



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF ENGINEERING AND TECHNOLOGY
UNIVERSITY EXAMINATIONS FOR THE DEGREE OF SCIENCE IN:
BUILDING CONSTRUCTION AND MANAGEMENT
2ND YEAR 1ST SEMESTER 2015/2016 ACADEMIC YEAR
CENTRE: MAIN CAMPUS**

COURSE CODE: TCM 3211

COURSE TITLE: SOIL MECHANICS

EXAM VENUE: W/S

STREAM: BSc IN CONSTRUCTION

DATE: 25/4/16

EXAM SESSION: 9.00 – 11.00 AM

TIME: 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) State any TWO construction failures that may arise due to inadequate understanding of soil properties.
(4 Marks)
- b) A soil sample with porosity of 38% has degree of saturation of 50%. Taking specific gravity of soil solids as 2.67. compute:
i. Dry unit weight
ii. Saturated unit weight
iii. Submerged unit weight
iv. Bulk unit weight
(10 Marks)
- c) Explain how the following affect permeability
i. Particle size
ii. Properties of the pore fluid
(6 Marks)
- d) Define THREE consistency limits as identified in cohesive soils
(6Marks)
- e) State any TWO methods of geophysical surveys used for soil site investigation
(4 Marks)

QUESTION TWO

- a) With the aid of neat sketch explain how variation in compaction effort affect moisture content-dry density curve.
(4 Marks)
- b) Distinguish between normally consolidated and pre- consolidated soils
(4 Marks)
- c) In a standard Proctor's test, volume of mould is 945cc and specific gravity of soil is 2.67. Determine the following:
i. Maximum dry density
ii. Optimum moisture content
iii. Plot 100% saturation line.

Table 1

Trial No.	1	2	3	4	5	6
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

(12 Marks)

QUESTION THREE

- a) State any FOUR types of earth retaining structures
(4 Marks)
- b) State any FOUR causes of slope failures
(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
- Dry
 - Saturated
 - Submerged

(12 Marks)

QUESTION FOUR

- a) Explain the difference in behavior between cohesionless and cohesive soils in reference to resistance to shear.
(4 Marks)
- b) State any FOUR advantages of triaxial compression test over direct shear test.
(4 Marks)
- c) Direct shear test was carried out on a cohesive soil sample and the results shown in Table 2.

Table 2

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

Compute the following;

- Values of cohesion and angle of internal friction for the soil
- deviator stress at failure if a triaxial test is carried out on the same soil with a cell pressure of 150kN/m^2 .

(12 Marks)

QUESTION FIVE

- a) State any THREE purposes of soil exploration exercise.
(3 Marks)
- b) Distinguish between safe bearing capacity and allowable bearing capacity of soils.
(3 Marks)
- c) State any FIVE benefits of soil stabilization.
(5Marks)
- d) In a purely cohesive soil ($c = 138\text{kN} / \text{m}^2$, $\gamma = 1.76 \times 9.81\text{kN} / \text{m}^2$) a strip footing 1.5m wide is to be laid at a depth of 4m.
- Estimate the ultimate bearing capacity from the theory of Terzaghi.
 - Calculate safe bearing capacity if the factor of safety is 3.

(9 Marks)