



**THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE**

(A Constituent College of JKUAT)

***Faculty of Engineering and  
Technology***

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

***Institutional Based Programme***

**DIPLOMA IN BUILDING & CIVIL ENGINEERING**

EBC 2216: 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*
- *Graph paper (2No)*
- *Fig 1 & 2*

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

**SECTION I (Attempt ALL questions – 30 marks)**

**Question 1 (20 marks)**

- a) Explain the **FOUR** factors that influence permeability (8 marks)
- b) Briefly describe the pumping test (5 marks)
- c) A variable head was made on a soil sample of length 350mm. The water level in a 30mm diameter 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 (7 marks)

**Question 2 (20 marks)**

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

**Table 1**

<b>Moisture Content (%)</b>	13	14	15	16
<b>Bulk Density (kg/m<sup>3</sup>)</b>	2043	2100	2120	2117

- (i) Plot the compaction curve on the graph paper provided
- (ii) Determine the compaction parameters (12 marks)

**Question 3 (20 marks)**

- a) A clay soil has a bulk unit weight of 19.4KN/m<sup>3</sup> and a moisture content of 24.3%. If the specific gravity of the soil particles is 2.75, determine:
- (i) Dry unit weight
- (ii) Void ratio
- (iii) Degree of saturation
- (iv) Saturated unit weight assuming that the voids remain constant (12 marks)
- b) In a series of consolidated-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 2**

<b>Cell pressure (KN/m<sup>2</sup>)</b>	200	400	600
<b>Principal stress difference (KN/m<sup>2</sup>)</b>	222	218	220

**Question 4 (20 marks)**

- a) (i) Outline the importance of soil mechanics in regard to construction of building.
- (ii) State the **FIVE** main factors upon which soil characteristics depend (8 marks)

b) The results of a sieving analysis of a soil were as follows:

**Table 3**

Sieve size (mm)	Mass retained		Sieve size (mm)	Mass retained
20	0		2	3.5
12.5	1.7		1.4	1.1
10	2.3		0.5	30.5
6.3	8.4		0.355	45.3
5.6	5.7		0.180	25.4
2.8	12.9		0.063	7.4

The total weight of the sample was 147.29. Plot the particle-size distribution curve on chart 1 and classify the soil. (12 marks)

**Question 5 (20 marks)**

a) (i) Briefly describe the liquid limit test using Casagrande apparatus

(ii) The results obtained when an organic soil of plastic limit 27% was tested using Casagrande apparatus were as shown in table 4.

**Table 4**

Test Number	1	2	3
Moisture Content (%)	50.66	50.38	50.12
Number of Blows	12	18	27

- Determine liquid limit of the soil tested. Use figure 1.
- Using the results obtained and figure 2, classify the soil (12 marks)

b) Briefly describe the shear box test (8 marks)