



# TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF ENGINEERING AND TECHNOLOGY  
DEPARTMENT OF BUILDING & CIVIL ENGINEERING

## UNIVERSITY EXAMINATION FOR:

DIPLOMA IN BUILDING AND CIVIL ENGINEERING  
(INSTITUTION BASED EXAMINATION)

### EBC 2205: SOIL MECHANICS I

**SERIES: MARCH 2017**

**TIME: 2 HOURS**

#### **Instructions to Candidates**

You should have the following for this examination

-Answer Booklet, examination pass and student ID

-Pocket calculator

This paper consists of **FIVE** questions. Attempt any **THREE** questions

**Do not write on the question paper**

**Mobile Phones are NOT allowed inside the examination room**

#### **QUESTION ONE**

- (a) Differentiate between residual and transported soil. (3 Marks)
- (b) With aid of neat sketches, show the FOUR clay structures. (8 Marks)
- (c) A sample of soil,  $1/1000 \text{ M}^3$  in volume, weighted in its natural state 1.73 Kg, the degree of saturation being 61.6%. After drying in the oven at  $105^\circ\text{C}$ , the sample weighed 1.44 Kg.  
Find: -
- (i) The specific gravity of the solids
- (ii) The natural moisture content

(iii)The void ratio (9 Marks)

## QUESTION TWO

(a).Outline the particle size distribution test for coarse grained soil. (5 Marks)

(b).The results of a dry-sieving test are given below. Plot the particle-size distribution curve and give a classification for the soil.

|                               |      |      |      |     |     |     |      |      |    |
|-------------------------------|------|------|------|-----|-----|-----|------|------|----|
| <b>Sieve size (mm/micron)</b> | 3.35 | 2.00 | 1.18 | 600 | 425 | 300 | 212  | 150  | 6  |
| <b>Mass retained</b>          | 0    | 2.6  | 12.5 | 57  | 62  | 34  | 18.7 | 12.7 | 14 |

(15 Marks)

## QUESTION THREE

(a) Briefly explain **THREE** main engineering problems where permeability is important. (5 Marks)

(b) Calculate total flow in ground where a sheet pile wall has been driven given the following data:

- Head causing flow = 5.0 m

- Number of equipotential drops = 14

- Number of flow lines = 6

- Duration = 1 day (5 Marks)

(c) Outline the variable head permeameter test. (6 Marks)

(d) Explain TWO factors which affect permeability. (4 Marks)

## QUESTION FOUR

(a).Outline THREE factors that affect soil compaction. (6 Marks)

(b) Standard Proctor compaction tests carried out on a sample of soil gave the following results:

|  |      |      |      |      |      |
|--|------|------|------|------|------|
| <b>Bulk Density (Kg/m<sup>3</sup>)</b> | 2050 | 2120 | 2150 | 2145 | 2135 |
| <b>Moisture Content (%)</b>            | 12.5 | 14.5 | 15.5 | 17.0 | 17.8 |

Plot the compaction curve and hence find the compaction parameters. Use graph paper provided. (14 Marks)

