GWANDA STATE UNIVERSITY

FACULTY OF NATURAL RESOURCES MANAGEMENT AND AGRICULTURE

DEPARTMENT OF HORTICULTURE AND CROP PRODUCTION

BACHELOR OF SCIENCE HONOURS DEGREE IN HORTICULTURE AND CROP PRODUCTION

NHC2201 SOIL FERTILITY MANAGEMENT

SECOND SEMESTER MAIN EXAMINATION

JUNE 2025

This examination consists of 3 pages

Time Allowed: **3 hours**

Total Marks: **100**

Special Requirements: **None**

Examiner's Name: **Mr Mathema N**

INSTRUCTIONS

1. Answer **any five** questions

MARK ALLOCATION

QUESTION	**MARKS**
EACH QUESTION CARRIES	**20**
TOTAL ATTAINABLE MARKS	**100**

Question 1 (20 marks)

a) Identify one macro-nutrient and one micro-nutrient that are components of the chlorophyll molecule. [3]
b) State the forms of the identified macronutrient and micronutrient absorbed by plant roots. [3]
c) Describe lime induced chlorosis [4]
d) Outline the processes by which plant nutrients are taken up by plant roots [10]

Question 2 (20 marks):

a) Discuss the role of nitrogen in plant growth and critically evaluate how nitrogen availability influences plant productivity in different cropping systems. [10]
b) Propose a nutrient management strategy that maximizes nitrogen use efficiency while minimizing environmental impacts in a maize-based cropping system. [10]

Question 3 (20 marks):

a) Critically assess how the carbon to nitrogen (C: N) ratio in soils and organic amendments affects nutrient availability and cabbage productivity. [12]
b) Using your understanding of nitrogen cycling, design a nutrient management strategy that optimizes cabbage yield while minimizing nitrogen losses and environmental impacts. [8]

Question 4 (20 marks)

Nutrient availability in soils is governed by a complex interplay of physical, chemical, and biological factors, each influencing how plants access essential elements for growth.

a) Justify the role of the following factors in controlling nutrient availability in soils:
   i. Soil pH [3]
   ii. Soil texture and structure [3]
   iii. Cation Exchange Capacity (CEC) [3]
   iv. Soil organic matter [3]
   v. Soil moisture and temperature [3]
b) Describe how cultural practices during crop production can influence the factors listed in (a) above. [5]

Question 5 (20 marks)

a) Analyze how different soil physical, chemical, and biological properties interact with plant root characteristics to influence nutrient uptake. [10]

b) Evaluate the effectiveness of mycorrhizal associations and root exudates in improving nutrient uptake under nutrient-limiting conditions. [5]

c) Propose an integrated agronomic management plan to optimize nutrient uptake in low-fertility soils. Justify your recommendations. [5]

Question 6 (20 marks)

a) Outline the process of nitrification in agricultural soils [10]

b) Critique the belief that termites are a necessary evil in cropping systems [10]

END OF EXAMINATION