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

END OF SEMESTER EXAMINATION
SERIES: JANUARY 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.

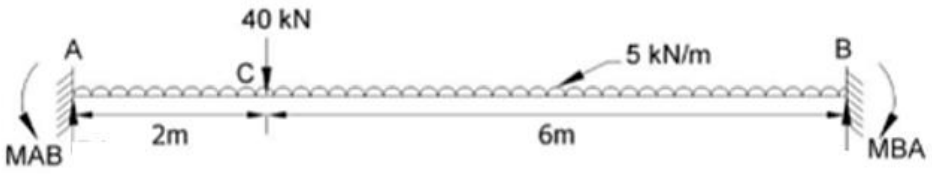


Figure 1.

Draw the following using figure 1;

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

b) Briefly explain the applications and advantages of arches and frames. **(6 marks)**
c) Briefly explain ANY TWO types of loads. **(4 marks)**
d) Briefly explain the FOUR components of structures. **(4 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)**

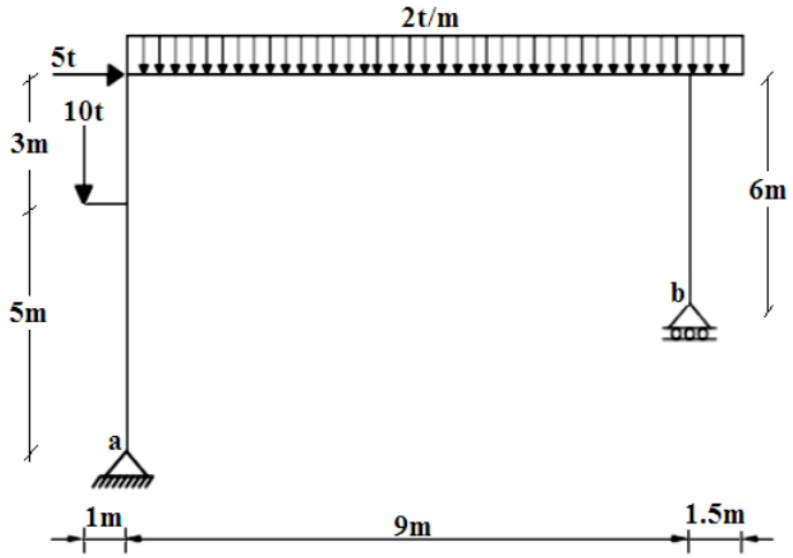


Figure 2

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

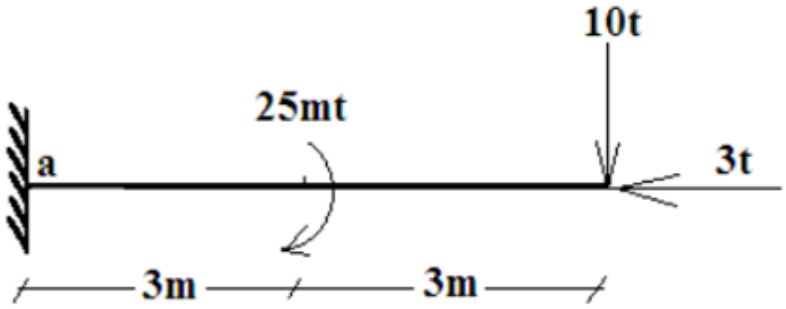
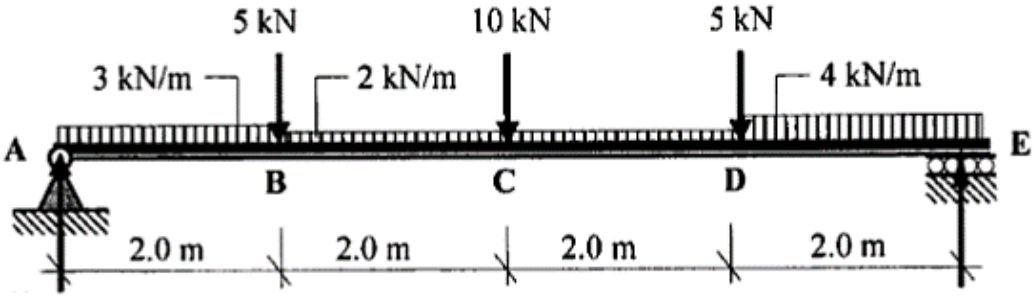


Figure 3

QUESTION 3

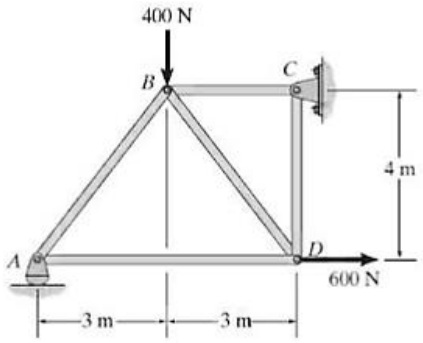
Analyse the following beam and draw shear force and bending moment diagrams.

(20 marks)

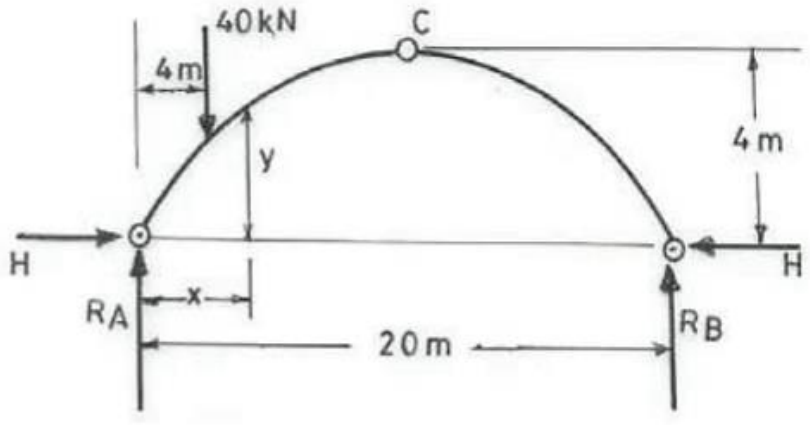


QUESTION 4

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)**

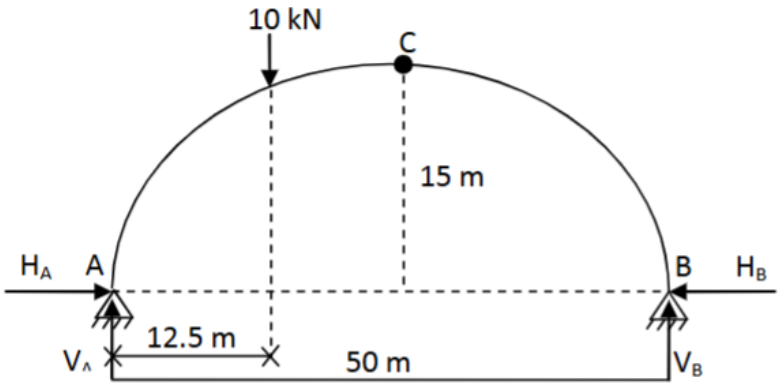


b) A three-hinged parabolic arch of 20 m span and 4 m central rise as shown in figure carries a point load of 40 kN at 4 m horizontally from left support. Compute BM, SF and AF at load point. Also determine maximum positive and negative bending moments in the arch and plot the bending moment diagram.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