**TECHNICAL UNIVERSITY OF MOMBASA**

# Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

**UNIVERSITY EXAMINATION FOR BACHELOR OF SCIENCE IN CIVIL ENGINEERING**

ECE 2205: THEORY OF STRUCTURES I

**END OF SEMESTER EXAMINATION**
**SERIES:** APRIL 2013
**TIME ALLOWED:** 2 HOURS

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
- *Answer Booklet*

This paper consists of **FIVE** questions.
Answer any **THREE** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

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**Question One**

**a)** Explain the following:
  **(i)** Triangle of forces
  **(ii)** Parallelogram of forces
  **(iii)** Polygon of forces
  **(iv)** Equilibrant
  **(v)** Resultant                                                    **(7 ½ marks)**

**b)** Define the following types of forces:
  **(i)** Tension
  **(ii)** Compression
  **(iii)** Shear
  **(iv)** Bending
  **(v)** Torsion                                                      **(5 marks)**

**c)** Sketch the deflected forms of the following structural elements subjected to vertical loads.
   **(i)** Proped cantilever
   **(ii)** Fixed ends beam
   **(iii)** Continuous beam
   **(iv)** Three-hinged arch
   **(v)** Portal frame                                        **(7 ½ marks)**


## Question Two

A simply supported beam is loaded as shown in figure 1.  Determine:

a) Support reactions
b) (i) Shear forces at critical points
   (ii) The shear force diagram                               **(20 marks)**

## Question Three

Determine and draw bending moment diagrams for the simply supported beam shown in:

   a) Figure 2
   **b)** Figure 3                                             **(20 marks)**


## Question Four

Figure 4 shows a timber roof truss.  Use the method of sections to calculate the forces in the following members:

(i)  AC
(ii) CD
(iii)    CF
**(iv)** AF                                                    **(20 marks)**

## Question Five

Figure 5 shows a simply supported girder carrying vertical loads under.

**a)** Determine:
   **(i)** Reactions at supports
   **(ii)** Bending moments at joints A, B and C

**b)** Use the method of resolution of forces at joints to determine the forces in the following members:
   **(i)** AG
   **(ii)** AB
   **(iii)** BG

c) Sketch the force diagram showing the above load and indicate if they are ties or struts.
                                                               **(20 marks)**