



Technical University of Mombasa

Faculty of **ENGINEERING AND TECHNOLOGY**

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE IN CIVIL ENGINEERING
BSCE

ECE 2317 : THEORY OF STRUCTURES IV

SEMESTER EXAMINATION

APRIL 2014 SERIES

2 HOURS

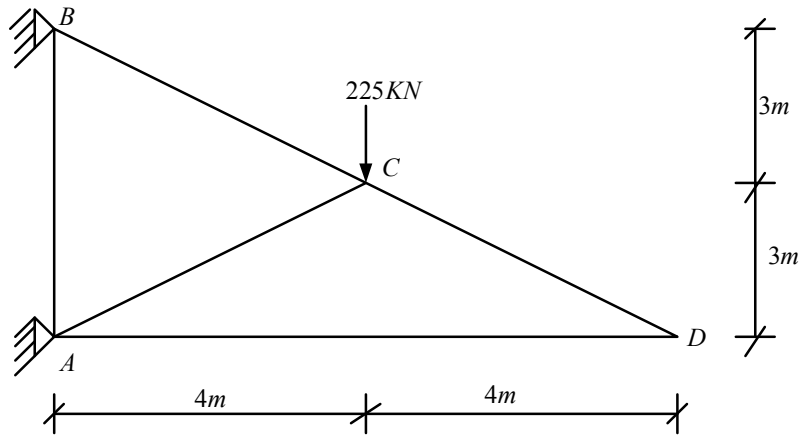
Instructions to candidates:

This paper consists of **FIVE** questions

Answer question **ONE** (compulsory) and any other **TWO** questions

QUESTION ONE

- a) Fig Q1(a) below is a roof truss loaded at point C with 225KN. Using complimentary Virtual work method, Determine vertical displacement at point C.



- Take
- Cross-section Area (A) of members = 2500mm^2
 - $E = 200\text{KN/mm}^2$

(14 marks)

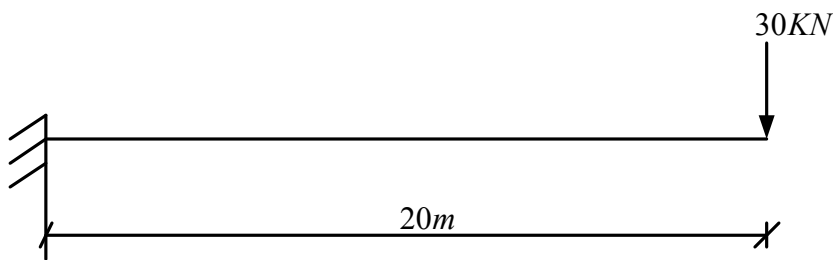
b) Define the following terms as used in the analysis of structures.

- (i) Principle of least work
- (ii) Complimentary virtual work
- (iii) Castaglianos 2nd theorem

(6 marks)

c) Figure Q1C is a 20m cantilever beam carrying a point load at its end B. Determine the deflection at the free end using virtual work method: Given that:

- I = $5,000\text{mm}^4$
 E = 200KN/mm^2



QUESTION TWO

Fig Q2 is a beam fixed at one end and rolled at the other. The beam carries point load of 50kN at B, 8m from point A. Given that, the length of the beam is 15m, determine reactions at

supports using the method of least work.

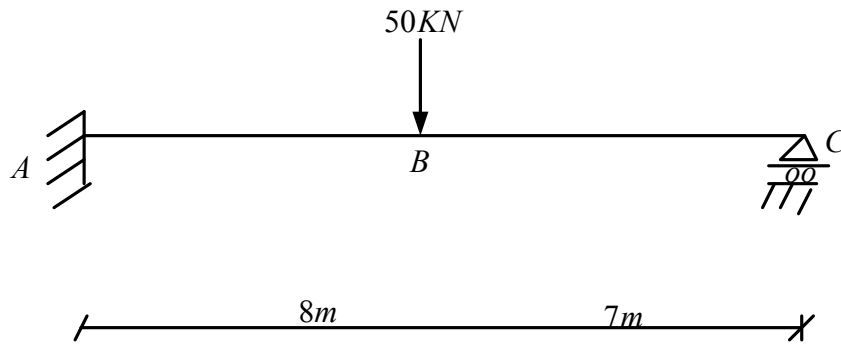


Fig. Q2

(20 marks)

QUESTION THREE

- a) From the concept of work and energy theorem, and using a well labeled sketch, show that, the total work done over a full range in a structure is given by

$$W = \int_0^D P.dA$$

(5 marks)

- b) Figure Q3(b) is a beam 40m long carrying a point load at C as shown. Using conjugate beam method, find reaction at B.

