TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING
ECV 4213 : THEORY OF STRUCTURES I

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: JULY 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination
-Answer Booklet, examination pass and student ID
This paper consists of **five** questions.
Attempt question ONE (Compulsory) and any other TWO questions.
Do not write on the question paper.

QUESTION ONE - Compulsory

a) A fixed beam of span 8 m carries 5 kN/m uniformly distributed load over the entire length along with a point load of 40 kN at 2m from left-hand support.

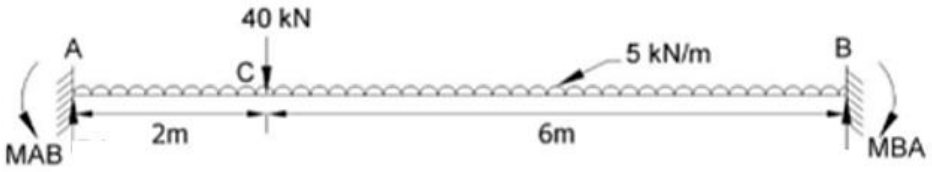


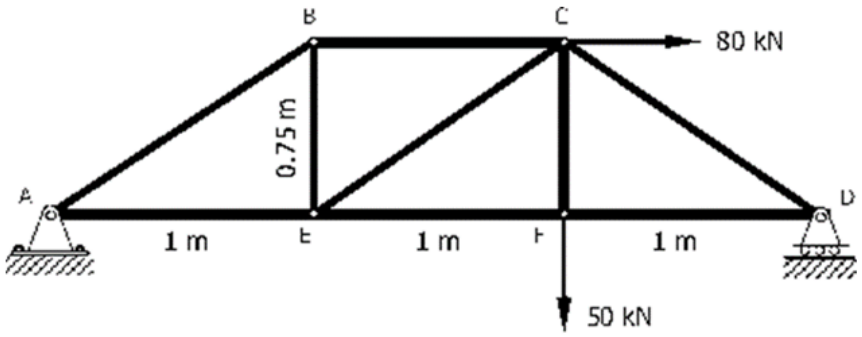
Figure 1.

Draw the following using figure 1;

i. Shear force diagram (SFD)
ii. Bending moment diagram (BMD). **(16 marks)**

b) Briefly explain ANY TWO types of loads. **(4 marks)**
c) From the truss in Figure 4, determine the force in members BC, CE, and EF.

(10 marks)



QUESTION TWO

a) For the frame presented in Figure (fig. 2) below, calculate the reactions at the two supports under the applied load. **(10 marks)**

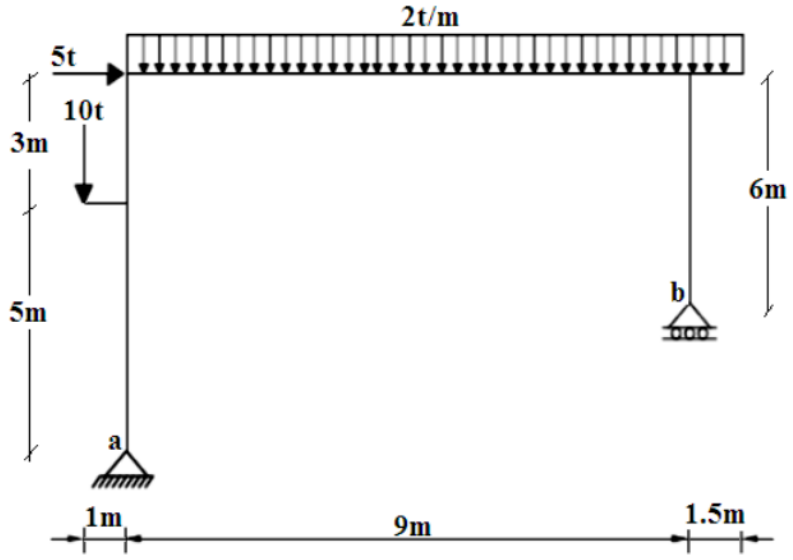


Figure 2

b) For cantilever beam presented in Fig. 3 below, calculate the reactions at the fixed support under the applied load. **(10 marks)**

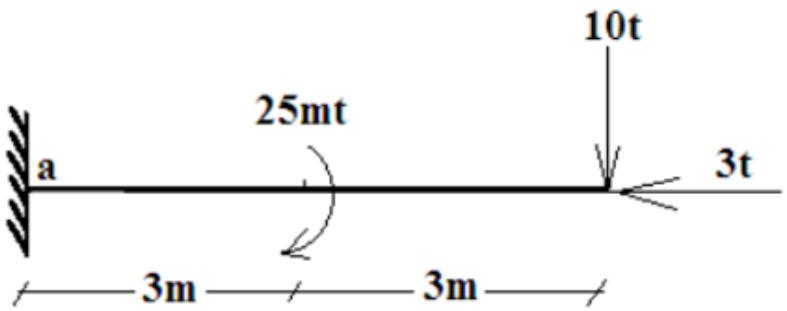
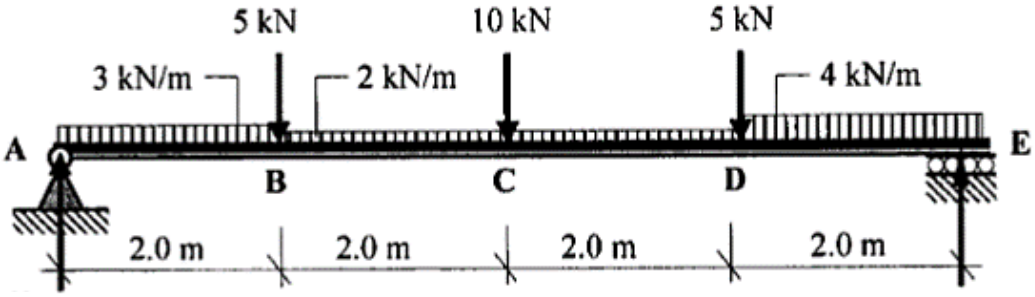


