



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

**UNIVERSITY EXAMINATIONS FOR THE DIPLOMA IN CIVIL ENGINEERING
(TVET)**

1ST YEAR 2ND SEMESTER 2023/2024 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TDE 2221

COURSE TITLE: MATERIAL TESTING

EXAM VENUE: STREAM: Dip CIVIL ENGINEERING

DATE: ../04/2024 EXAM SESSION:

DURATION: 2 HOURS

Instructions

- 1. Answer ALL questions in Section A (Compulsory) and ANY other three questions in Section B**
- 2. Candidates are advised not to write on question paper**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**
- 4. Indicate your course particulars IN a well prepared title block (scale to be used is 1:1)**

Section A (Compulsory) (40 Marks)

1. State Four ways in which engineering soils can be classified (4 Marks)

2. Distinguish between fine sand and clay using three observable (field) examples

(6 Marks)

3. Name any two soils based on unified classification system (2 Marks)

4. Describe how the following rocks are formed

i. Metamorphic rocks

ii. Igneous rocks

iii. Sedimentary rocks (6 Marks)

5. State any two uses of engineering soils (2 Marks)

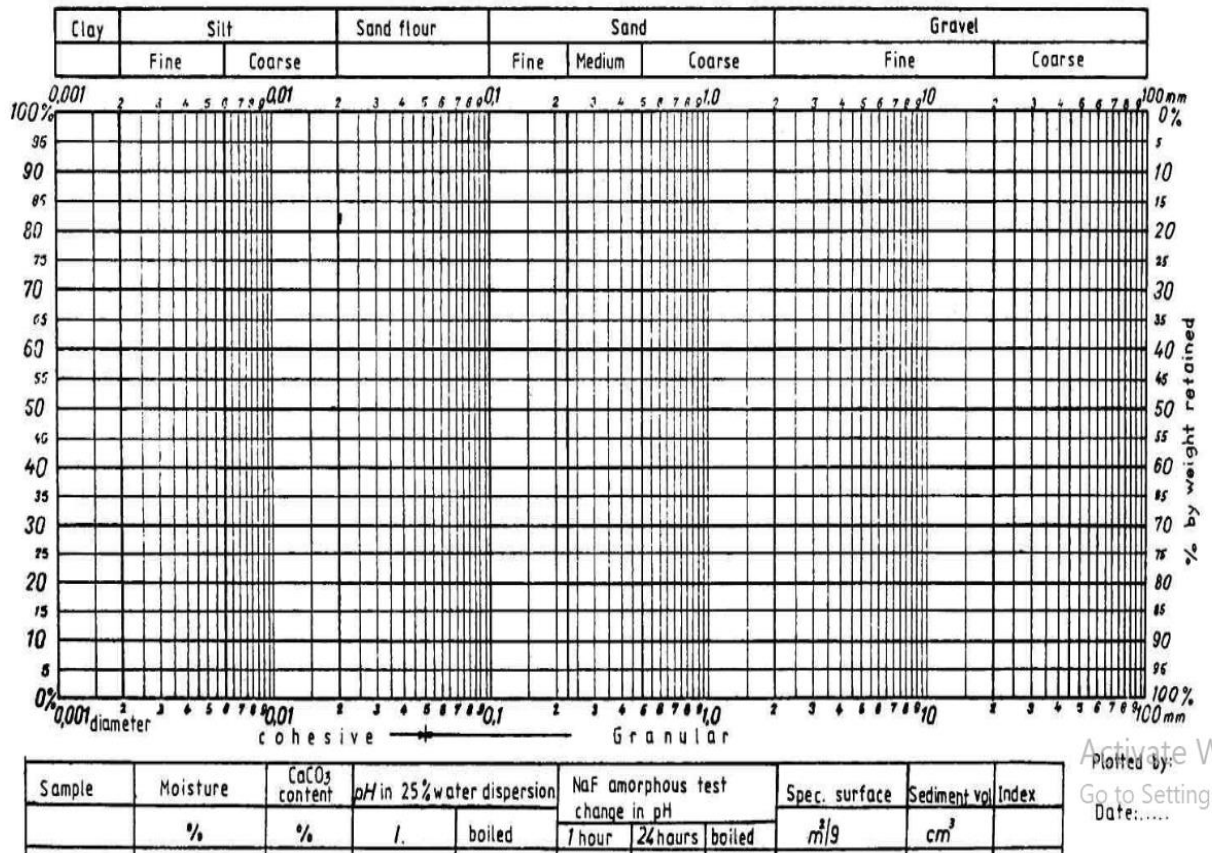
6. The results of a particle size analysis of a soil are given in the following table.

Sieve no. mm 9.53 4 10 20 40 100 200

% finer 100 89.8 70.2 62.5 49.8 28.6 4.1

(a) Classify the soil according to British classification (BS) and unified soil classification system (USCS)

(b) Is this soil a good foundation material? Justify your answer (20 Marks)



Section B (Answer any three questions)

(60 Marks)

7. With the aid of sketches, describe the procedures of carrying out sieve analysis test (20 Marks)
8. Describe the oven dry method of carrying out moisture content test on a soil sample (20 Marks)
9. The results of a sieve analysis of a soil were as follows:

| Sieve size (mm) | Mass retained (g) | Sieve size (mm) | Mass retained (g) |
|-----------------|-------------------|-----------------|-------------------|
| 20 | 0 | 2 | 3.5 |
| 12 | 1.7 | 1.4 | 1.1 |
| 10 | 2.3 | 0.5 | 30.5 |
| 6.3 | 8.4 | 0.355 | 45.3 |
| 4.75 | 5.7 | 0.180 | 25.4 |
| 2.8 | 12.9 | 0.075 | 7.4 |

The total mass of the sample was 147.2 g.

(a) Plot the particle-size distribution curve and describe the soil. Comment on the flat part of the curve

(b) State the effective grain size (20 Marks)

10. a) With the aid of sketches, describe any two phase systems of soil (6 Marks)

b) Define the following properties of soil stating their symbols

i. Void ratio

ii. Porosity

iii. Degree of saturation (6 Marks)

c) Prove from basic principle that (4 Marks)

$$n = \frac{e}{1+e}$$

d) A soil sample having a volume of 1m³ contains 0.3m³ of air and 0.25m³ of water, calculate the degree of saturation and the porosity of the soil sample (4 Marks)

