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 4413: THEORY OF STRUCTURES V

END OF SEMESTER EXAMINATION
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 a critical method for 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 the 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: The axial force = "p"
Stiffness for the elastic spring = "t" **(10 marks)**

Question Two (20 marks)

A fixed uniform beam PQ is 6m long. The beam is loaded with a 5KN concentrated load at 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)**

W

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)**