Figure 3

QUESTION 3

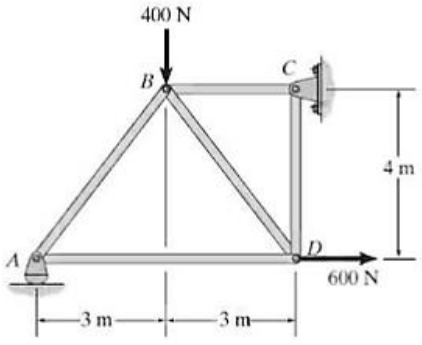
Analyse the following beam and draw shear force and bending moment diagrams.

(20 marks)

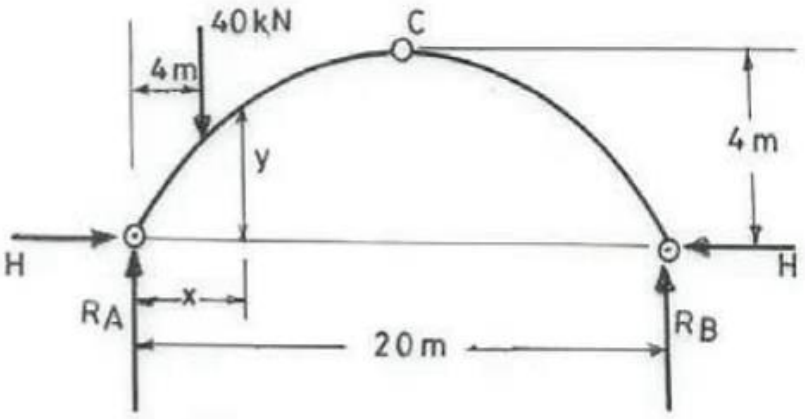


QUESTION 4

a) Determine the force in each member of the truss shown in Figure below, and indicate whether the members are in tension or compression. **(10 marks)**

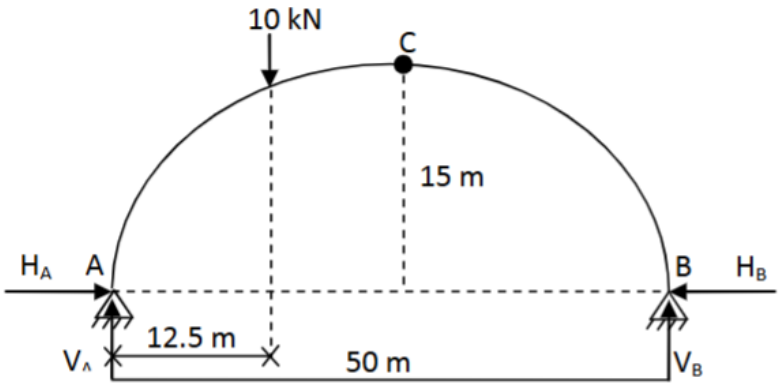


b) A three-hinged parabolic arch of 20 m span and 4 m central rise as shown in figure carries a point load of 40 kN at 4 m horizontally from left support. Compute BM, SF and AF at load point. Also determine maximum positive and negative bending moments in the arch and plot the bending moment diagram. **(10 marks)**

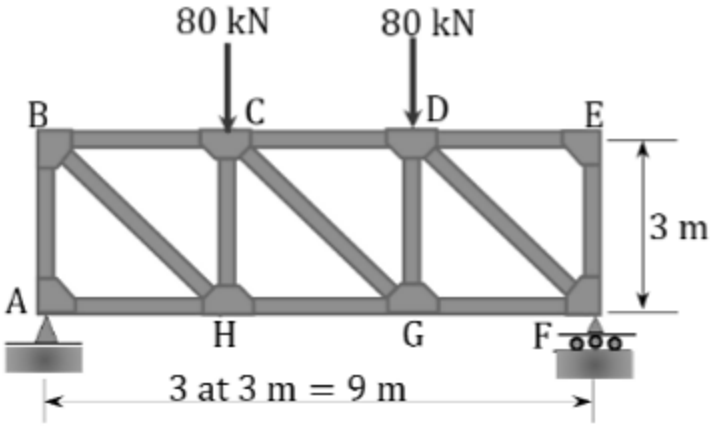


QUESTION 5

a) A 3-hinged parabolic arch of span 50m and rise 15m carries a load of 10kN at quarter span as shown in figure. Calculate total reaction at the hinges. **(10 marks)**



c) Using the method of sections, determine the axial forces in members CD, CG and HG, of the truss shown in Figure below. **(10 marks)**


80 kN
80 kN
B
C
D
E
3 m
A
H
G
F
3 at 3 m = 9 m