THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

((A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Engineering &Technology in Conjunction with Kenya Institute of Highways and Building & Technology (KIHBT)

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING

EBE 3115: THEORY OF STRUCTURES I

END OF SEMESTER EXAMINATION
SERIES: AUGUST 2012
TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Scientific Calculator*
- *Drawing Instruments*

This paper consists of **FIVE** questions
Answer any **THREE** questions

All questions carry equal marks
This paper consists of **THREE** printed pages

Question One (20 Marks)

a) Illustrate the variation of stress with strain for a mild steel rod subjected to an increasing tension force from zero to failure. **(6 marks)**

b) Define the following terms:
   i) Proof stress
   ii) Elastic limit
   iii) Poisson ratio **(6 marks)**

c) A steel bar of rectangular cross-section 150 x 60mm is subjected to an axial tension of 25OKN. Determine the changes that result in the cross-sectional dimensions given that E = 200KN/mm^2 and poisons ratio = 0.4 **(8 marks)**

Question Two (20 marks)

a) Define the following:
   i) Lateral strain
   ii) Radius of gyration
   iii) Slenderness ratio
   iv) Shear force **(4 marks)**

b) A beam of span 'l' carries a uniformly distributed load of 'w'KN per unit length over its entire length. Derive and expression for the maximum bending moment. **(3 marks)**

c) A beam is loaded as shown in figure 1.
   i) Calculate the support reactions
   ii) Draw the shear force and bending moment diagrams indicating the values at the critical points. **(13 marks)**

A

Question Three (20 marks)

a) Derive the equation of theory of simple bending. **(9 marks)**

b) Determine the maximum moments which can be resisted by the section in figure 1, if the maximum permissible stresses are 105N/mm^2 and 125N/mm^2 for top and bottom fibres respectively. **(11 marks)**

Figure 2

Question Four (20 marks)

a) For the beam shown in figure 3, sketch the influence line diagram for:
- **i)** The reaction at A
- **ii)** The reaction at B
- **iii)** The bending moment at E. **(12½ marks)**

b) Determine the maximum bending moment at point E in question 4(a) when a UDL of 50KN/m and 6m long crosses the beam from C to D. **(7½ marks)**

10m

Question Five (20 marks)

a) Using the method of tension coefficients, determine the forces in the members of the frame shown in figure 4. **(20 marks)**

D