



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

DIPLOMA IN ARCHITECTURE (DA 10A)
DIPLOMA IN CIVIL ENGINEERING (DC 10A)
DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBC 10A)

EBC 2216: SOIL MECHANICS I

END OF SEMESTER EXAMINATION

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Scientific Calculator*
- *3 No. graph papers*
- *Fig 1 casagrande chart*
- *Fig 2 (Plasticity Chart)*
- *Fig 3 (Particle size Distribution Chart)*

This paper consists of **FIVE** questions

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **FOUR** printed pages

SECTION A (COMPULSORY)

Question 1

- 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) A laboratory test was carried out on a soil sample of specific gravity 2.65. The following results were obtained
- Mass of wet soil = 20.6KN
 - Mass of dried soil = 17.0KN

Calculate:

- (i) Saturated density of the sample
 - (ii) Porosity
 - (iii) Void ratio
 - (iv) Degree of saturation
 - (v) Critical hydraulic gradient (11 marks)
- c) (i) Define the term liquid limit
- (ii) The results obtained when an inorganic soil of plastic limit 27% was tested using Casagrande Apparatus were as shown in: Table 1

Table 1

TEST NUMBER	1	2	3
MOISTURE CONTENT (%)	50.65	50.38	50.12
NUMBER OF BLOWS	12	18	27

- Using fig 1 provided and results from Table 1, determine the liquid limit
 - Using the results obtained and fig 2 (plasticity chart), determine the group symbol for the soil tested (8 marks)
- d) State **THREE** factors that affect soil compaction (3 marks)

SECTION B (Answer any TWO questions)

Question 2

- a) Outline the sieve analysis test (6 marks)
- b) The results of a sieving analysis of a soil were as follows:

Table 2

Retained on sieve size (mm)	Weight retained (g)	Retained on sieve size (mm)	Weight retained (g)
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 147.2g.

- (i) Plot the particle-size distribution curve on fig 3 and; describe the soil
- (ii) State the effective grain size (14 marks)

Question 3

- 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 following results.

Table 3

Bulk Density (kg/m ³)	2187	2160	2155	2140	2125	2058
Moisture content (%)	22	18.2	16.8	15.1	14.5	12.5

- i) Using graphical method, determine compaction parameters
- ii) Calculate the moisture content if the soil were compacted at 100% saturation to the maximum dry density (13 marks)

Question 4

- a) Explain **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 stand pipe fell from 1650mm to 1100mm after 60seconds. Determine the coefficient of permeability of the soil if the diameter of the sample was 80mm (7 marks)

Question 5

a) (i) Define the term shear strength

(ii) Define the **TWO** shear strength parameters

(6 marks)

b) In an undrained triaxial test on the specimens of a sandy clay soil taken from a depth of 3m below ground level the following results were obtained.

Table 4

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

Draw the Mohr's diagram and determine the shear strength parameters

(9 marks)

c) Briefly describe the unconfined compression test

(5 marks)