# THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

# Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

**BACHELOR OF ENGINEERING IN BUILDING & CIVIL ENGINEERING (BEBC)**
**[Institutional Based Programmes]**

EBC 4404: FOUNDATION ENGINEERING II

**END OF SEMESTER EXAMIANTION**
**SERIES:** DECEMBER 2012
**TIME:** 2 HOURS

**Instructions to Candidates:**
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 **TWO** printed pages

---

**Question One (30 marks)**

**a)** Finite element method is critical stability analysis of structures. Outline using illustrations the fundamental concept of equilibrium relating to this method. **(8 marks)**

**b)** Outline **FOUR** limitations of the finite element method. **(6 marks)**

**c)** Discuss concept of finite element theory as applied to structure using illustrations where appropriate. **(6 marks)**

**d)** A horizontal structural element is subjected to an axial force and an elastic spring of uniform stiffness.
- **(i)** Develop an elemental stiffness matrix for the structure.
- **(ii)** Explain the terms used in the matrix
- **(iii)** Comment on the perception of the matrix

Assume: An axial force = "p"

Stiffness for the elastic spring = t **(10 marks)**

**Question Two (20 marks)**

A fixed uniform beam pcp is 6m long. The beam is loaded with a 5KN concentrated had 2m from the support at P. Determine:

**a)** Modal displacement **(8 marks)**

**b)** Moment of the beam **(12 marks)**

**Question Three (20 marks)**

Figure 1 shows a supported truss. Determine forces in the members. **(20 marks)**

C

**Question Four (20 marks)**

A prismatic beam is as shown in figure 2. Flexural rigidity of the beam is EI constant. Analyze the beam using the flexibility method. **(20 marks)**

P

**Question Five (20 marks)**

An axially loaded structural member PQ has an overall length 'L'. It is subjected to an axial force $F_p$ at end P and $F_q$ at end Q. The cross sectional area and modulus of elasticity for the member are "C" and "D" respectively.

a) Derive an expression for:

Force $F_p$ and $F_q$ expressing them in matrix form. **(15 marks)**

**b)** Explain all the terms used in the matrix obtained in (a) **(5 marks)**