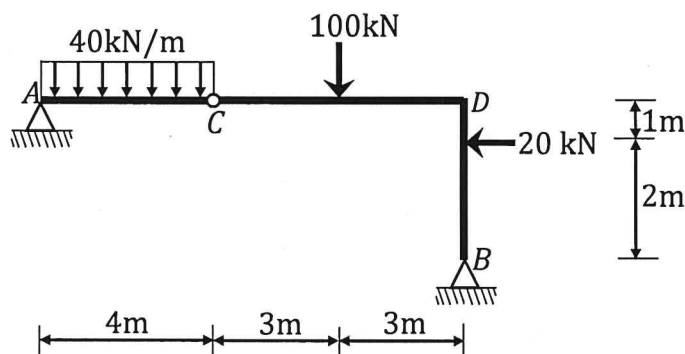
(6Mks)**(14Mks)**

Figure Q5

=====END OF PAPER=====

