THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

**DIPLOMA IN BUILDING & CIVIL ENGINEERING
DIPLOMA IN CIVIL ENGINEERING
DIPLOMA IN ARCHITECTURE**

EBC 2201: STRENGTH OF MATERIALS I

SPECIAL/SUPPLEMENTARY EXAMINATON

SERIES: OCTOBER 2011

TIME: 2 HOURS

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
- *Answer booklet*
- *Mathematical table/Calculator*

This paper consists of **FIVE** questions. Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **FOUR** printed pages

SECTION A (COMPULSORY)

Question 1

a) Define the following terms:
   i.   Working stress
   ii. Modulus of rigidity
   iii. Poisson's ratio
   iv. Strain   (8 marks)
b) Sketch and label a typical stress-strain graph for a mild steel rod that is tested to failure
                                                                        (5 marks)
c) Find the position of the centroid for the plane surface shown in figure 1 with respect to x-axis
                                                                        (7 marks)

Fig. 1

d) A beam is loaded as shown in figure 2. Sketch the following indicating critical values.
   i.   Shear force diagram
   ii. Bending moment diagram   (10 marks)

Fig. 2

SECTION B (Answer *any TWO questions from this section*)

Question 2

Figure 3 shows members of a frame. Using the tension coefficient method, determine the magnitude and nature of the forces acting on the members   (20 marks)

2.5m

Question 3

a) Figure 4 shows an axial load of 20MN acting a shaft.

Fig. 4

Determine:

    i.   Compressive stress
    ii.   Bearing stress at the base   (10 marks)

b) Use figure 5 to determine the following
    i.   Centre of area
    ii.   Ixx
    iii.   IYY
    iv.   y from the bottom   (10 marks)

Fig. 5

Question 4

A beam is loaded as shown in fig 6. Determine the positions of the points of centra flexure
(20 marks)

Fig. 6

Question 5

Fig. 7 shows a cross-section of a build-up beam. Determine the following:

   i.   position of the centroid along xx axis   (8 marks)
  ii.   second moment of area about xx axis   (12 marks)

                      25mm