



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2015/2016 ACADEMIC YEAR**

SECOND YEAR FIRST SEMESTER EXAMINATIONS

**FOR THE DIPLOMA
IN
CIVIL AND STRUCTURAL ENGINEERING**

COURSE CODE: DCE 073

COURSE TITLE: THEORY OF STRUCTURES I

DATE: THURSDAY 10TH DECEMBER 2015 TIME: 2.00 – 4.00 PM

INSTRUCTIONS:

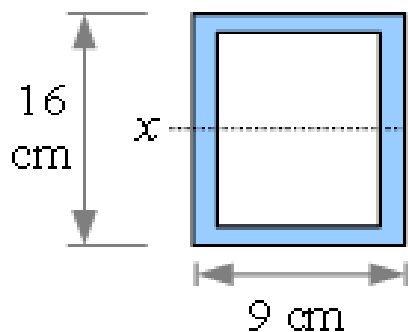
1. This paper consists of **FOUR** Questions
2. Answer Question One and any other **Two** Questions
3. Examination duration is **2 Hours**

MMUST observes **ZERO** tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over.

QUESTION 1 [Compulsory]

- a) Define the following terms as used in theory of structures
- (i) Elasticity
 - (ii) Malleability
 - (iii) Ductility
 - (iv) Plasticity
 - (v) Brittleness (5Marks)
- b) Define factor of safety (2 Marks)
- c) Define the following terms as used in theory of structures
- d) Define factor of safety (2 Marks)
- e) Explain the two distinct uses of factor of safety (4 Marks)
- f) List four types of forces and their respective effects on a structural member (8 Marks)
- g) Define the term beam as applied to civil engineering (2 Marks)
- h) A hollow rectangular beam has 1 cm thick walls, as shown. What is the moment of inertia about the x-x centroidal axis? 8mks



- i) Explain the effect of doubling the moment of inertia of a beam. (2 Marks)
- j) Describe the stress strain curve and Draw a stress strain graph of a ductile material (copper) and indicate the following
- i. Limit of proportionality
 - ii. Elastic limit
 - iii. Yield point
 - iv. Breaking point (8 Marks)

QUESTION 2

- a) A tensile bar stretches an amount $\delta = \frac{P \cdot L}{A \cdot E}$ where P is the applied load, L is the length of the bar, A is the cross-sectional area, and E is Young's Modulus. The bar has a

circular cross section. Given a load of 30 kN, a length of 80 cm, a diameter of 6 mm, and a Young's Modulus of 207 GPa, calculate:

- (i) The deflection in mm. (6 Marks)
- (ii) Stress exerted on the bar (3 Marks)
- (iii) Strain (3 Marks)
- b) State the Hooke's law (2 Marks)
- c) List three design codes or standards that have specified factor of safety in relation to structures (6Marks)

QUESTION 3

- a) Briefly explain four circumstances that should be taken into account while determining factor of safety 8 (Marks)
- b) A mass of 1000kg is exerted on a structural member and the area of contact is 50mm^2 . The structural member stretches with 2mm. If the structural member original length is 2M, calculate on the structural member
 - i) Stress (3 Marks)
 - ii) Strain (3 Marks)
 - iii) Young's modulus (Marks)
- iv) What type of force is being experienced by the structural member? explain (3 Marks)

QUESTION 4

- a) Describe three types of beams (3 Marks)
- b) Explain three types of load distribution on a beam (3 marks)
- c) A uniform 8kg metal bar of equal length to a diving board is placed on top of a diving board of 3m length. Draw the shearing forces and bending moments experienced by the diving board and Calculate
 - (i) Bending moment
 - (ii) Shear force. (14 marks)