

# **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)**

a) Given the truss shown in figure 1 below find the horizontal and vertical components of the joint A the method of virtual work. All cross-sectional areas are  $100 \text{mm}^2$  and  $\text{E} = 290 \text{kN/mm}^2$ . (20 marks)

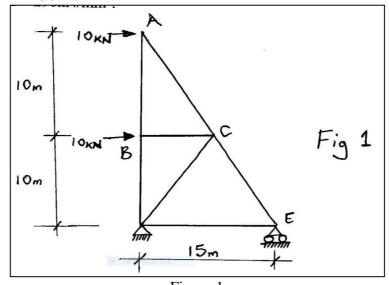


Figure 1

## b) 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)	Second Moment of Area Theorem	(2 marks)

## **Question TWO**

Using the conjugate beam method, determine the slope at the point B on the beam shown in the figure 2 below.

(20 marks)

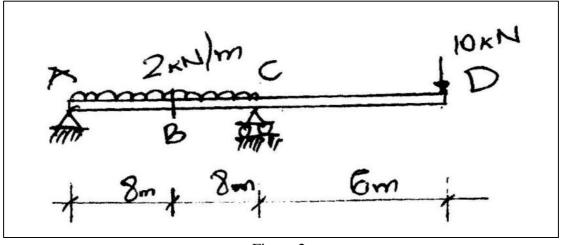
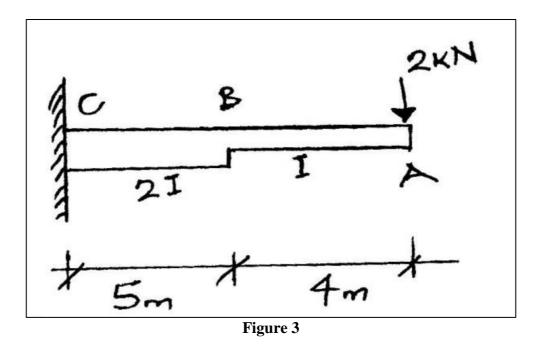


Figure 2

## **Question THREE**

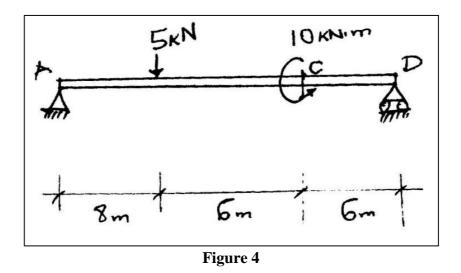
Determine the deflection at point A on the beam shown in the figure 3 below in terms of EI.

(20 marks)



### **Question FOUR**

Using Castigliano's theorem of least work, determine, the vertical displacement at point B as shown in figure 4 below. (20 marks)



## **Question FIVE**

Use the method of virtual work to determine the horizontal deflection at point C. The cross-sectional area of each member is indicated in the figure. Assume the members are simply supported and the  $E=290 \text{ kN/mm}^2$ .

(20 marks)

