TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSC IN CIVIL ENGINEERING

ECE 2317: THEORY OF STRUCTURES IV

END OF SEMESTER EXAMINATION

SERIES: APRIL2016

TIME: 2HOURS

DATE: 12May2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, Drawing Instruments, Scientific calculator, examination pass and student ID

This paper consists of five questions. Attemptquestion ONE (Compulsory) and any other TWO questions.

Question ONE (Compulsory) – 30 marks

a) Find the deflection at point A in the figure 1 below. Take the cross-sectional area for all members to be 12,000mm2 and E = 200GPa. All other dimensions are given in the figure. (15 marks)

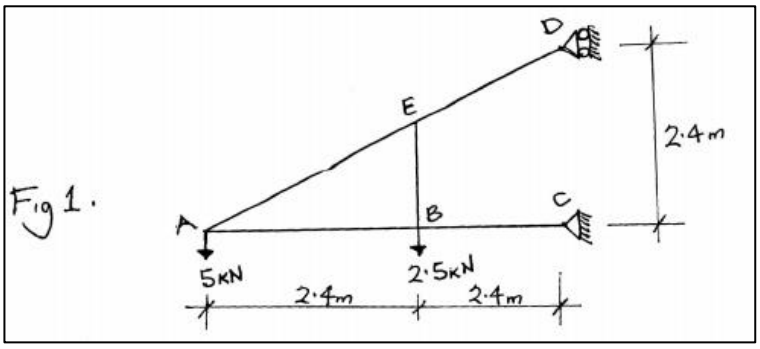

Fig 1.

b) Find the displacement and slope at the tip of the cantilever beam loaded as shown in Fig. 2. Assume the flexural rigidity of the beam EI to be constant for the beam and given as 290kN.m^2) (5 marks)

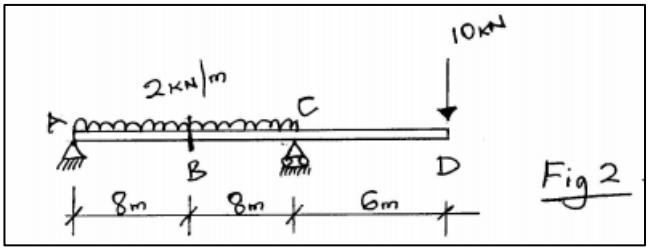

Fig 2

c) State the following

(i) Principle of virtual work (2 marks)
(ii) Castigliano's Second Theorem (2 marks)
(iii) First Moment of Area Theorem (2 marks)
(iv) Complementary Work (2 marks)
(v) Least Work Theorem (2 marks)

(10 marks)

Question TWO

Using the moment area method find the deflection at point D and the slope at point B and C as shown in the figure 3 below. Take the flexural rigidity of the member to be constant.

(20 marks)

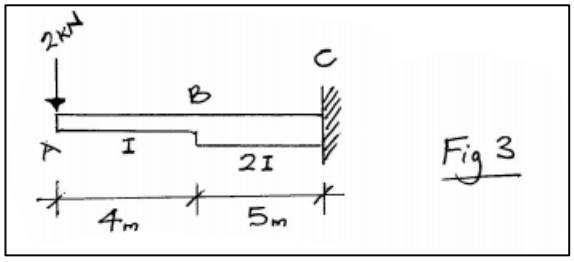

Fig 3

Question THREE

a) Using the principle of virtual displacement show that the virtual work of translation is zero. Assume the body is in equilibrium and is a plane rigid body.

(10 marks)

b) Using the conjugate beam method find the rotation at point A as shown in the figure 4 below.

(10 marks)

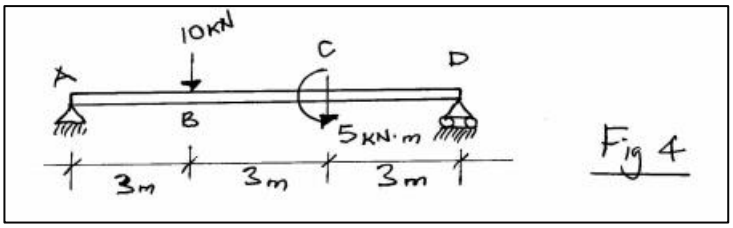

Fig 4

Question FOUR

Find the horizontal and vertical deflection components of joint A using the method of virtual work. Refer to the truss in figure 5 below.

Question FIVE

a) Using the least work theorem find the displacement at point B as shown in the figure 6 below.

(10 marks)

b) Using Castigliano's Second Theorem determine vertical displacement at point B as shown in the beam below (Figure 7). Assume the flexural rigidity is constant.

(10 marks)