

BINDURA UNIVERSITY OF SCIENCE EDUCATION
FACULTY OF SCIENCE AND ENGINEERING

AEH203

Department of Engineering and Physics
Bachelor of Science (Honours) Degree in Agricultural Engineering Part III
Theory of Structures

3 HOURS (100 Marks)

INSTRUCTIONS

Answer any FOUR questions. Each question carries 25 marks

JUN 2023

1. a) Calculate the reactions on the beam shown in Figure Q1 (a) at the two supports under the applied load.

[10 marks]

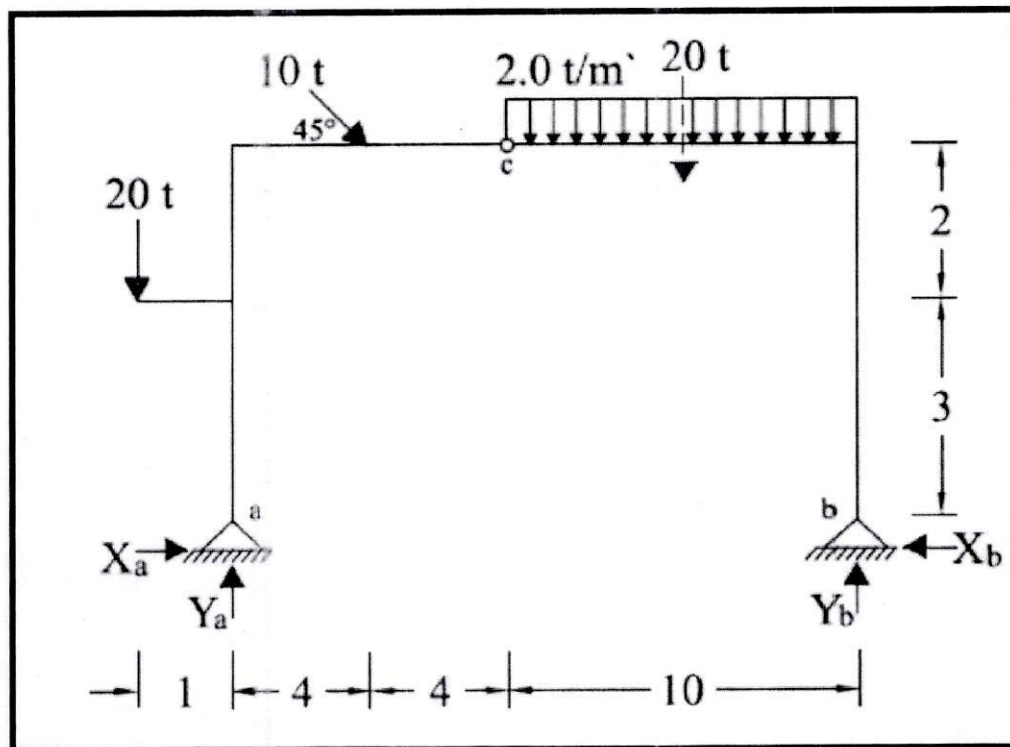


Figure Q1 (a)

- b) From the figure shown in Figure Q2 (b), determine:
i) The horizontal components of reaction at pin connections A,

B, and C of the supporting gable frame. [7 marks]

ii) The vertical components of reaction at the pin connections A, B, and C of the supporting gable frame. [8 marks]

2. Figure Q2 (a) shows a beam with two loads, a UDL of 2 t/m and 6 tons inclined 60 degrees from the horizontal. Determine:

i) Determine the reactions at the two supports. [5 marks]

ii) Draw the shear force Diagram. [10 marks]

iii) Draw the bending moment diagram. [10 marks]

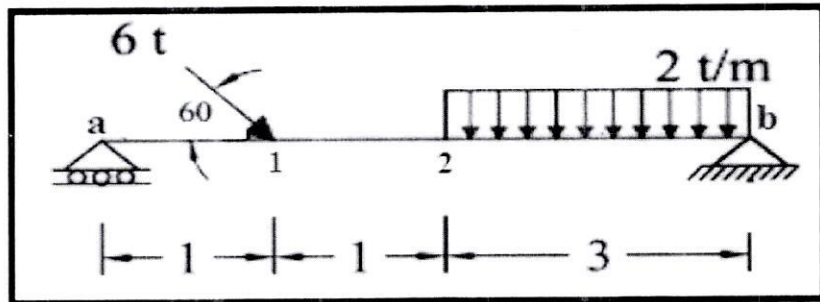


Figure Q2: Beam

3. a) Briefly describe and draw an example of a zero force member. [5 marks]

b) Figure Q3 shows a structure that has five point loads.

