



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)

University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FIRST SEMESTER EXAMINATION FOR DEGREE IN BACHELOR OF SCIENCE IN
CIVIL ENGINEERING

ECV 204 - THEORY OF STRUCTURES 1

Date: 7/12/2015

Time: 8:30 – 10:30 AM

INSTRUCTIONS:

- *This paper comprises five questions*
- *Answer question one and any other two questions*
- *All the optional questions carry equal marks*

QUESTION ONE (30 MARKS)

- a) Explain three functions of a structure. (6 marks)
- b) In the force system shown in Figure 1, find :
i) The magnitude of the resultant force (2 marks)
ii) Position of the line of action of the resultant force. (2 marks)

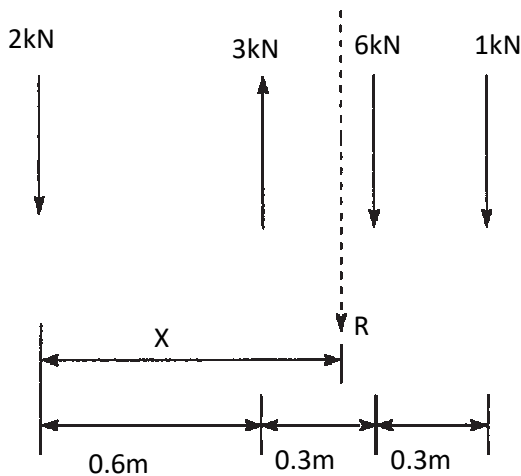


Fig. 1

- c) Calculate the reactions at the support in the cantilever beam shown in Figure 2 (6 marks)

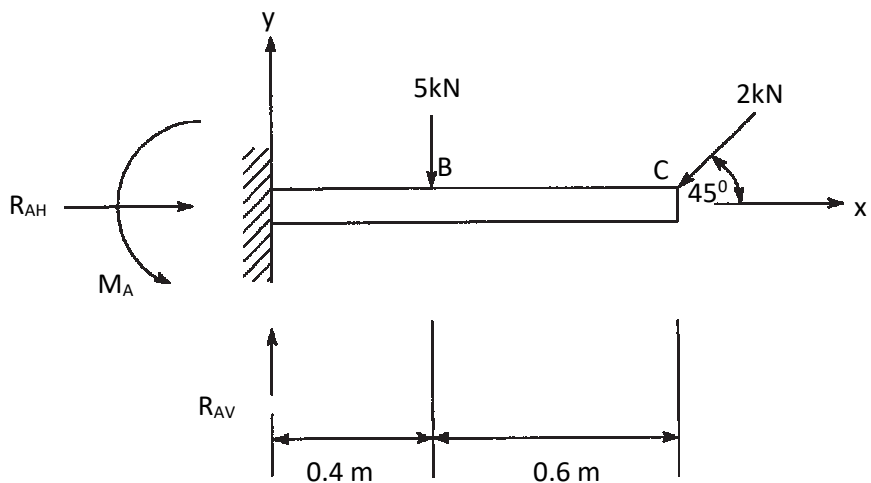


Fig. 2

- d) Calculate the reactions at the supports in the plane truss shown in Figure 3 (6 marks)

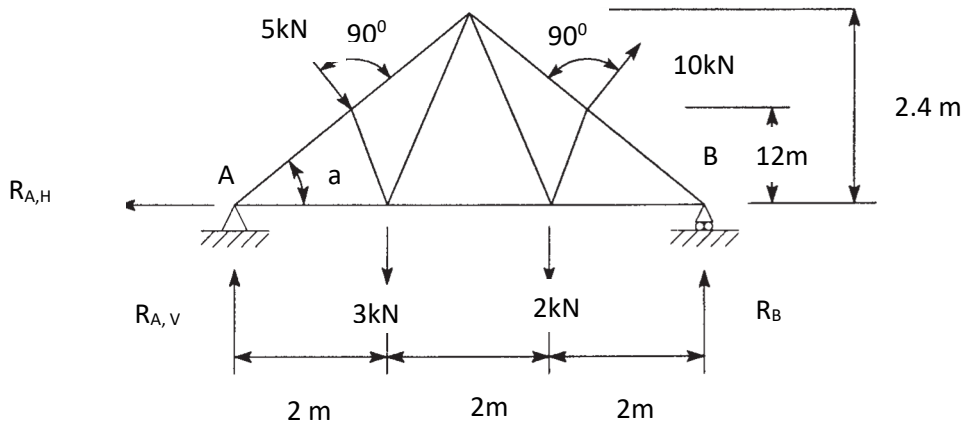


Fig. 3

- e) Figure 4 shows a beam ABCD supporting three concentrated loads, two of which are inclined to the longitudinal axis of the beam.
- Determine the maximum value of normal force in the beam. (2 marks)
 - Construct the normal force diagram for the beam. (2 marks)
 - Construct the bending moment diagram for the beam. (4 marks)

