



TECHNICAL UNIVERSITY OF MOMBASA
SCHOOL OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

CERTIFICATE IN BUILDING AND CIVIL ENGINEERING

EBC1203: FORCES IN FRAMES AND STRUSSES

END OF SEMESTER EXAMINATION

SERIES: APRIL 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

- Answer Booklet
- Examination pass
- Student ID
- Scientific Calculator

This paper consists of five questions.

Attempt any THREE questions.

Do not write on the question paper.

QUESTION ONE (20Marks)

(a) A rod is 2m long at a temperature of 10°C . Find the expansion of rod, when the temperature is raised to 80°C . If this expansion is prevented, find the stress induced in the material of the rod. Take $E=1.0 \times 10^5 \text{MN/m}^2$ and $\alpha= 0.000012$ per degree centigrade .

(8

Marks)

(b) Two brass rods and one steel rod together support a load as shown in Figure 1. If the stresses in the brass and steel are not to exceed 60 N/mm^2 and 120 N/mm^2 , find the safe load that can be supported. Take E for steel = $2.0 \times 10^5 \text{ N/mm}^2$ and for brass = $1.0 \times 10^5 \text{ N/mm}^2$. The cross-sectional area of steel rod is 1500 mm^2 and of each brass rod is 1000 mm^2 . (12 Marks)

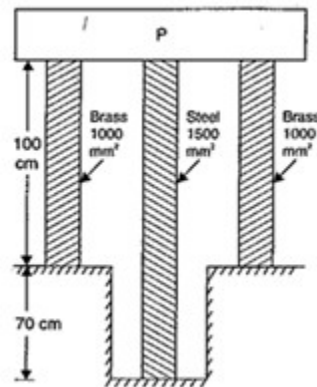


Fig1

QUESTION TWO (20Marks)

(a) Explain the following:-

(i) Reaction

(ii) Bending Moment

(iii)

Shear Force

(8Marks)

(b) (i) Construct the BM and S.B.D. for the overhanging beam shown in figure 2

(8 Marks)

(ii) Indicate points of contraflexure.

(4 Marks)

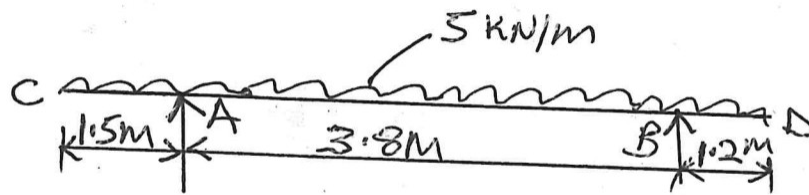


Fig 2

QUESTION THREE (20 Marks) .

A simply supported girder carries loads as shown in Fig 3. By using joint resolution method determine the forces in each member of the frame and state whether the member is in tension or compression

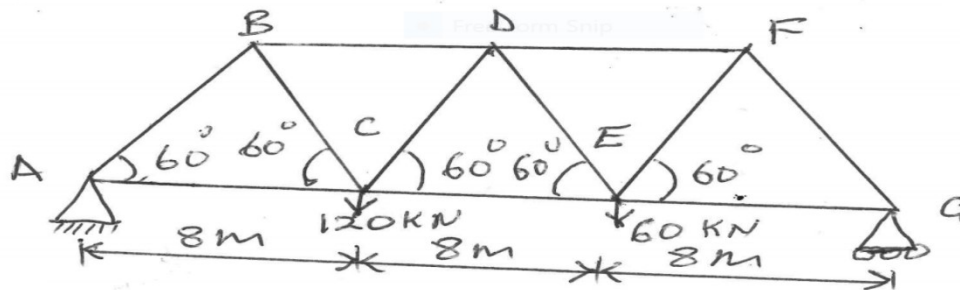


Fig 3

QUESTION FOUR (20 Marks)

(a) Explain the following:-

(i) Reaction

(ii) Bending Moment

(iii) Shear Force

(8 Marks)

(b) Construct the bending moment and shear force diagrams for the overhanging beam shown in figure 4. Indicate points of contraflexure

(12 Marks)

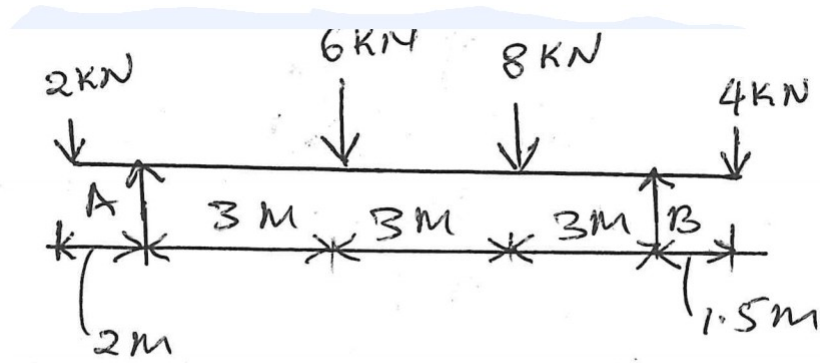


Fig 4

QUESTION FIVE (20 Marks)

A simply supported girder carries loads as shown in Fig 5. By method section, determine the forces in each member of the frame and state whether the member is in tension or compression

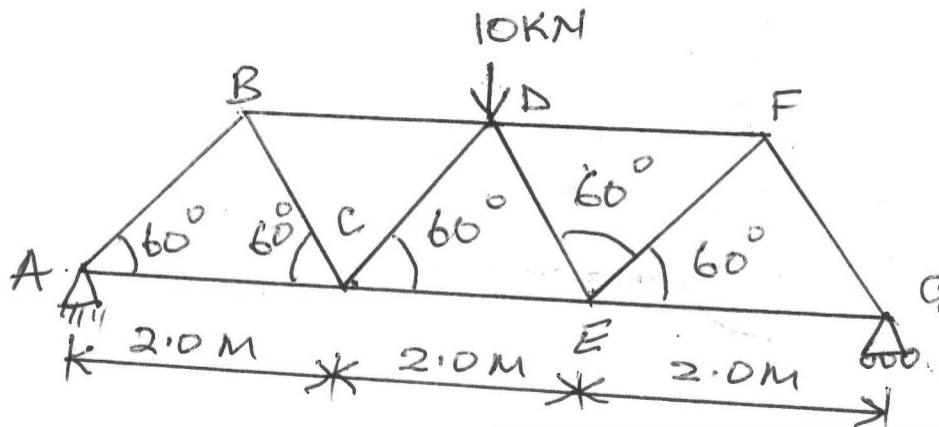


Fig 5