TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2303 : SOIL MECHANICS I

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: 15 Dec 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

-Drawing instruments.

-Calculator.

This paper consists of five questions.

Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question One (Compulsory) **(30marks)**

a) Define soil mechanics as per Karl Terzaghi. **(**2marks)

b) Outline the two main processes of soil formation. (4 marks)

c) A soil sample in its natural state has a mass of 2.29 kg and a volume of 1.15 x $10^{-3}m^3$. Under an oven dried state, the dry mass of the sample is 2.035 kg. The specific gravity of the solids is 2.68.

Determine;

i) Total density (1 mark)

ii) Water content (1 mark)

iii) Void ratio (2 marks)

iv) Porosity (1 mark)

v) Degree of saturation. (1 mark)

d) Briefly discuss Soil-Phase relationships. Use illustrations. (6 marks)

e) Outline the simple field identification tests that can be used to distinguish between clay and silt. (8marks)

f) A saturated sample of undisturbed clay has a volume of 19.2 cm^3 and weighs 32.5 gm. After oven drying, the weight is 20.2 gm. Determine;

i) Water content (1mark)

ii) Specific gravity (3marks)

Question Two **(20marks)**

a) State Stoke's Law. (2mark)

b) Particles of Five (5) different sizes are mixed in the proportions shown below and enough water added to make 1000cm^3 of the suspension. The temperature of the suspension is 20^0C. Viscosity, μ = 1.11 x 10^{-5} g.s/cm^2, Specific gravity Gs = 2.70 and unit weight of water, γ_w = 1.0 g/cm^3.

Particle size (mm)	**Weight (g)**
0.050	6
0.020	20
0.010	15
0.005	5
0.001	4
T0tal	**50**

i) What is the largest particle size present at a depth of 6cm, eight (8) minutes after start of sedimentation? (5marks)

ii) Calculate the Gs of suspension at a depth of 6 cm, 8 minutes after sedimentation.
(6marks)

iii) How long should the sedimentation be allowed until all the particles have settled below 6 cm?
(5marks)

iv) Define soil.
(2marks)

Question Three **(20marks)**

a) A sample of dry soil of mass 500g was used for sieve analysis. The masses retained on each sieve are as given below;

Sieve Aperture. (mm).	Mass in gm.
2.00	10
1.40	18
1.00	60
0.50	135
0.250	145
0.125	56
0.075	45

i) Plot a grain size distribution curve.
(4marks)
ii) Compute percentages of gravel, coarse sand, medium sand, fine sand and silt. (5marks)
iii) Compute Uniformity Coefficient
(2marks)
iv) Compute Coefficient of Curvature
(2marks).

b) Distinguish between single (granular) structure and flocculant structure. (7marks)

Question Four **(20marks)**

a) Define Soil Compaction. (2marks)
b) Outline the factors affecting soil compaction. (3marks)
c) A sand sample of 35cm^3 cross-sectional area and 20cm long was tested in a constant head permeameter. Under a head of 60cm, the discharge was 120 ml in 6 minutes. The dry weight of the sand used for the test was 1120g and G = 2.68. Determine;
   i) Coefficient of permeability in cm/sec. (2marks)
   ii) The discharge velocity (2marks)
   iii) The seepage velocity. (2marks)
d) Outline the properties of a flow net. (6marks)

e) Distinguish between flow lines and equi-potential lines. (3marks)

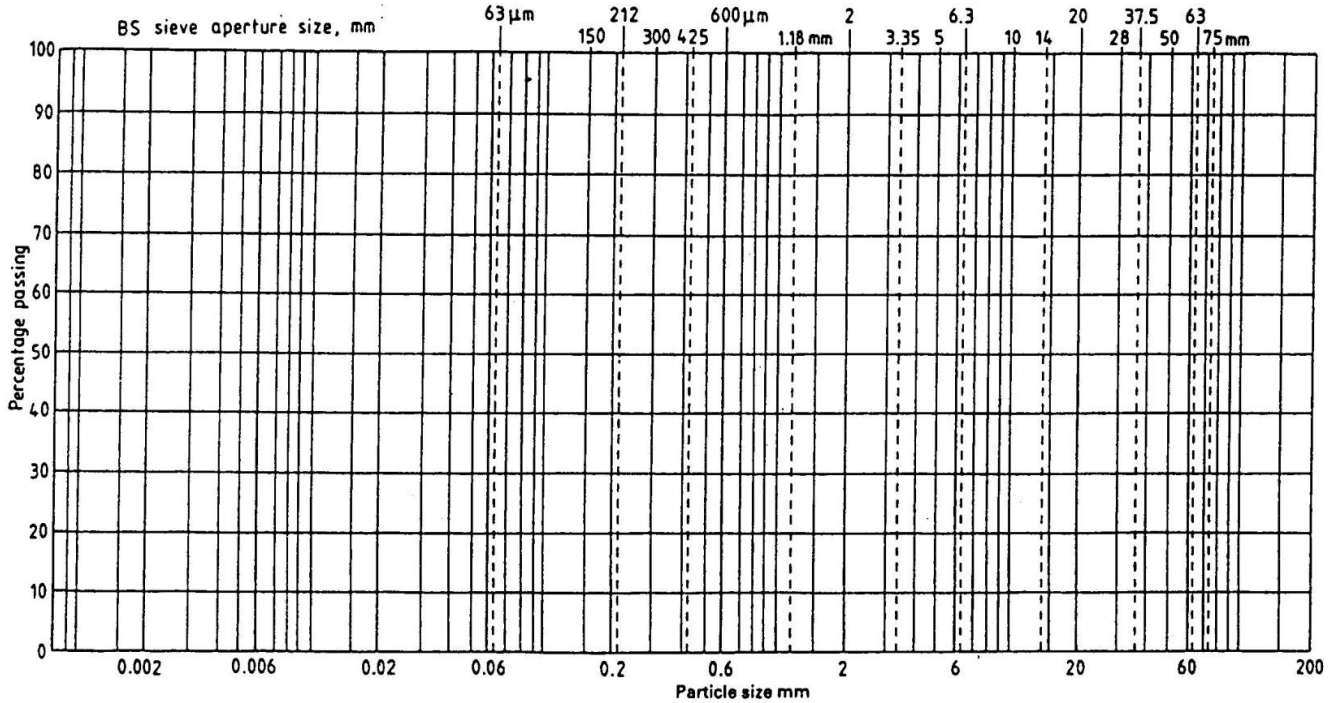
Question Five **(20marks)**

a) Briefly describe the Standard Proctor compaction test.
(8marks)
b) Outline four factors that can influence permeability. (8marks)
c) Define consistency of soils. (4marks)

Particle size distribution chart

Form 2.N

Location	Soil description	Job ref.		Sample no.	
		Borehole/Pit no.		Depth	m
Test method	BS 1377-2:1990:**9.2/9.3/9.4/9.5***			Date	



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

*Delete as appropriate

Operator	Checked	Approved