



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

DATE: 30th MARCH

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)

- Briefly discuss the formation of soils. (4marks)
- Distinguish between single (granular) structure and flocculant structure (4marks)
- Outline the factors that affect the permeability of soils. (6marks)
- A sand sample with 35cm^2 cross sectional area and 20cm long was tested in a constant head permeameter. Under a head of 60cm, the discharge was 120ml in 6 min. the dry weight of sand used was 1120g and $G_s = 2,68$. Determine ;

- i) The coefficient of permeability in cm/sec.
 - ii) The discharge velocity
 - iii) The seepage velocity. (6marks)
- e) Define the following geotechnical properties;
- i) Void ratio
 - ii) Porosity
 - iii) Water content
 - iv) Degree of saturation (4marks)
- f) A sample of saturated clay has a mass of 1.526 kg and a dry mass of 1.053kg. The specific gravity of the solid particles is 2.7. For the sample, determine;
- i) Water content
 - ii) Void ratio
 - iii) Porosity
 - iv) Total density (6marks)

Attempt any TWO questions
QUESTION TWO

- a) Describe the FOUR field identification tests that can be used to distinguish Silt from Clay. (6marks)
- b) A sample of dry soil of mass 500g was used for sieve analysis. The masses of soil retained on each sieve are as given below;-

Sieve Size (in mm)	Weight Retained (in g)
2.00	10
1.40	18
1.00	60
0.500	135
0.250	145
0.125	56
0.075	45

The total weight of the sample was 500 g:

- (i) Compute the data for particle size distribution analysis. (4marks)
- (ii) Plot the particle size distribution curve on the chart 1 provided and describe the soil. (8 Marks)
- (iii) State the effective grain size. (2 Marks)

QUESTION THREE

- a) Describe THREE major achievements which result after soil compaction. (6 marks)
- b) Outline factors affecting compaction. (4 marks)
- c) A saturated sample of undisturbed clay has a volume of 19.2 cm^3 and a weight of 32.5 g . After oven drying, the weight reduces to 20.2 g . Determine:
 - i) Water content
 - ii) Specific gravity
 - iii) Void ratio (3 Marks)
- d) Briefly describe the properties of a flow net. (7marks)

QUESTION FOUR

- a) State Stoke's Law. (2 Marks)
- b) Outline the assumptions taken when applying Stoke's Law. (4 Marks)
- c) Using phase diagrams describe the different soil states. (6 marks)
- d) A soil sample in its natural state has a mass of 2.29 kg and a volume of $1.15 \times 10^{-3} \text{ m}^3$. Under 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.
 - ii) Water content.
 - iii) Void ratio.
 - iv) Porosity.
 - v) Degree of saturation. (8 Marks)

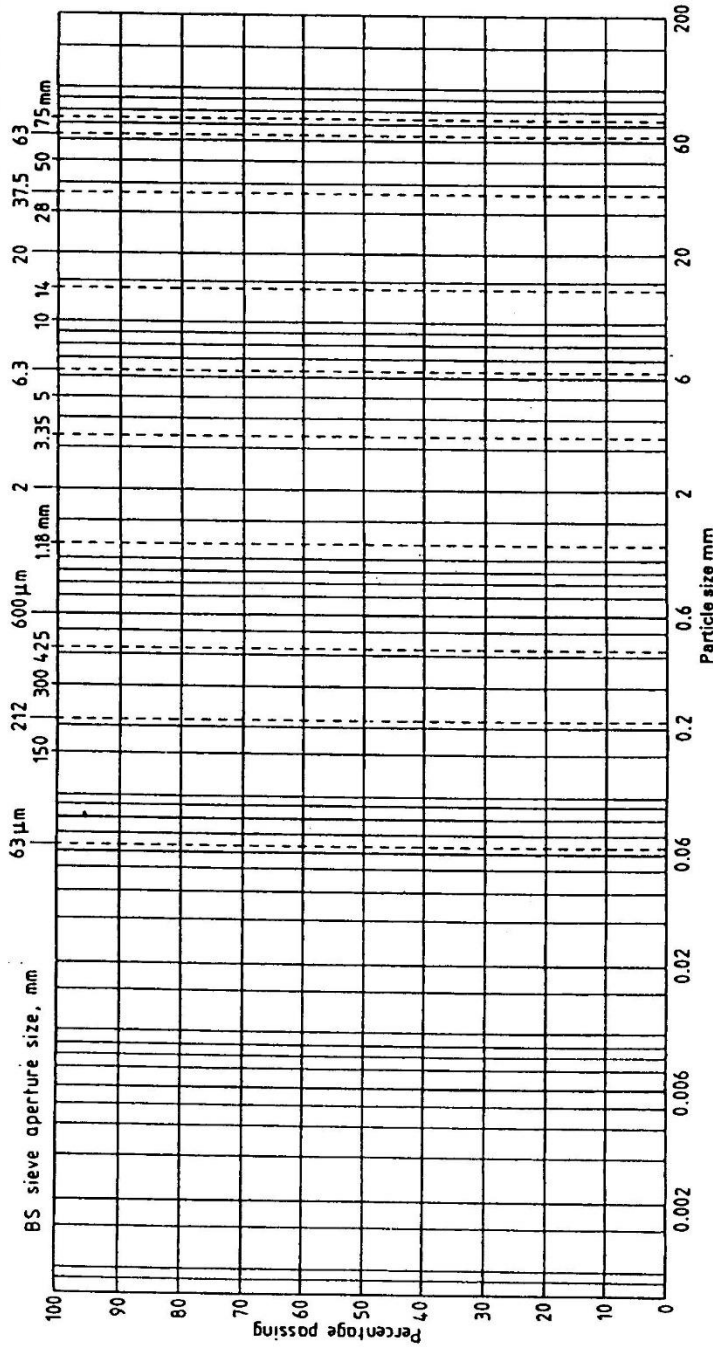
QUESTION FIVE

- a) Distinguish between flow lines and equipotential lines. (6 Marks)
- b) Distinguish between Residual and Transported soils. Give examples. (6 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;
 - (i) The saturated unit weight.
 - (ii) Submerged unit weight.
 - (iii) Void ratio (6 marks)
- d) Define soil compaction. (2 marks)

Particle size distribution chart

Form 2.N

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



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Coarse	COBBLES	BOULDERS
	SAND			GRAVEL					
Operator							Checked	Approved	

*Delete as appropriate

