THE TECHICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING (HDBC 12S)

EBC 3118: SOIL MECHANICS I

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: JULY 2013
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination

- *Answer Booklet*
- *Scientific Calculator*
- *2No. Graph Papers*
- *Chart I*

This paper consists of **FIVE** questions.
Answer any **THREE** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One

a) From basic principles, derive the equation for determining the moisture content in terms of void ratio, degree of saturation and particle specific gravity. **(8 marks)**

b) A clay soil has a bulk unit weight of 19.4KN/m^3 and a moisture content of 24.3%. The specific gravity of the soil is 2.75. Determine the following:
- **(i)** Dry unit weight
- **(ii)** Void ratio
- **(iii)** Degree of saturation
- **(iv)** Saturated unit weight assuming that the void ratio remains constant. **(12 marks**)

Question Two

a) Outline the cone penetrometer method of determining of liquid limit. **(6 marks**)

b) Table 1 shows results of a sieve analysis test on soil

Retained on Sieve Size (mm)	**Mass Retained**
20	0
12.5	1.7
10	2.3
6.3	8.4
5.6	5.7
2.8	12.9

Retained on Sieve Size (mm)	**Mass Retained**
2	3.5
1.4	1.1
0.5	30.5
0.355	45.3
0.180	25.4
0.063	7.4

(i) Plot the grading curve on Chart 1.
(ii) State the effective grain size **(14 marks)**

Question Three

a) Outline **TWO** factors which affect compaction. **(6 marks)**

b) Table 2 shows results obtained from a compaction test.

Moisture Content (5)	13	14	15	16
Bulk Density (kg/m^3)	2043	2100	2110	2117

Use the data to:
(i) Plot the compaction curve
(ii) Plot the 0% and 5% air voids lines
(iii) Determine the compaction parameters **(14 marks)**

Question Four

a) Outline **FOUR** factors that influence permeability. **(8 marks)**

b) (i) Explain the term 'critical hydraulic gradient'

(ii) Distinguish between flow lines and equipotential lines. **(5 marks)**

c) A variable head was made on a soil sample of length 350mm. The water level in a 30mm diameter standpipe fell from 1650mm to 1100mm after 60 seconds. Determine the coefficient of permeability of the soil if the diameter of the sample was 80mm. **(7 marks)**

Question Five

a) Define the following terms as applied in shear strength:
(i) Principal plane
(ii) Principal stress **(2 marks)**

b) In a series of unconsolidated undrained triaxial tests on specimens of a fully saturated clay, the following results were obtained at failure. Determine the values of shear strength parameters. **(8 marks)**

Table 3

ALL ROUND PRESSURE (KN/m^2)	200	400	600
PRINCIPAL STRESS DIFFERENCE (KN/m^2)	222	218	220

c) Outline the procedure for carrying out Vane test **(5 marks)**

d) Explain the TWO shear strength parameters **(5 marks)**