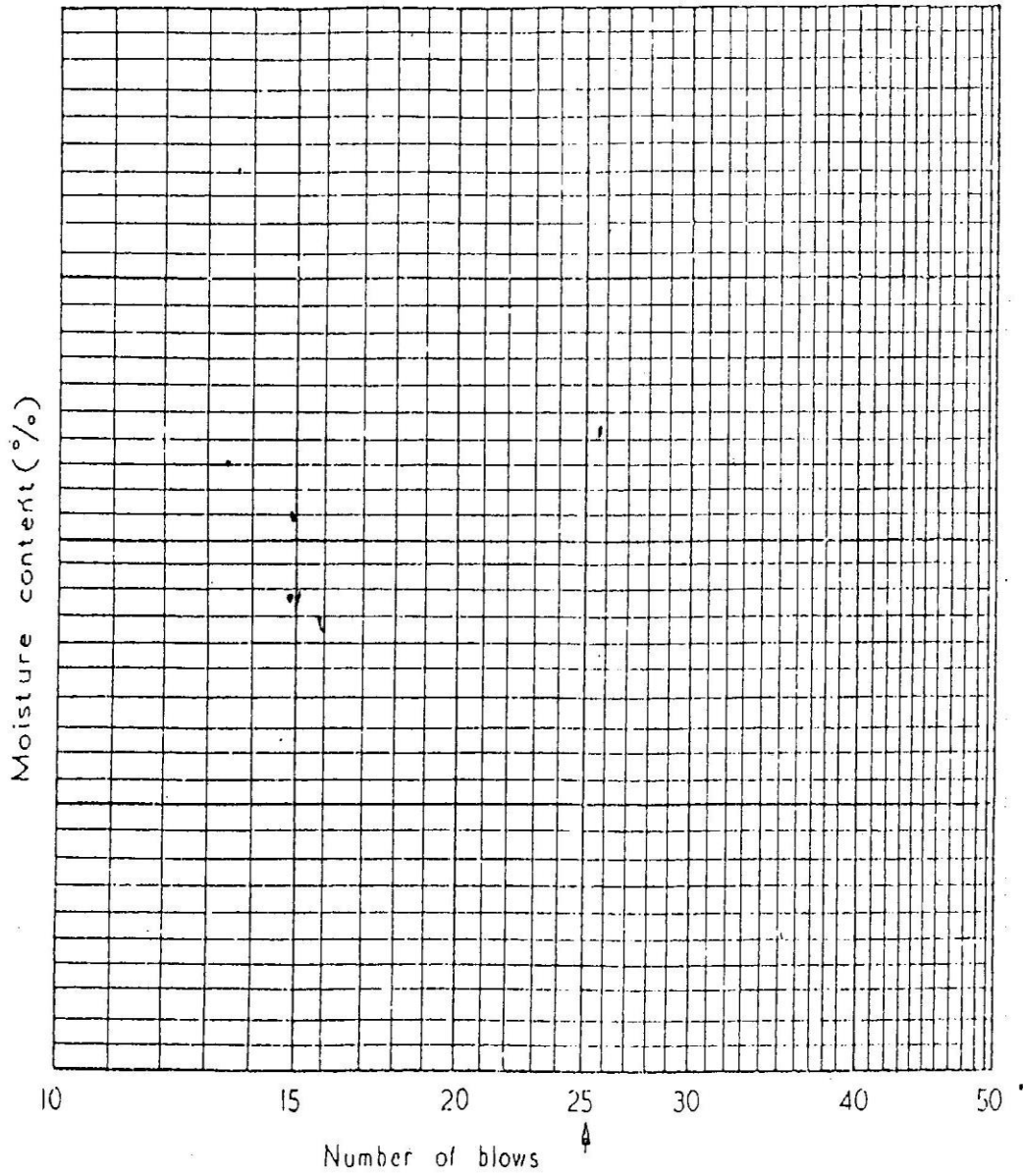
## QUESTION FIVE

- (a) Briefly describe the laboratory procedure for carrying out sand replacement method for bulk density. (10 Marks)
- (b) In a liquid limit test on a fine-grained soil, using a cone penetrometer, the following results were recorded:

|                        |      |      |      |      |      |
|------------------------|------|------|------|------|------|
| Cone Penetrometer (mm) | 16.0 | 18.0 | 20.0 | 22.0 | 24.0 |
| Moisture Content (%)   | 32.5 | 42.5 | 52.0 | 62.0 | 70.0 |

In a plastic limit test on the same soil the plastic limit was found to be 25%. Determine the liquid limit and plasticity index of the soil and classify it according to the British Soil Classification System. Use graph paper provided and Figure 1. (10 Marks)

†Type of test: Natural moisture content (•), Liquid limit (—)



Results. Liquid limit (LL):

Plastic limit (PL):

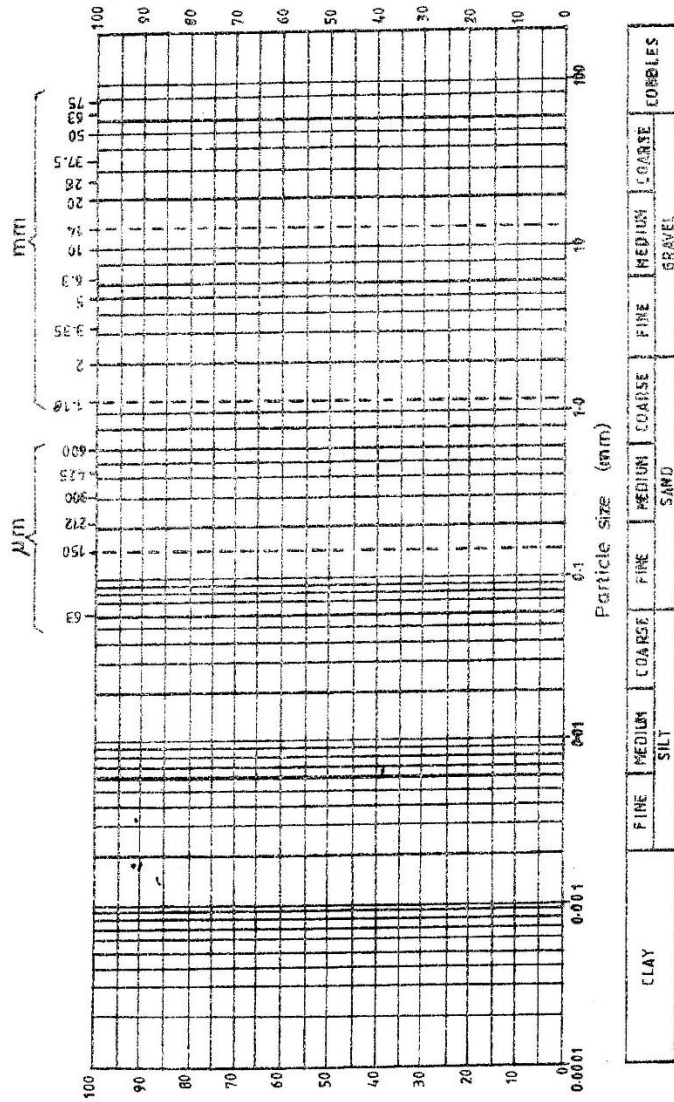
Plasticity index (PI):

