TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING
(INSTITUTION BASED EXAMINATION)

ECE 2303 : SOIL MECHANICS I

END OF SEMESTER EXAMINATION

SERIES: MARCH 2017

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

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)

a) Briefly discuss the importance of soil mechanics in civil engineering. (5marks)

b) Define consistency of clay soils. (4marks)

c) Outline THREE factors that affect soil compaction. (3marks)

d) Particle size distribution analysis carried out on a soil using the dry sieving technique yielded the follow results:

Best test sieve size (mm)	Mass of the soil retained(g)
3.35	0
2.00	45.98
1.18	56.19
0.600	117.50
0.425	61.30
0.300	58.50
0.212	43.67
0.150	66.42
0.063	51.08

The total mass of the sample used was 510.86g

(i) Calculate and tabulate data for particle size analysis and use it to draw the particle size distribution curve. (9marks)

(ii) Calculate the coefficient of uniformity. (3marks)

(iii) Determine particle size sub ranges and describe the soil. (2marks)

b) Classify the soil based on the Unified soil classification system. (2marks)

QUESTION TWO

a) Briefly describe the simple field tests that can be used to identify clay and silt. (8 marks)

b) Distinguish between Residual and Transported soils. (4 marks)

c) The moisture content of an undisturbed sample of clay from a volcanic region is 265%, under 100% saturation. The specific gravity of the solids is 2.5. The dry unit weight is 3.3 $KN/m^{3.}$ Determine; (6 marks)

(i) The saturated unit weight.

(ii) Submerged unit weight.

(iii) Void ratio

d) Define Soil compaction. (2 marks)

QUESTION THREE

a) Explain FOUR factors that influence permeability. (8 marks)

b) Outline the standard proctor compaction test. (8 marks)

c) Permeability of a soil 75 mm diameter and 60 mm long was tested using the constant head method. The head causing flow was 83 mm when $120cm^3$ of water was collected in 14 seconds. Calculate coefficient of permeability for the soil tested. (4marks)

QUESTION FOUR

a) Define soil mechanics. (2 marks)
b) Using particle size distribution curves, describe FOUR important features of a soil. (8 marks)
c) A clay soil sample is compacted at a moisture content of 18% bulk density of 1.86Mg/m^3. The particle specific gravity of the soils is 2.73. Determine the following:
   i) Dry density
   ii) Air voids ratio
   iii) Calculate the percentage of air voids if the soil were to compacted at a moisture of 25%.
   iv) Briefly explain the difference between the results obtained based on compaction concepts. (10marks)

QUESTION FIVE

a) Briefly discuss consistency limits. (10marks)

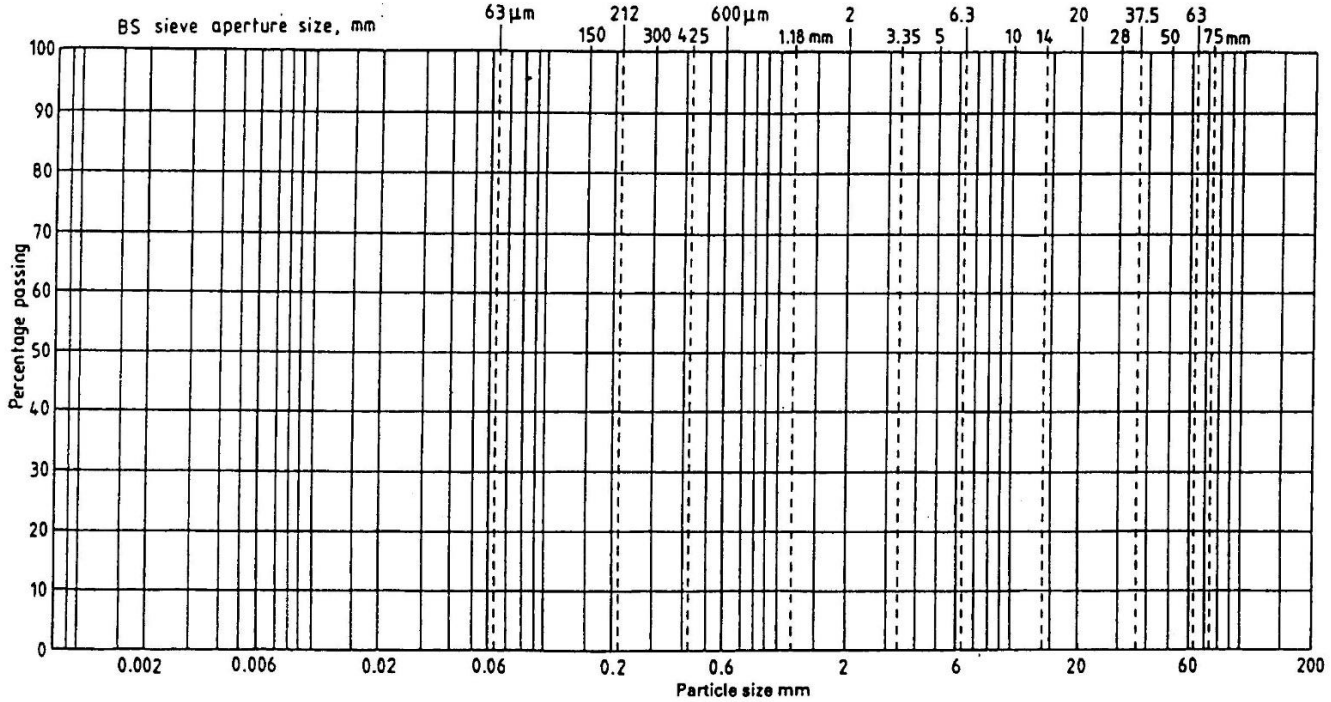
b) A soil deposit when in a loose state has 48% porosity but when dense its porosity is 42%. The particle specific gravity of the soil is 2.68. Calculate the increase in hydraulic gradient for the soil when its state changes from loose to dense. (5marks)

c) Explain the effects of "Piping" in dams. (5marks)

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