THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

INSTITUTIONAL BASED PROGRAMME

DIPLOMA IN BUILDING & CIVIL ENGINEERING

EBC 22011: STRENGTH OF MATERIALS II

END OF SEMESTER EXAMINATION

SERIES: NOVEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:

This paper consists of **FIVE** questions

- *Answer Booklet*
- *Pocket Calculator*

Answer question **ONE (COMPULSORY)** in **SECTION A** and any other **TWO** questions in **SECTION B**

Marks are indicated for each part of the question

This paper consists of **FOUR** printed pages

SECTION A ***(Answer all questions in this section - 30 Marks)***

Question One

a) With the aid of a stress-strain graph, sketch the behavior of mild steel in tension, indicating all the critical points (10 marks)

b) Define the following terms related to 1(a)
   (i) Hooke's Law
   (ii) Limit of Proportionality
   (iii) Elastic limit
   (iv) Yield point
   (v) Maximum stress
   (vi) Permissible working stress (12 marks)

c) Resolve the member forces in figure 1. Determine whether in tension or compression (8 marks)

Figure 1

SECTION A ***(Answer all questions in this section - 20 Marks each)***

Question Two

Using the method of joint resolution, determine the forces in each member of the frame and state whether it's a strut or a tie (20 marks)

60^{o}

Question Three

a) Define the following:

i) Centre of gravity
ii) Centre of area (centroid)
iii) Second moment of area (8 marks)

b) For the figure 3 shown, calculate the second moment of area about x-x and y-y (12 marks)

Figure 3

Question Four

a) Define the following
(i) Reaction
(ii) Shear force
(iii) Bending moment (6 marks0

b) Sketch the shear force and bending moment diagrams for figure 2 indicating the critical values (14 marks)

40KN/m

Question Five

a) A short rigid bar weighing 29.4KN is suspended by copper and steel wires of areas 150mm^2 and 60mm^2 respectively as shown in figure 5

Determine:
(i) The stress in each rod
(ii) Extension of each rod

$E_{st} = 205KN/mm^2$
$E_c = 93KN/mm^2$ (15 marks)

Figure 5

b) A mass of concrete pier (column) of a rectangular cross-section 650 x 800mm and 22m long carries an axial compressive load of $2.5 \times 10^6 N$

i) Determine the stress in the concrete at the base of the pier
ii) The amount of shortening that will occur in the pier. Density of concrete $24KN/m^3$ (5 marks)