



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

Moisture Content (%)	13	14	15	16
Bulk Density (kg/m³)	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/m³ 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

Cell pressure (KN/m²)	200	400	600
Principal stress difference (KN/m²)	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)