



MACHAKOS UNIVERSITY

UNIVERSITY EXAMINATIONS 2024/2025

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

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

ECV 212: THEORY OF STRUCTURES I

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*
- *All symbols have their usual meaning*

QUESTION ONE (30MKS)

- a. State the degree of freedom of the frames shown in figure 1-3below (6mks)

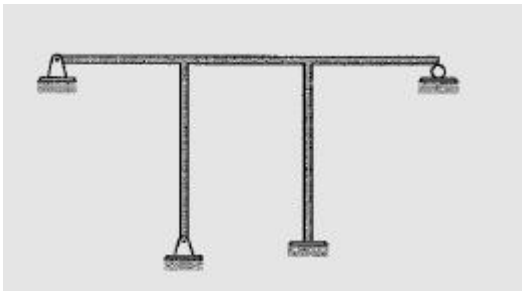


Figure 1

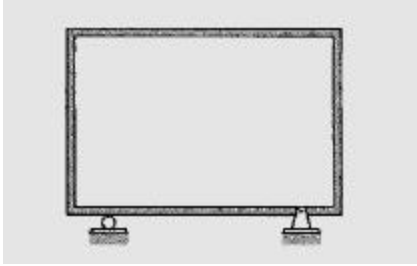


Figure 2

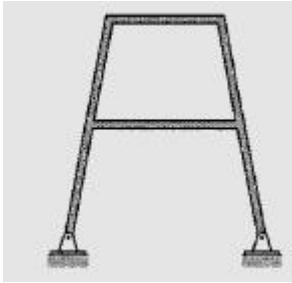


Figure 3

- b. Determine the reactions and the forces in all the members of the pin jointed structures shown in figure 4 (6mks)

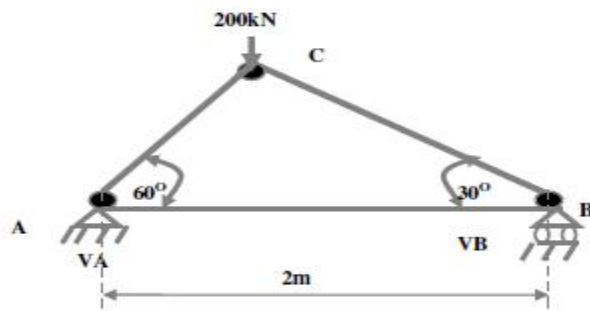


Figure 4

- c. Calculate the shear force and bending moment for the beam subjected to the loads as shown in figure 5. Draw the shear force and bending moment diagrams (6mks)

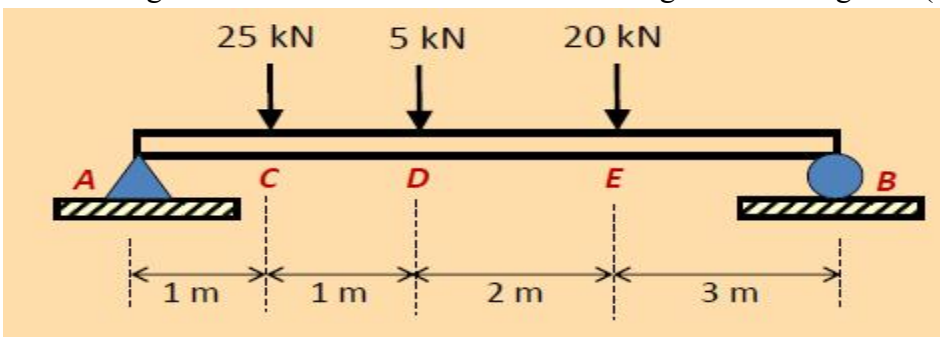


Figure 5

- d. Calculate the reactions and draw the shear force diagram for the frame shown in figure 6 (6mks)

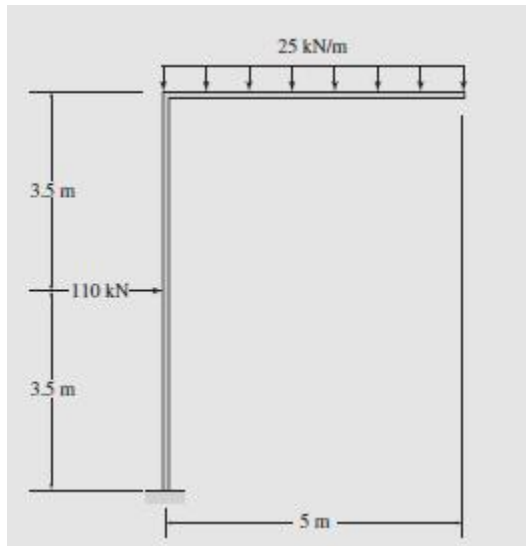


Figure 6

- e. A three hinged arch is subjected to two concentrated loads as shown in figure 7. Determine the support reactions of the arch (6mks)

