



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING

EBC 3118: SOIL MECHANICS I

END OF SEMESTER EXAMINATION

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Scientific calculator*
- *2No: Graph Papers*
- *Particle size Distribution Chart*

This paper consists of **FIVE** questions

Answer question **ONE**, which is compulsory and any other **TWO** questions

Maximum marks for each part of question are clearly shown

This paper consists of **FOUR** printed pages

SECTION A (COMPULSORY)

Question 1

- a) (i) Define the term moisture content.
- (ii) In a moisture content test for a certain soil, the following data was recorded as shown in table 1.0

Table 1.0

Mass of empty tin (g)	16.24	16.18
Tin + Wet Soil (g)	29.30	27.71
Tin + Dry Soil (g)	26.96	25.66

- Calculate the moisture content of the soil (6 marks)
- b) Derive the expression of dry density in terms of density of water, particles specific gravity and void ratio (6 marks)
- c) Explain the **FOUR** main areas where soil mechanics is of great importance (8 marks)
- d) A sheet pile driven into a soil with a coefficient of permeability of 0.0044mm/s retains water on one side to a height of 4.2m. On plotting the flow net it was observed that the number of equipotential drops and flow channels was 8 and 10 respectively. Compute the seepage loss in litres/day/metre (5 marks)
- e) Briefly describe the sieve test (5 marks)

SECTION B (Answer any TWO questions)

Question 2

- a) Outline **FOUR** factors which affect compaction (8 marks)
- b) The following results were obtained from a compaction test

Table 2.0

Moisture content (%)	13	14	15	16
Bulk density (kg/m ³)	2043	2100	2120	2117

- i) Plot the compaction curve
- ii) Determine the compaction parameters (12 marks)

Question 3

- a) Briefly describe the shear box test (9 marks)
- b) The data in Table 3 refers to triaxial tests performed on an undisturbed soil samples. The load dial calibration factor is 1.4N per division. Each sample is 75mm long and 37.5mm diameter. Plot a graph to determine the value of apparent cohesion and the angle of internal friction for the soil (11 marks)

Table 3.0

Test	Cell pressure (kN/m ²)	Axial load dial reading (divisions) at failure
1	50	65
2	150	105
3	250	146

Question 4

- a) Briefly describe the variable head permeameter test (6 marks)
- b) Explain **FOUR** factors that influence permeability (8 marks)
- c) A pumping test was carried out for determining coefficient of permeability of soil in place. A well of diameter 40cm was drilled up to impermeable stratum. The depth of the water bearing stratum was 9m. The yield from the well was 5m³/min at a steady draw-down of 5m. Determine the coefficient of permeability in m/day if the observed radius of influence was 160m (6 marks)

Question 5

- a) Briefly describe the liquid limit test using Casagrande apparatus (6 marks)
- b) The results of a sieve analysis on a soil sample are given in Table 4. If the total mass of the sample was 311g, plot the particle size distribution curve on Chart 1. From the curve, determine;
- (i) The effective size and uniformity coefficient
- (ii) Describe the soil (14 marks)

Table 4.0

Sieve size (mm)	Mass Retained (g)
50	0
37.5	15.5
20	17
14	10
10	11
6.3	33

3.35	114.5
1.18	63.3
0.6	18.2
0.15	17
0.0063	10.5