



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF ENGINEERING AND TECHNOLOGY
UNIVERSITY EXAMINATIONS FOR THE DEGREE IN SCIENCE IN
CONSTRUCTION MANAGEMENT
2ND YEAR 1ST SEMESTER 2017/2018 ACADEMIC YEAR
CENTRE: MAIN CAMPUS**

COURSE CODE: TCM3211

COURSE TITLE: SOIL MECHANICS

EXAM VENUE: WS

STREAM: BSc CONSTRUCTION MGT

DATE: 18/12/2017

EXAM SESSION: 9.00 – 11.00 AM

DURATION: 2 HOURS

Instructions

- 1. Answer question 1 (Compulsory) and ANY other two questions**
- 2. Candidates are advised not to write on question paper**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**

QUESTION ONE

a) Define the following categories of soils on the basis of particle size.

- i. Gravel
- ii. Sand
- iii. Organic silt
- iv. Clay

(6 Marks)

b) The porosity of a soil sample is 35% and the specific gravity of its particle is 2.7.
Calculate its : -

- i. Dry density
- ii. Saturated density
- iii. Submerged density

(6 Marks)

c) Sieve analysis of a given sample of sand were carried by making use of sieve sizes indicated in Table 1 The total weight of sand used for the analysis was 500gms.

Table 1

Sieve size(Microns)	2000	1400	1000	500	250	125	75
Weight retained in gms on each sieve size	10	18	60	135	145	56	45

Plot the grain distribution curve on semi-log paper and discuss the distribution characteristic using uniformity coefficient and coefficient of curvature indices.

(9 Marks)

d) Discuss any THREE factors affecting permeability

(6Marks)

e) Explain laboratory procedure for determining plastic limit

(3 Marks)

QUESTION TWO

a) State any FOUR factors affecting compaction.

(4 Marks)

b) Explain conditions under which the following compaction plants are recommended;

- i. Smooth wheel rollers
- ii. Sheep foot rollers
- iii. Pneumatic tyred rollers
- iv. Rammers

(6 Marks)

c) In a standard Proctor's Test, the mould of 1 liter capacity weighs 12.5N when empty. Successive trials gave results shown in Table 2. Determine the following:

- i. Optimum moisture content
- ii. Degree of saturation at maximum dry density.
- iii. Plot 100% saturation line

Table 2

Weight of mould+weight of soil(N)	29.6	30.1	31.5	31.2	30.8
Water content (%)	16.7	18.6	21.0	21.7	23.5

(10 Marks)

QUESTION THREE

- a) Distinguish using appropriate sketches the difference between counterfort and buttressed retaining walls
(4 Marks)
- b) State assumptions of Rankine's earth pressure theory
(4 Marks)
- c) A retaining wall with vertical back is 8m high. The density of the top 3m of fill is 17.15kN/m^3 and the angle of friction is 30° ; for the lower 5m, the values are 18.12kN/m^3 and 35° respectively. There is a surcharge load on the horizontal surface of the fill equivalent to 11.8kN/m^2 . Find the magnitude and point of application of the active thrust on the wall per lineal meter.
(12 Marks)

QUESTION FOUR

- a) Explain areas of applications where shear strength characteristic of soil is so important for determination of integrity analysis of construction structures.
(4 Marks)
- b) State any FOUR advantages of Triaxial Compression test.
(6 Marks)
- c) A direct shear test was carried out on a cohesive soil sample and the results in Table 3 were obtained.

Table 3

Normal stress(kN/m^2)	150	250
Shear stress at failure(kN/m^2)	110	120

What would be the deviator stress at failure if a triaxial test is carried out on the same soil with cell pressure of 150kN/m^2 .
(10 Marks)

QUESTION FIVE

- a) Distinguish between safe bearing capacity and allowable bearing capacity of soils.
(3 Marks)
- b) In a falling head permeability test the length and area of cross section of soil specimen are 0.17m and $21.8 \times 10^{-4} \text{ m}^2$ respectively. Calculate the time required for the head to drop from 0.25m to 0.10m. The area of cross section of stand pipe is $2 \times 10^{-4} \text{ m}^2$. The sample has three layers with permeabilities $3 \times 10^{-5} \text{ m/sec}$ for first 0.06m, $4 \times 10^{-5} \text{ m/sec}$ for second 0.06m and $6 \times 10^{-5} \text{ m/sec}$ for the third 0.05m thickness. Assume the flow is taking place perpendicular to the bedding plane.
(9 Marks)
- c) List any FOUR soil stabilizers commonly used in general construction and describe how they are used.
(8 Marks)