



MANICALAND STATE UNIVERSITY OF APPLIED SCIENCES

FACULTY OF AGRIBUSINESS AND COMMERCE

**DEPARTMENT OF AGRICULTURE ECONOMICS
AND
DEVELOPMENT**

INTRODUCTION TO SOIL SCIENCE

Code: AEDT125

**END OF SEMESTER EXAMINATIONS
AUGUST 2022**

DURATION: 3 HOURS

EXAMINER: Mr N. SAKADZO

INSTRUCTIONS

- 1. Answer any **Four** questions*
- 2. Be concise and clear*
- 3. Total marks 100*

ADDITIONAL MATERIAL

- 1. Calculator*
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Question one

- a) Differentiate between primary and secondary mineral [4]
- b) In form of a table, compare the structure of a silicon tetrahedron and an aluminium tetrahedron [6]
- c) (i) Write a reaction showing isomorphous substitution of Al^{3+} and Fe^{2+} given that $\text{Al}^{3+} = 0.051$ and $\text{Fe}^{2+} = 0.064$ nm in diameter respectively [3]
- ii. Do you think the crystal structure will be stable? Give reasons for your answer [2]
- d) Using one example in each case, compare between 2: 1 and 1:1 clays under the following headings:
- i. Examples [2]
 - ii. Physical properties [4]
 - iii. Chemical properties [4]

Question two

- a) Leaching and eluviation are common processes that occur in soils of the humid tropics. Give a comparison between leaching and eluviation [10]
- b) With the aid of a diagram, explain the different types of soils that are formed due to drainage along the soil catena [15]

Question three

- a) If the soil moisture content is 0.36kgkg^{-1} and the bulk density is 1.4Mg/m^3 , calculate the volumetric moisture content in M^3M^3 and in $\text{mm } 100\text{mm}^{-1}$ [5]

- b) Discuss the advantages and disadvantages of using the thermogravimetric moisture method of measuring soil moisture content [6]
- c) Explain major forces that affect the free energy of water [8]
- d) Describe the following components of the water potentials:
- i. Matric potential [2]
 - ii. Osmotic potential [2]
 - iii. Gravitational [2]

Question four

- a) Using a chemical reaction describe the weathering of aluminium oxide in soils [12]
- b) Discuss the formation of the following soil processes;
- i. Ferralitization [8]
 - ii. Salinization [5]

Question five

- a) Discuss the mechanisms that are involved in the formation of soil aggregates [12]
- b) Discuss the simple classification of soil biota under the following headings:
- i. Size [3]
 - ii. Modes of nutrition [4]
 - iii. Oxygen requirements [4]
 - iv. Evolutionary development [2]

END OF EXAM