



---

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**

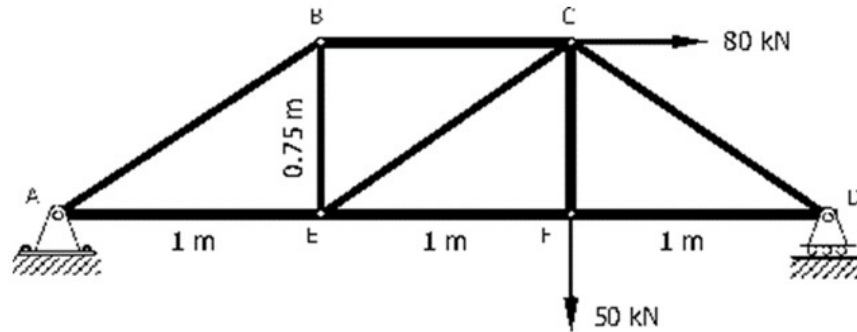
- a) A fixed beam of span 8 m carries 5 kN/m uniformly distributed load over the entire length along with a point load of 40 kN at 2m from left-hand support.



**Figure 1.**

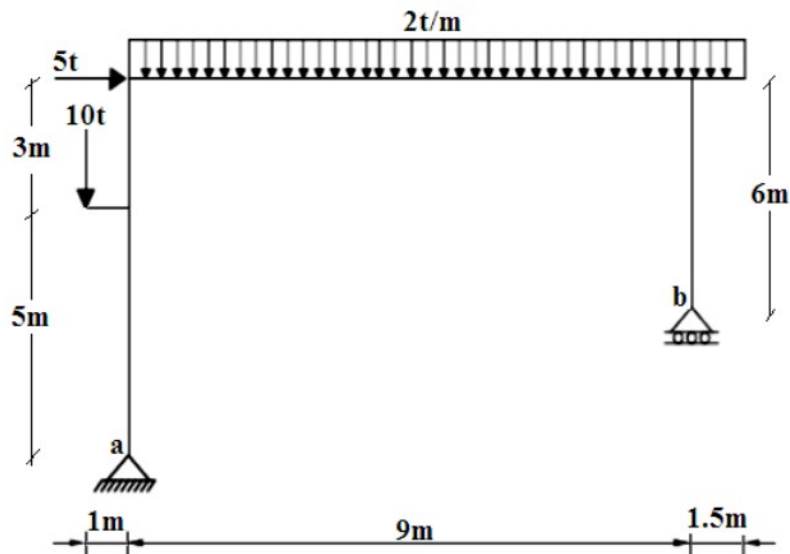
Draw the following using figure 1;

- Shear force diagram (SFD)
  - Bending moment diagram (BMD).
- 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)**

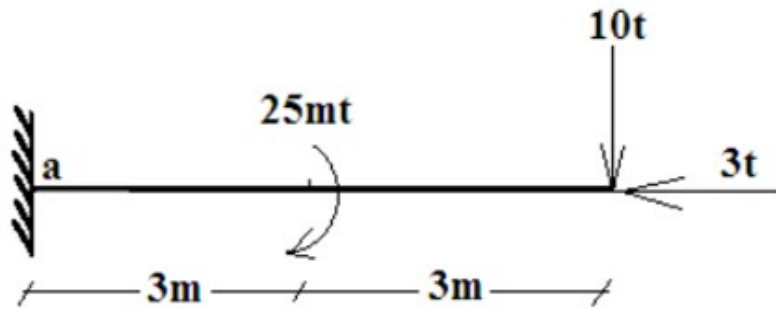
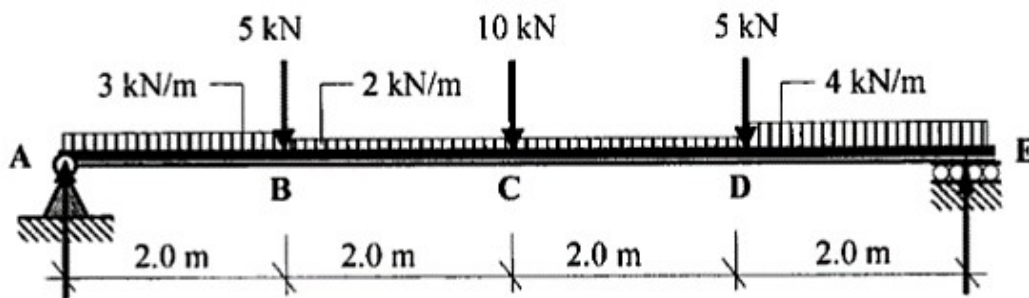


Figure 3

### QUESTION 3

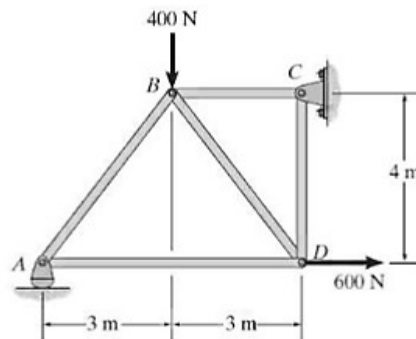
Analyse the following beam and draw shear force and bending moment diagrams.

(20 marks)

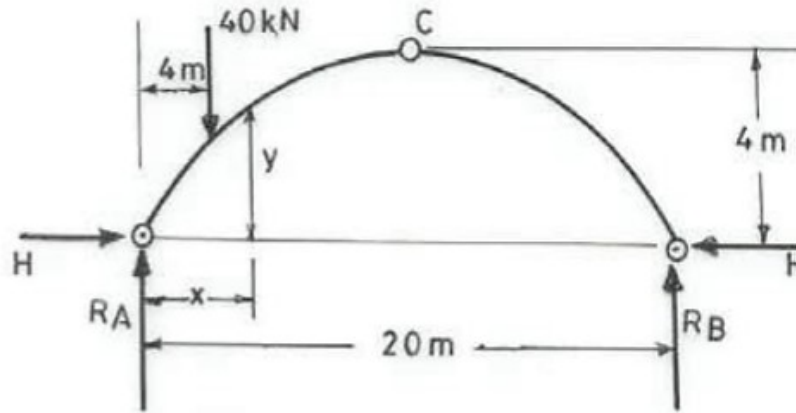


### QUESTION 4

- 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)

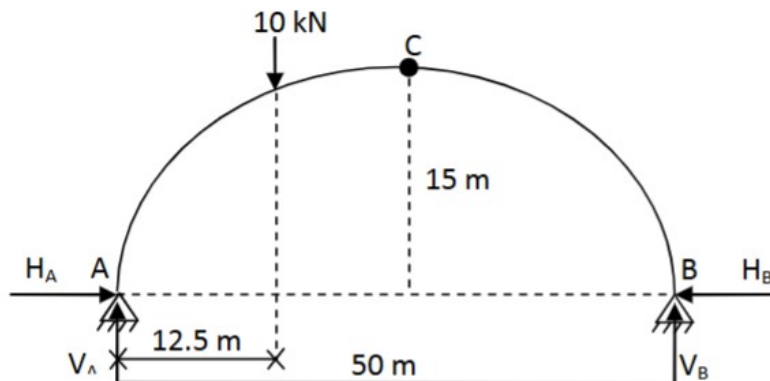


- b) A three-hinged parabolic arch of 20 m span and 4 m central rise as shown in figure carries a point load of 40 kN at 4 m horizontally from left support. Compute BM, SF and AF at load point. Also determine maximum positive and negative bending moments in the arch and plot the bending moment diagram.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

