



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 2018/2019 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TCM3211

COURSE TITLE: SOIL MECHANICS

EXAM VENUE: STREAM: BSc CONSTRUCTION MGT

DATE: ../12/2018 EXAM SESSION:

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.
- Course grained soils
 - Fine grained soils
- (6 Marks)
- b) Define specific gravity of soil and explain its significance
- (3 Marks)
- c) The porosity of a soil sample is 32% and the specific gravity of its particle is 2.65.
Calculate its : -
- Dry density
 - Saturated density
 - Submerged density

(6 Marks)

- d) Define consistency limits of fine grained soils

(6Marks)

- e) 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)

QUESTION TWO

- a) Explain effect of compaction on any TWO properties of soil.
- (4 Marks)
- b) Explain types of soils which are recommended for the following compaction plants ;
- Smooth wheel rollers
 - Sheep foot rollers
 - Pneumatic tyred rollers
 - Rammers

(6 Marks)

- c) Data in **Table 2** are observations made in a standard Proctor's Test, the volume of mould is 945cc and $G=2.67$.

Table 2

Mass of wet soil (kg)	1.70	1.89	2.03	1.99	1.96	1.92
Water content (%)	7.7	11.5	14.6	17.5	19.7	21.2

Determine the following:

- Optimum moisture content
- Degree of saturation at maximum dry density.

iii. Zero air void line

(10 Marks)

QUESTION THREE

a) Distinguish between active and passive earth pressure

(4 Marks)

b) State assumptions of Rankine's earth pressure theory

(4 Marks)

c) A cantilever retaining wall of 7m height retains sand. The properties of the sand are void ratio $e=0.5$, angle of internal friction $\phi =30^\circ$ and specific gravity of particle $G_s=2.7$. Using Rankine's theory determine active earth pressure at the base when the backfill is

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

(12 Marks)

QUESTION FOUR

a) State any FOUR benefits of soil stabilization

(4 Marks)

b) State any FOUR disadvantages of direct shear test.

(6 Marks)

c) A consolidated undrained test was conducted on a clay sample and results in Table 3 were obtained.

Table 3

σ_3 (kN/m ²)	σ_d (kN/m ²)	μ (kN/m ²)
200	118	110
600	352	320

Determine the shear strength parameters with respect to

- i. Total stresses
- ii. Effective stresses

(10 Marks)