



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

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS 2022/2023 ACADEMIC
YEAR**

SECOND YEAR SECOND SEMESTER EXAMINATIONS

**FOR THE DEGREE
OF
BACHELOR OF SCIENCE
IN CIVIL & STRUCTURAL ENGINEERING**

COURSE CODE: CSE 222

COURSE TITLE: SOIL MECHANICS I

DATE: 19TH APRIL 2023

TIME: 8 – 10 A.M

INSTRUCTIONS:

1. This paper contains FOUR questions
2. Question ONE (1) is Compulsory
3. Attempt a total of Three (3) questions in this booklet.
4. Marks for each question are indicated in the parenthesis.

Examination duration is 2 Hours

MMUST observes ZERO tolerance to examination cheating

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

SECTION A: Answer ALL questions [30 Marks]

Question One

- a. Differentiate residual from transported soils. (4 Marks)
- b. The engineering behavior of soils is influenced by soil structure to varying degrees. Giving examples, illustrate the following types of soil structures. (9 Marks)
 - i. Single grained structure
 - ii. Flocculent structure
 - iii. Honeycomb structure
- c. Using a diagram, illustrate the phase relationships for a soil mass and determine the three volumetric ratios. (12 Marks)
- d. Define soil compaction and state its importance in engineering practice. (5 Marks)

SECTION B (Answer any TWO questions)

Question two (20 Marks)

- i. A sample of wet silty clay has a mass of 126Kg. The following data were obtained from laboratory tests on the sample; Wet density, $\rho_t = 2.1 \text{ g/cm}^3$, $G = 2.7$, Water content, $w = 15\%$. Determine; (i) dry density, (ii) porosity, (iii) void ratio, (iv) degree of saturation. (8 Marks)
- ii. The results of a sieve analysis were as tabulated below.

Sieve size (mm)	Mass Retained(g)
10	0.0
6.3	5.5
2	25.7
1	23.1
0.6	22.0
0.3	17.3
0.15	12.7
0.063	6.9

2.3g passed through the 63 μm sieve. You are required to;

- i. Calculate the percentage retained and percentage passing on each sieve. (10 Marks)
- ii. Discuss the significance of sieve analysis (2 Marks)

Question Three (20 Marks)

A cone penetrometer test was carried out on a sample of clay with the following results;

Cone penetration (mm)	16.1	17.6	19.3	21.3	22.6
Water content (%)	50.0	52.1	54.1	57.0	58.2

The results from the plastic limit test were;

Test No.	Mass of tin (g)	Mass of wet soil + tin (g)	Mass of dry soil + tin (g)
1	8.1	20.7	18.7
2	8.4	19.6	17.8

Determine the liquid limit, plastic limit and the plasticity index of the soil.

Question Four (20 Marks)

- i. The type of compaction method to be adopted in the field depends on the soil type and required compaction level. Outline any FIVE types of compaction equipment used in the field, stating when they are most suitable. **(10 Marks)**

- ii. With the aid of diagrams, state the objective of the following soil mechanics tests and explain briefly how they are performed.
 - i. Cone penetrometer test **(5 Marks)**
 - ii. Sieve analysis test **(5 Marks)**

