



TECHNICAL UNIVERSITY OF MOMBASA
**Faculty of Engineering &
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING
**DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE 12S)
DIPLOMA IN ARCHITECTURE (DA 12S)**

EBC 2203: STRENGTH OF MATERIALS I

**SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: OCTOBER/NOVEMBER 2013
TIME ALLOWED: 2 HOURS**

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Mathematical tables/Calculator*

This paper consists of **FIVE** questions.

Answer any **THREE** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One

A non-ferrous metal test piece, gauge length 50mm, original cross section 80mm² gave the following results in a tensile test:

Load (KN)	20	30	40	45	50	55	57.5	60
Extension (mm)	0.053	0.080	0.107	0.120	0.140	0.172	0.195	0.23

The test specimen failed at 65KN, with an extension of 6.86mm and a minimum diameter of fracture of 7.0mm

a) Plot a load extension graph (6 marks)

Determine:

b) The elastic modulus (4 marks)

c) The 0.1 per cent proof stress (4 marks)

d) The percentage elongation (2 marks)

e) The percentage area reduction (4 marks)

Question Two

A simply supported girder AG carries loads as shown in figure 1. Determine the forces in each member of the girder frame and state whether the member is in tension or compression.

NOTE: All sloping members are 60° to horizontal (20 marks)

60°

Question Three

The beam ABCD shown in figure 2 is simply supported at B and C. It is loaded at the free end as shown and carries a uniformly distributed load between B and C. An anti-clockwise moments is introduced at point D.

80KNm

- a) Calculate moments at salient points and draw the bending moment diagram (11 marks)
- b) Calculate the shear forces at salient points and draw the shear force diagram (7 marks)
- c) Determine the position of maximum bending moment (2 marks)

Question Four

The second moment of area about X-X axis & Y Y axis (20 marks)

X

Question Five

- a) Define the terms:
 - (i) Bending moment
 - (ii) Shear force
- b) A beam PQ 8m long carries a uniformly distributed load of 20KN/m run together with concentrated loads of 30KN at the left hand end P and 60KN at the right hand end Q. The supports of the beam are at the same level and 5m apart such that the reactions are equal.
 - (i) Determine the position of the supports of the beam from P
 - (ii) Calculate the values of the bending moments and shear forces at the critical points. Find the magnitude and position of the maximum B.M between the supports.

- (iii)** Sketch the bending moments and shear force diagrams indicating the values at the critical points.