THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBC 11)
DIPLOMA IN CIVIL ENGINEERING (DC 11)

EBC 2216: SOIL MECHANICS I

END OF SEMESTER EXAMINATION
SERIES: AUGUST 2012
TIME: 2 HOURS

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
- *Answer Booklet*
- *Scientific Calculator*
- *Graph Papers (2No)*
- *Casagrande Chart*
- *Plasticity Chart*

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 (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/m^3)	2043	2100	2120	2117

    i) Using the data, plot the compaction curve on graph paper.
    ii) Determine the compaction parameters. **(12 marks)**

Question Two (20 marks)

a) In an undrained triaxial test on three specimens of a certain soil taken form a depth of 3m below ground level, the following results were obtained.

TABLE 2

CELL PRESSURE (KN/m^2)	DEVIATOR STRESS (KN/m^2)
200	221
400	362
600	505

    i) Using a graph paper, draw Mohr's diagram.
    ii) Determine the shear strength parameters
    iii) Obtain the Coulomb's equation for the soil, given density of soil as 2000kg/m^3
                                                          (10 marks)

b) Outline the procedure for carrying out Vane Test. **(5 marks)**

c) A shear vane apparatus was used to determine the undrained shear strength of a silt. The plates of the apparatus measured 12.7mm in height and 12.5mm in width. A torque of 0.45 x 10^{-3}KNm was applied. Calculate the undrained shear strength of the soil. **(5 marks)**

Question Three (20 marks)

a) (i) Briefly explain the importance of soil mechanics in regard to construction of buildings.
    (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 Dry soil = 17.0KN

Calculate:

i)   Saturated density of the sample
ii) Porosity
iii) Void ratio
iv) Degree of saturation
v) Critical hydraulic gradient   **(12 marks)**

Question Four (20 marks)

a) The results obtained when an organic soil of plastic limit 27% was tested using Casagrande apparatus were as shown in table 3.

TABLE 3

TEST NO.	1	2	3
MOISTURE CONTENT (%)	50.65	50.38	50.12
NUMBER OF BLOWS	12	18	27

    i) Plot the flow diagram on Casagrande Chart.
    ii) Using results in (i) and plasticity chart, classify the soil   **(6 marks)**

b) The results of a sieve analysis on a soil sample are given in Table 4. If the total mass of the sample was 311g, plot the particle size distribution curve on the grading chart. From the curve determine:
i)   The effective size
ii) The uniformity coefficient
iii) Describe the soil and give the group symbol of classification.   **(14 marks)**

TABLE 4

Sieve Size (mm)	Mass Retained (g)
50	0
37.5	15.5
20	17.0
14	10.0
10	11
6.3	33
3.35	114.5
1.18	63.3
0.60	18.2
0.15	17.0
0.063	10.5

Question Five (20 marks)

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 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)**