



# 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  
**SPECIAL/SUPPLEMENTARY EXAMINATION**

SERIES: JUNE/JULY 2012

**TIME: 2 HOURS**

## **Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*
- *Scientific Calculator*
- *Chart 1*
- *2 No. Graph paper*

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

Maximum marks for each part of a question are clearly shown

This paper consists of **THREE** printed pages

**Question 1 (20 marks)**

- a) (i) Explain the term shear strength  
(ii) Explain the **TWO** shear strength parameters (6 marks)
- b) In an undrained triaxial test on the specimens of a certain soil taken from a depth of 2m below ground level the following results were obtained:

**Table 1**

Cell Pressure (KN/m <sup>2</sup> )	Deviator Stress (KN/m <sup>2</sup> )
200	221
400	362
600	505

- Using the graph paper provided, draw the Mohr's diagram and determine the shear strength parameters (9 marks)
- c) Briefly describe the unconfined compression test (5 marks)

**Question 2 (20 marks)**

- a) State **FIVE** factors upon which properties of soils are derived. (7½ marks)
- b) A variable head was made on a soil sample of length 350m. The water level in a 30mm diameter stand pipe fell from 1650mm to 1100mm after 60 seconds. Determine the coefficient of permeability of the soil if the diameter of the sample was 80mm. (7½ marks)
- c) Explain the following terms as applied in soil mechanics:  
(i) Degree of saturation  
(ii) Bulk unit weight  
(iii) Porosity (5 marks)

**Question 3 (20 marks)**

- 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 2. If the total mass of the sample was 311g, plot the particle size distribution curve on Chart 1. Determine the following:  
(i) The values of D10 and Cu  
(ii) The description of the soil (14 marks)

**Table 2**

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
0.063	10.5

**Question 4 (20 marks)**

- a) Outline the standard compaction test (7 marks)
- b) A standard proctor compaction test carried out on a sandy clay of specific gravity 2.55 gave the results shown in Table 3.

**Table 3**

Bulk Density (KG/m <sup>3</sup> )	2187	2160	2155	2140	2125	2058
Moisture Content (%)	22	18.2	16.8	15.1	14.5	12.5

- (i) Using the graph paper provided, determine the compaction parameters
- (ii) Compute the moisture content if the soil were compacted at 100% saturation to the maximum dry density. (13 marks)

**Question 5 (20 marks)**

- a) (i) Explain the term moisture content
- (ii) In a moisture content test on a sandy clay, the following data was recorded as shown in table 4

**Table 4**

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

- 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)