TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE 12S)

EBC 2207: SOIL MECHANICS I

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2013
TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Scientific Calculator*

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

a) Outline the standard compaction test. **(5 marks)**

b) Table 1 shows the results of proctor test:
   (i) Plot the compaction curve and determine compaction parameters
   (ii) Determine the moisture content necessary for complete saturation at the maximum dry density if the specific gravity of the solids is 2.72 **(15 marks)**

Table 1

BULK DENSITY (kg/m^3)	2057	2148	2151	2158	2140
MOISTURE CONTENT (%)	12.8	14.2	16.0	17.0	18.0

Question Two

a) Outline the procedure for carrying out moisture content test of a soil **(5 marks)**

b) A clay soil has a bulk unit weight of 19.6KN/m3 and a moisture content of 25.0%. If the specific gravity of the soil is 2.65, determine:
   (i) Dry unit weight
   (ii) Void ratio
   (iii) Degree of saturation
   (iv) The saturated unit weight assuming that the void remains constant. **(12 marks)**

c) State THREE factors upon which characteristics of soils depend **(3 marks)**

Question Three

a) Outline the procedure for carrying out grading test. **(5 marks)**

b) The results of dry-sieving test are given in table 2.
   (i) Plot the particle size distribution curve and give a classification for the soil. Use chart 1.

Table 2

Sieve size (mm/ μm)	3.35	2.00	1.18	850	600	425	300	212	150	63
Mass Retained (g)	0	2.6	12.0	30.5	27.0	52.0	44	18	16.7	10

The quantity passing the 63 μm sieve and collected in the pan was 3.7g and the original weighed quantity was 217.2g

   (ii) Find the effective size and uniformly coefficient of the soil **(15 marks)**

Question Four

a) Explain FOUR factors that affect permeability. **(8 marks)**

b) An undistributed soil sample subjected to a variable head permeability test had the following test details:

Length of sample	=	200mm
Diameter of sample	=	100mm
Diameter of stand pipe	=	3mm
Initial head	=	500mm
Final head	=	200mm
Time for drop in head	=	15 minutes

Calculate the coefficient of permeability in m/day **(5 marks)**

c) Outline the procedure for carrying out variable-head permeameter test **(7 marks)**

Question Five

a) Outline the procedure for carrying out Dry strength test. **(5 marks)**

b) The results of a liquid limit test on an organic soil are given in Table 3. The plastic limit value of the soil was found to be 25%.

Table 3

TEST NUMBER	1	2	3
MOISTURE CONTENT (%)	70	60	50
NUMBER OF BLOWS	12	18	29

(i) Using figure 1 provided and results from table 3, determine the liquid limit
(ii) Using the result in (i) and figure 2, determine the group symbol for the soil tested.

(8 marks)

c) Derive an expression for dry density in terms of density of water, particles specific gravity and void ratio. **(7 marks)**