THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

CERTIFICATE IN TECHNOLOGY II

EBC 1105: THEORY OF DEFLECTION

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions in two sections **A** & **B**
Answer question **ONE (COMPULSORY)** and any other **TWO** questions.
Maximum marks for each part of a question are clearly shown
This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question 1 (30 marks)

a) Define the following terms in relation to theory of deflection

(i) Curvature
(ii) Slope
(iii) Deflection
(iv) Stiffness
(v) Bending (5 marks)

b) Find the maximum deflection for a simply supported beam, length 6m, carrying a point load of 20KN at the mid span. (5 marks).

Figure 1

c) Find the area and centroid of a cantilever of length 15m that experiences a deflection of 0.3m after a loading of 45kg. Give a sketch of the same showing the centroid (12 marks)

d) Derive the general differential equation for deflection (8 marks)

SECTION B (Answer any TWO questions from this section)

Question 2 (15 marks)

The beam below is 6m long with a flexural stiffness of 300KNm^3. Determine the slope at the end and the deflection at the middle (15 marks)

Figure 2

Question 3 (15 marks)

A 7m beam has three point loads, 20KN, 30KN and 25KN located from point A 1.5m, 3.0m and 5.0m respectively. Find the reactions at the supports and bending moments at point P which is 2.0m from point A, point Q which is 3.5m from A and point K which is 6.0m from A, using the Macaulay's bracket method (15 marks)

Question 4 (15 marks)

Draw a bending moment and a shear force diagram for a fixed-ended beam of 4m span with a 160KN point loads 1m from the left hand side (15 marks)

Figure 3

Question 5 (15 marks)

Using the method of virtual work, determine the vertical deflection at joint G in the truss, below, under the loading conditions shown in figure (i), (ii) and (iii)

Figure 4