Determine:

i) The reactions at the two supports. [5 marks]

ii) The forces in all the members of the truss by the method of joints. [20 marks]

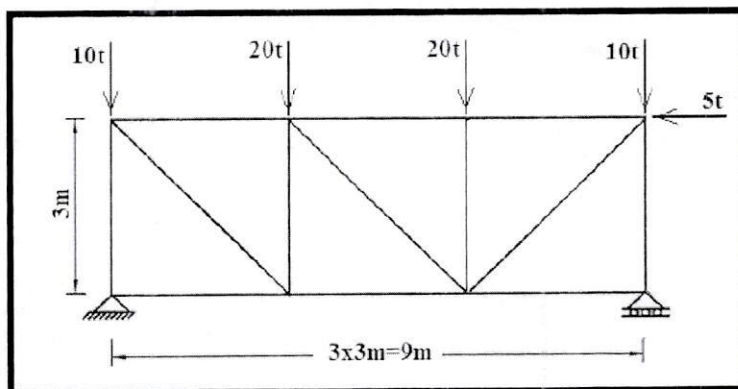


Figure Q3: Structure

4. The Figure 4 shows a symmetrical arc. Draw:

i) Internal force diagram for F_x , and F_y .

[15 marks]

ii) Bending moment diagram (BMD).

[10 marks]

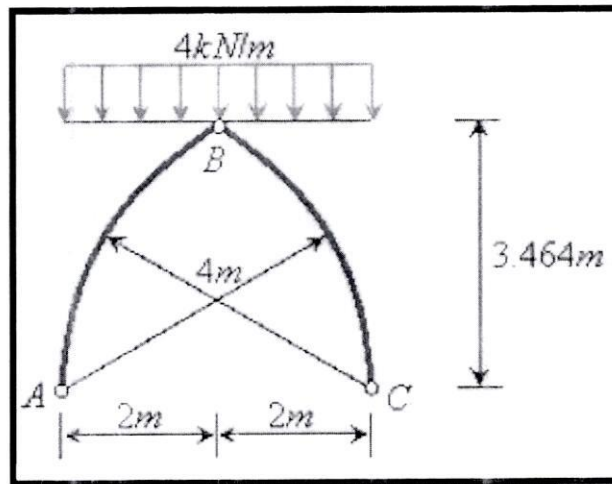


Figure Q4: Symmetrical Arc

5. The suspension bridge in Figure Q5 is constructed using the two stiffening trusses that are pin connected at their ends C and supported by a pin at A and a rocker at B. The cable has a parabolic shape and the bridge is subjected to the single load of 50 kN.

Determine:

i) The reactions A_y and C_y .

[10 marks]

ii) The maximum tension in the cable IH.

[15 marks]

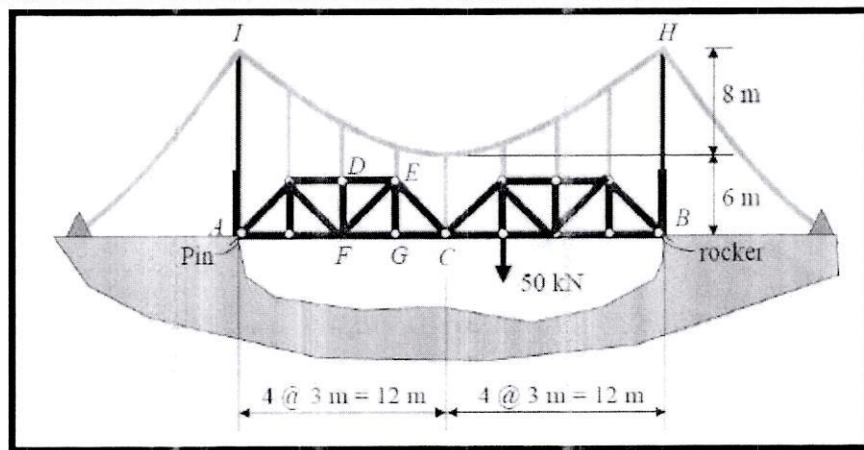


Figure Q5: Suspension Bridge

6. a) Define an influence line. [5 marks]

b) From Figure Q6 (b) shows find and draw the influence lines for the following as a result of unit moving load from left to right:

- i. Y_a [5 marks]
- ii. Y_b [5 marks]
- iii. Q_{m-m} [5 marks]
- iv. Q_{s-s} [5 marks]

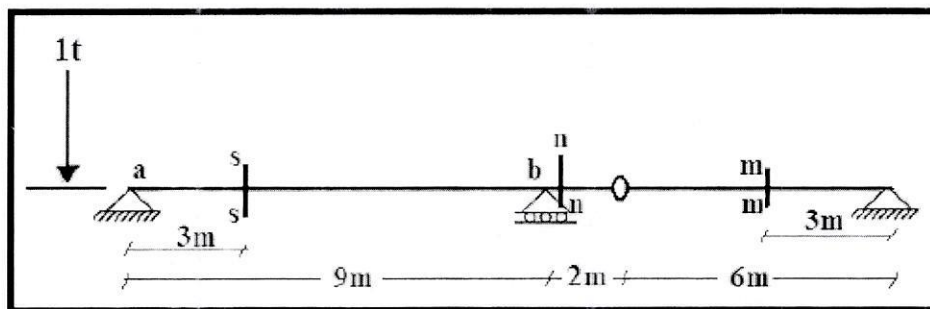


Figure Q6 (b)