



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

DEPARTMENT OF BUILDING & CIVIL ENGINEERING
**DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE 13M)
DIPLOMA IN ARCHITECTURE (DA 13M)**

EBC 2203: STRENGTH OF MATERIALS I

END OF SEMESTER EXAMINATION

SERIES: APRIL 2014

TIME ALLOWED: 2 HOURS

Instructions to Candidates:

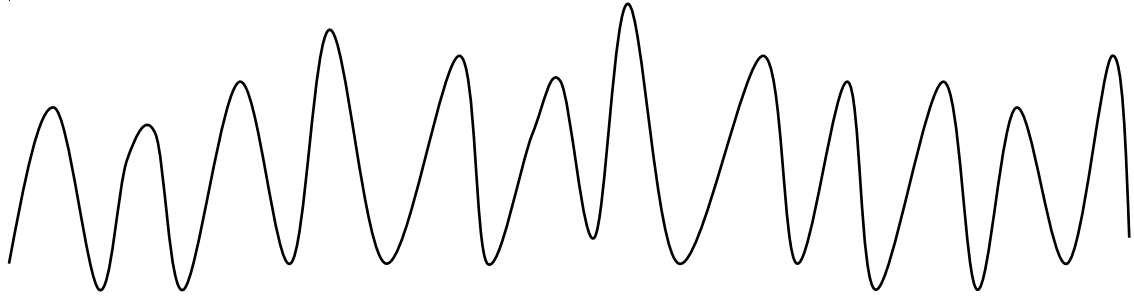
You should have the following for this examination

- Answer booklet
- Drawing Paper
- Drawing Instruments

This paper consists of **FIVE** questions. Answer any **THREE** questions of the **FIVE** questions
 All questions carry equal marks
 Maximum marks for each part of a question are as shown
 This paper consists of **THREE** printed pages

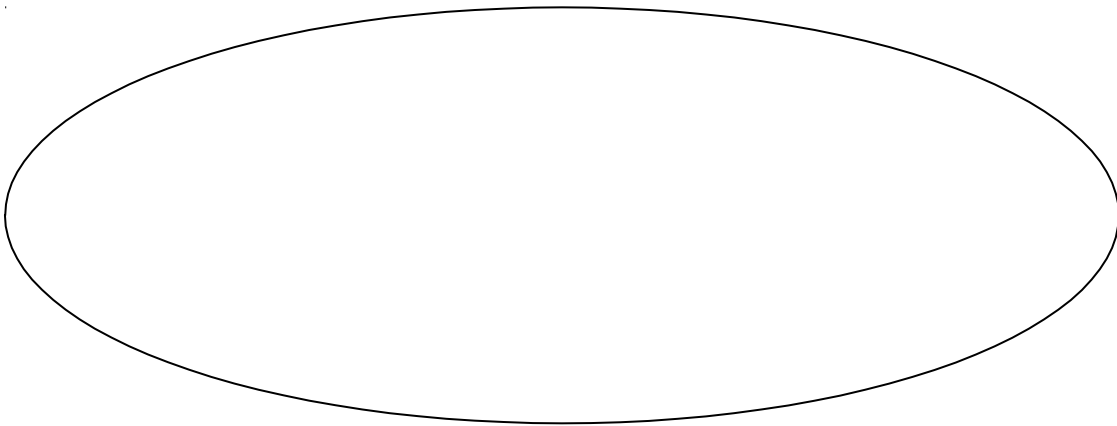
Question One

- a) Illustrate **THREE** common types of supports assumed in structural analysis. **(3 marks)**
- b) With reference to figure 1:
 (i) Determine the value of x if the mid-point of the beam is a point of contra flexure.
 (ii) Sketch the shear force and bending moments diagram indicating the value at critical points. **(17 marks)**



Question Two

Using the method of joint resolution, determine the magnitude and nature of the forces in members of the truss in figure 2. **(20 marks)**



Question Three

- a) Illustrate the variation of stress with strain for a mild steel rod subjected to an increasing tension force from zero to failure. **(6 marks)**
- b) Define the following terms:
 (i) Proof stress
 (ii) Elastic limit
 (iii) Poisson ratio **(6 marks)**

- (c) A steel bar of rectangular cross-section 150 x 60mm is subjected to an axial tension of 250KN. Determine the changes that result in the cross-sectional dimensions, given that $E = 200\text{KN/mm}^2$ and Poisson's ratio = 0.4 **(8 marks)**

Question Four

State Hooke's Law and comment briefly on its limitations (Figure 3) ABCD is a heavy square platform of side 2m long, and weighing, 5KN. It is hung horizontally by four vertical wires all of the same material, length and cross section. The wires are attached to the corners A, B, C and D. The centre of gravity of the platform is 0.8m from AB and 0.5m from AD. Calculate the tension in each wire, assuming that all the wires remain vertical and stretched within the elastic limit **(20 marks)**

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Question Five

Determine the position of the centre of area of the shape in figure 4 and calculate the values of I_{xx} and I_{yy} . **(20 marks)**

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