



# 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

**END OF SEMESTER EXAMINATION**

SERIES: AUGUST/SEPTEMBER 2011

**TIME: 2 HOURS**

## **Instructions to Candidates:**

You should have the following for this examination

- *Answer booklet*
- *Scientific Calculator*

This paper consists of **FIVE** questions in **TWO** sections A & B

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

Maximum marks for each part of a question are as shown

This paper consists of **FOUR** printed pages

## SECTION A (COMPULSORY)

### Question 1

- a) Sketch the shear force and bending moment diagrams indicating the critical values for the beam loaded as shown in fig 1 (10 marks)

Fig 1

- b) Determine the positions of the points of contra flexure for the fig 1 of 1(a) (20 marks)

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

### Question 2

- a) (i) Define the following terms:

- (i) Poisson's ratio
- (ii) Modulus of rigidity
- (iii) Working stress

- (ii) Determine a fully labeled typical strain-strain graph for a mild steel rod tested to destruction (7 marks)

- b) Determine the following properties of the sectional shape shown in fig 2 (13 marks)

- (i) Centre of area
- (ii)  $I_{xx}$
- (iii)  $I_{yy}$
- (iv)  $\bar{y}$  bottom

Fig 2

### Question 3

Determine the magnitude of the forces in the members of the frame shown in fig 3 and the nature of the forces in each member using the tension co-efficient method. (20 marks)

Fig 3

### Question 4

- a) Fig 4 shows the cross-section of built up beam made of plates. Determine;
- (i) The position of the centroid along xx axis
  - (ii) The second moment of area about xx axis (20 marks)

Fig 4

**Question 5**

- a) Find the position of the centroid of the triangular area shown in fig 5 related to the y axis  
(10 marks)

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- b) Determine both the compressive stress in the shaft and the bearing stress in the base of the column shown in fig 6 due to an axial load of 10MN.  
(10 marks)

Fig 6