



TECHNICAL UNIVERSITY OF MOMBASA
**Faculty of Engineering &
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2317: THEORY OF STRUCTURES IV

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2013

TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions. Answer question **ONE (Compulsory)** and any **TWO** questions

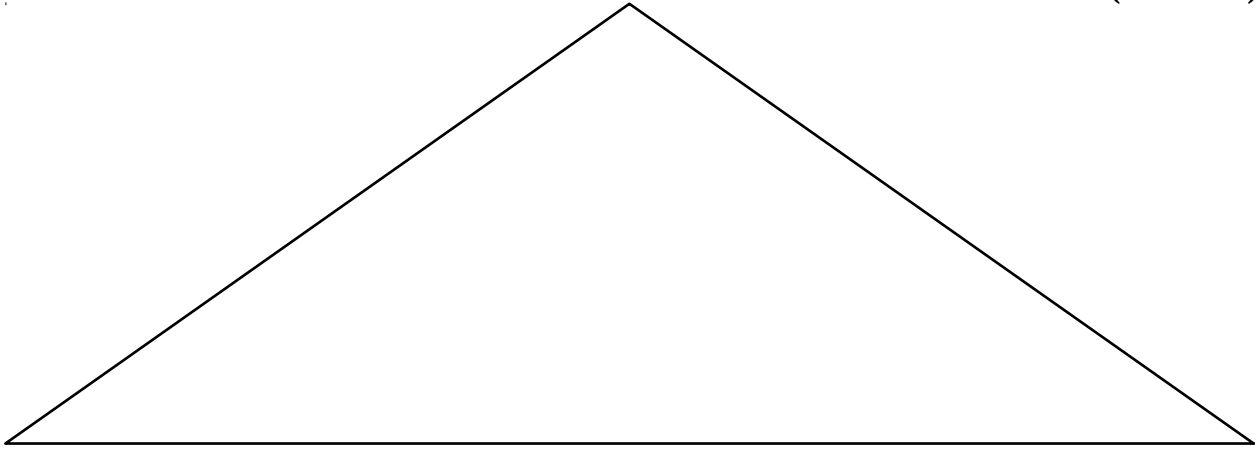
Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One (Compulsory)

- Describe the virtual work method application using virtual displacements mention P & D systems.
(5 marks)
- Describe the complementary virtual work method using virtual forces mention P & D systems
(5 marks)

- c) Using the virtual work method, determine the horizontal displacement of Roller at B.
Assume $E = \text{Constant}$ **(20 marks)**



Question Two

For the beam shown, using virtual methods, determine the deflection at point A. **20 marks)**

Given $EI = \text{Constant}$

Question Three

Using the conjugate beam method, determine the deflection at A and the slope at A **(20 marks)**

L

Question Four

a) Using Castigliano's theorem, determine the reaction at A for the beam shown.

b) Derive Castigliano's 1st theorem **(20 marks)**

W

Question Five

Using Castigliano's theorem of least work, determine the force in CE of the braced truss shown. $EI =$ constant. The areas of the sections are shown circled (in mm)

6m