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 AND CIVIL ENGINEERING (DBC II)
DIPLOMA IN CIVIL ENGINEERING (DC II)

EBC 2216: SOIL MECHANICS I

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: OCTOBER 2012
TIME: 2 HOURS

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

This paper consists of **FIVE** questions. Answer question 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) Briefly describe the variable head permeameter test **(6 marks)**

b) Explain **FOUR** factors that influence permeability. **(8 marks)**

c) A pumping test was carried out for determining coefficient of permeability of soil in place. A well of diameter 40cm was drilled up to impermeable stratum. The depth of the water bearing stratum was 9m. The yield from the well was 5m^3/min at a steady draw-down of 5m. Determine the coefficient of permeability in m/day if the observed radius of influence was 160m. **(6 marks)**

Question Two (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 following results:

Table 1:

Bulk Density (Kg/m3)	2187	2160	2155	2140	2125	2058
Moisture Content (%)	22	18.2	16.8	15.1	14.5	12.5

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

Question Three (20 Marks)

a) (i) Define the term 'moisture content'
(ii) Table 2 shows data recorded during a moisture content test:

Table 2:

Mass of Tin (Empty) g	16.24	16.18
Tin + Wet Soil (g)	29.30	27.71
Tin + Dry Soil (g)	26.96	25.66

Calculate the moisture content of the soil tested. (6 marks)
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)

Question Four (20 marks)

a) Define the following terms as applied to shear strength:

i) Principal plane
ii) Principal stress   (2 marks)

b) In a series of unconsolidated-undrained triaxial tests on specimens of a fully saturated clay, the following results were obtained at failure.

Table 3:

All Round Pressure (KN/m²)	200	400	600
Principal Stress Difference (KN/m²)	222	218	220

Determine the values of shear strength parameters.   **(8 marks)**

c) A borehole on a building site has the soil profile as shown in figure 1. Determine the effective stress at the centre of the clay stratum:
   i) Under normal conditions
   ii) When the ground water level is lowered by 3m, and assuming that the sand remains saturated up to the water table.   **(10 marks)**

Impermeable Shale

Question Five (20 marks)

a) Explain the following terms:
   i) Liquid limit
   ii) Plastic limit
   iii) Shrinkage limit   **(4 ½ marks)**

b) The following results were obtained form a liquid limit test on a certain soil:

Table 4:

Penetration (mm)	15.6	18.2	21.4	23.6
Moisture Content (%)	48.6	54.6	62.2	67.4

A plastic limit test for the same soil gave a value of 22%. Classify the soil using the plasticity chart.
                                                                        (6 ½ marks)

c) Outline the sieve analysis test. **(6 marks)**

d) Define the following terms:
    i) Effective size
    ii) Uniformity coefficient **(3 marks)**