GWANDA STATE UNIVERSITY

FACULTY OF NATURAL RESOURCES MANAGEMENT AND AGRICULTURE

DEPARTMENT OF HORTICULTURE AND CROP PRODUCTION

PROGRAMME: BSc HONOURS HORTICULTURE & CROP PRODUCTION/ANIMAL HEALTH & PRODUCTION

NHC1102: PRINCIPLES OF SOIL SCIENCE

FINAL EXAMINATION

JULY 2023

This examination paper consists of 3 pages.

Time Allowed:	3 Hours.
Total Marks:	100
Special Requirements:	Scientific calculator, ruler (supplied by student)
Examiner's Name:	Mr Madzaramba T.H

Instructions

1. Answer **ALL** questions in Section A
2. Answer any **THREE (3)** questions in Section B

Mark allocation

Question	**Marks**
Section A	40
Section B	60
Total attainable marks	100

SECTION A: Answer **ALL** questions.

Question 1

a) Explain in detail the meaning of the following terms.

i. Cation exchange capacity (CEC) [4]

ii. Adsorption [4]

iii. Soil separates [4]

iv. Pedogenesis [4]

v. Ammonification [4]

b) An undisturbed soil sample was collected from the farm for analysis. The inside dimension of core sampler was 0.1m diameter and 0.06m deep. The dominant soil type is loam and of a granular structure. After collection, the soil was subsequently oven dried. After drying the soil was saturated in a basin of water. The oven dry soil and water at saturation weigh 0.85kg.

Determine the following:

i. Total porosity [6]

ii. Particle density [6]

c) State and explain four (4) factors affecting the infiltration of water into the soil [8]

[40]

SECTION B: Answer **THREE** questions in SECTION B

Question 2

With the aid of clearly illustrated diagrams describe four levels of water in a soil [20]

Question 3

a) Calculate the porosity of a 250 g sample that contains 65 g of water when 55% of the pores are full of water. [5]

b) Calculate the bulk density of a 400 cm^3 soil sample that weighs 600 g and that is 10% moisture. [5]

c) Outline the procedure of determining soil texture. [10]

Question 4

Explain four (4) basic processes responsible for soil formation in agricultural lands of Sub-Saharan Africa. [20]

Question 5

Outline the structure of the following Alumino-silicate clays, clearly stating the; ratio of Octahedral to tetrahedral sheets, bonding between layers, surface area, physical stability and degree of swelling due to water absorption:

i. Kaolinite [5]

ii. Montmorillonite and Vermiculite [5]

iii. Hydrous Mica [5]

iv. Chlorites [5]

Question 6

a) Describe the effect of anthropogenic activities on soil properties [8]

b) A soil sample was collected from a field, two days after a rainfall event when the soil moisture was near field capacity. The inside dimension of core sampler was 80mm diameter and 160mm deep. The weight of the wet soil and cylinder was 3000g. The dry weight of the soil was 2.86kg. Weight of core sampling cylinder was 1760g. Find the bulk density of the soil. [12]

END OF QUESTION PAPER!!!