



THE TECHNICAL 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 19.4 kN/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)	204	2100	2110	2117
	3			

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/m²)	200	400	600
PRINCIPAL STRESS DIFFERENCE (KN/m²)	222	218	220

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

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