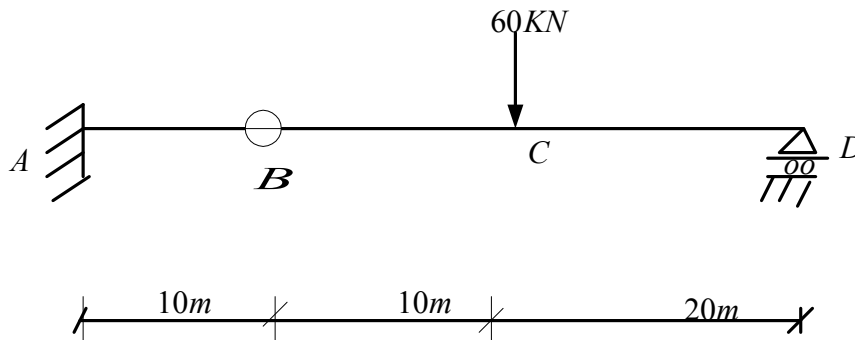


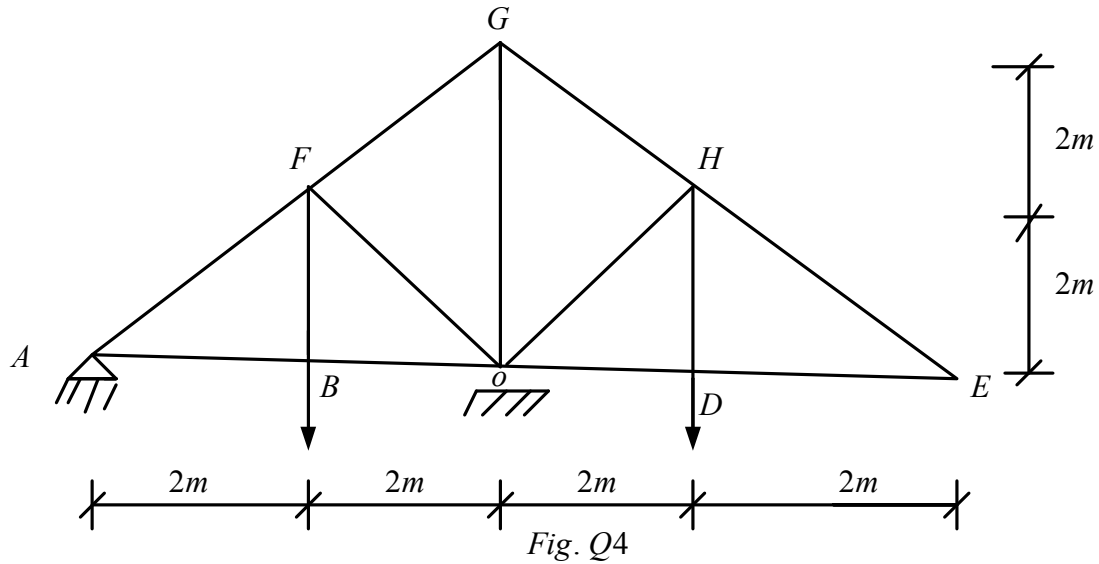
Fig. Q3(b)

(15 marks)

QUESTION FOUR

Figure Q4 is a roof truss 8m long loaded at points BDE and supported at points A and C as

shown. Using Castaglianos 1st theorem find vertical deflection at point D, given that, the cross-sectional areas of all members is uniform at 0.0025m^2 and $E = 230\text{KN/mm}^2$.



(20 marks)

QUESTION FIVE

- a) State Mohr's 1st and 2nd theorems of slope and deflection of beams .
- b) Figure Q5 is a propped cantilever beam loaded at point D with 100KN. Find the maximum deflection in span AB.

(20 marks)