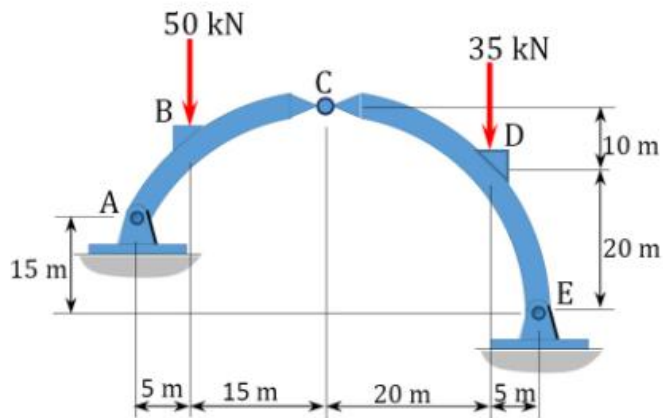


Figure 7

QUESTION TWO (20MKS)

Determine the forces in all members of the truss shown in figure 8.

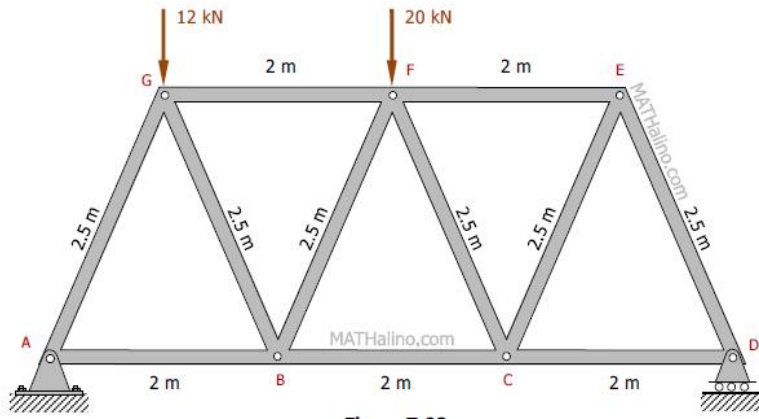


Figure 8

QUESTION THREE (20MKS)

Draw the shear force and bending moment diagrams for the beam shown in figure 9.

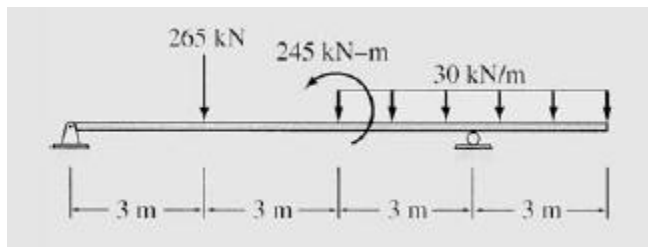


Figure 9

QUESTION FOUR (20MKS)

A three hinged arch of span 25m with a central rise of 5m is hinged at the crown and the end supports. It carries a point load of 100 kN at 6m from the left support. Calculate the reaction at the supports and moment at 5m from the left support.

QUESTION FIVE (20MKS)

A cable supports two concentrated loads at B and C as shown in figure 10. Determine the sag at B, tension in the cable and the length of the cable.

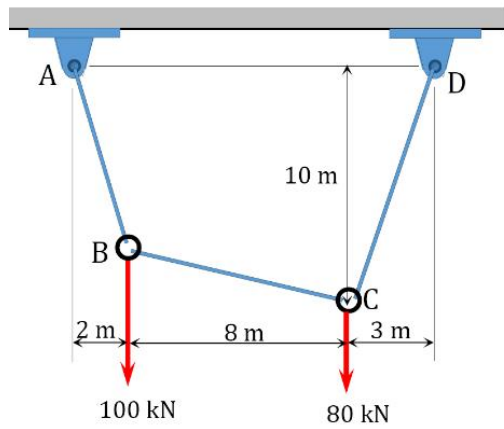


Figure 10