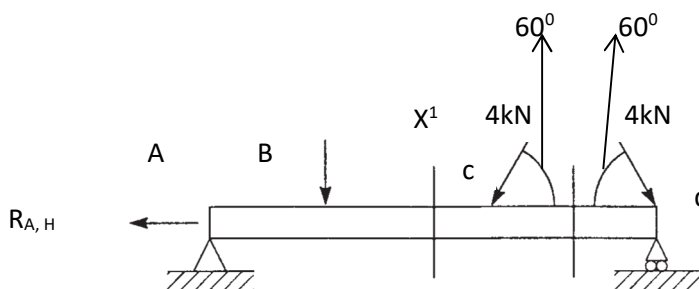


Fig. 4

QUESTION TWO (20 MARKS)

For the beam shown in Figure 5, construct the:

- i) shear force diagram. (8 marks)
- ii) bending moment diagram. (12 marks)

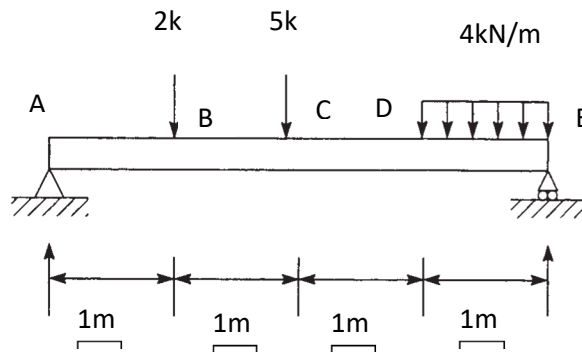


Fig. 5

QUESTION THREE (20 MARKS)

A precast concrete beam of length L m is to be lifted from the casting bed and transported so that the maximum bending moment is as small as possible. If the beam is lifted by two slings placed symmetrically, show that each sling should be $0.21L$ m from the adjacent end.

QUESTION FOUR (20 MARKS)

Using the method of joints, determine the magnitude and type of force in all members of the truss shown in Figure 6; all members are 1 m long. (*Ignore the arrows in the members*)

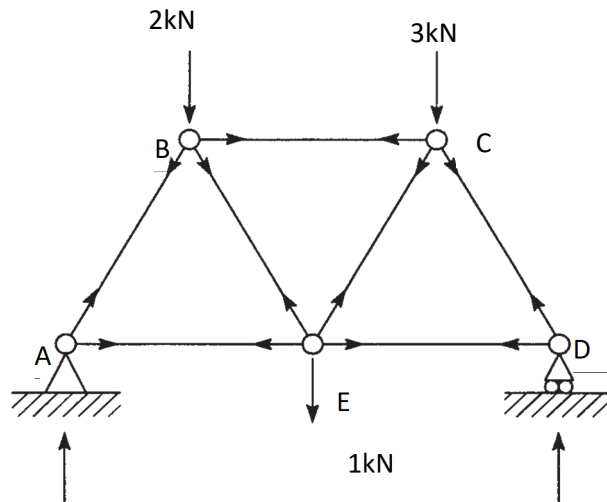


Fig. 6

QUESTION FIVE (20 MARKS)

Using the method of sections, calculate the forces in the members CD, CF and EF in the truss shown in Figure 7.

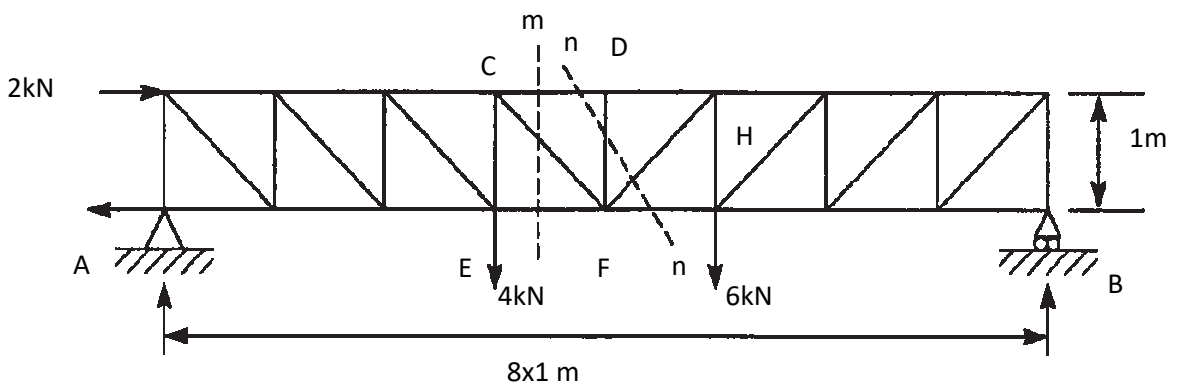


Fig. 7