Soil classification

Fig-1

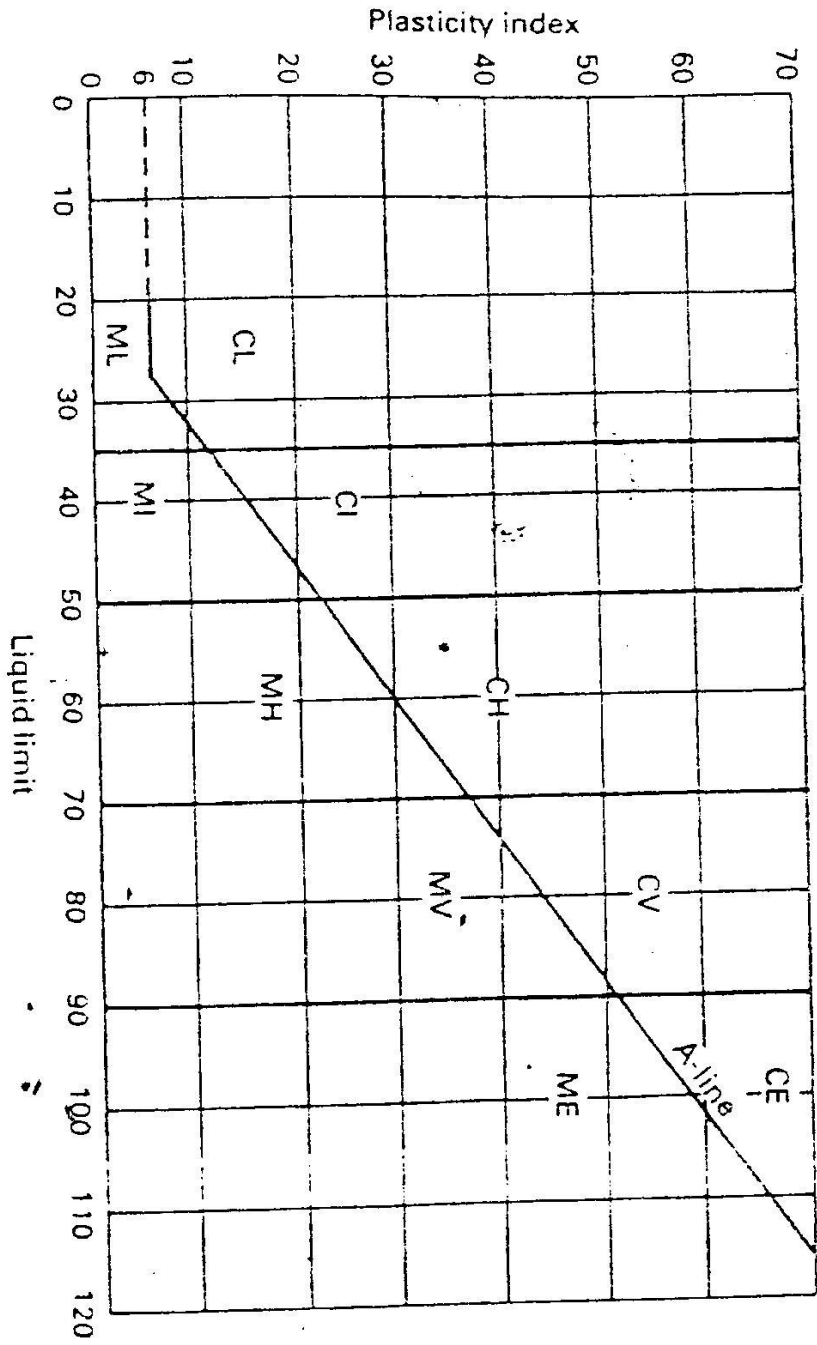
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Chart 1



Particle size distribution chart

Name \_\_\_\_\_  
 Index No. \_\_\_\_\_  
 Paper No. \_\_\_\_\_



Plasticity chart: British system. (BS 5930: 1981)

FIG. 2