



(University of Choice)

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

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2018/2019 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DIPLOMA

IN

CIVIL ENGINEERING AND WATER TECHNOLOGY

COURSE CODE: DCE 075

COURSE TITLE: SOIL MECHANICS

DATE: FRIDAY 1ST FEBRUARY 2019 TIME: 3.00PM – 5.00PM

INSTRUCTIONS:

1. Answer Question **ONE** and any other **THREE** Questions
2. Marks for each question are indicated in the parenthesis.
3. Examination duration is **2 Hours**

MMUST observes **ZERO** tolerance to examination cheating

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

SECTION A – COMPULSORY (25 MARKS)

Question One

- a) All soils originate directly or indirectly from solid rocks and these are classified according to their mode of formation. State;
- i. These **three** modes of formation (6 Marks)
 - ii. In each case give **two** examples (2 Marks)
- b) State **FOUR** factors that control the complex process of converting soils (4 Marks)
- c) There are four main groups of Clay minerals that may be identified depending on the stacking arrangement and the types of ion providing linkages. Name the **THREE** of them (3Marks)
- d) Define the following terms as used in soil mechanics:
- i. Bulk density (2 Marks)
 - ii. Void ratio (2 Marks)
 - iii. Porosity (2 Marks)
 - iv. Air- Voids Content (2 Marks)
 - v. Specific gravity (2 Marks)

SECTION B (45 MARKS)

Question Two (15 Marks)

- a) With the aid of a diagram explain a soil model in which three phases i.e. solid, Liquid and Gas appear in their proportions considering Unit solid volume, unit solid mass and unit total volume. (10 Marks)
- b) From the Unit solid volume soil model with proportions of masses and volumes show that porosity (n) is given by: $n = \frac{e}{1 + e}$ (6 Marks)

Question Three (15 Marks)

- a) State the Expression of the following
- i. Degree of saturation structure. (2 Marks)
 - ii. Percentage saturation (3 Marks)
- b) For a soil having a void ratio of 75% and a percentage saturation of 0.85.
- i. Determine the Porosity and Air-Voids ratio. (5 Marks)
 - ii. For the case above, determine the porosity and Air-Voids ratio when the soil is saturated. (5 Marks)

Question Four (15 Marks)

- a) Since soil consists of discrete particles, the pore spaces between the particles are all interconnected such that water flows freely within the soil mass. State the Bernoulli's equation with the three head components. (5 Marks)
- b) In a saturated condition, one dimension flow is governed by Darcy's law.
- i) State the Darcy's law (2 marks)
 - ii) Illustrate one dimensional flow in soil using a well labelled diagram (5 Marks)
 - iii) Show that $q = Aki$ (3 Marks)

Question Five (15 Marks)

- a) Describe the term Compaction as used in soil mechanics (2 Marks)
- b) State **THREE** main objective for soil compaction (3 Marks)
- c) The dry density in the field is achieved after compaction and must be compared with the maximum values obtained in the laboratory. State **FIVE** methods used to measure field density. (5 Marks)
- d) Effectiveness of compaction is depended on various factors. State **FIVE** factors. (5 marks)