UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMMES: BACHELOR OF SCIENCE YEAR II IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING, AGRICULTURAL EDUCATION, AGRONOMY ANIMAL SCIENCE, ANIMAL SCIENCE (DAIRY) AND HORTICULTURE

COURSE CODE: CP 201

TITLE OF PAPER: INTRODUCTORY SOIL SCIENCE

TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS: ANSWER ANY FOUR (4) QUESTIONS

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QUESTION 1

(a) Define or give short descriptions of the following terms and phrases (Each answer carries **2 marks**).

(i) Weathering
(ii) Isomorphous substitution
(iii) Soil texture
(iv) Mineralisation
(v) Illuviation

(b) (i) Discuss the effects of soil pH on plant growth. [12]

(ii) Outline the strategies you would recommend to improve plant growth in acid soils. [3]

[25]

QUESTION 2

(a) Distinguish between physical weathering and biogeochemical weathering of rocks and minerals to form soil [5]

(b) Discuss in detail the physical and biochemical weathering processes of rocks and minerals to form soil. [20]

[25]

QUESTION 3

(a) Discuss the ways in which soil colloids obtain negative charges [7]

(b) Discuss the importance of clay minerals when soils are used for crop production [18]

[25]

QUESTION 4

(a) Define the term "soil horizon" and indicate how horizons are identified and named in a soil profile. [3]

(b) Using an appropriate diagram, illustrate the major soil horizons of a representative mineral soil and describe the properties of each. [10]

(c) Discuss the processes of soil formation clearly indicating their contribution to soil development [12]

[25]

QUESTION 5

A chemical analysis of a soil revealed the following information:

Exchangeable Ca	= 800 ppm
Exchangeable Mg	= 672 kg/ha
Exchangeable K	=195 ppm
Exchangeable H	= 3 mg/100g
Exchangeable Al	= 450 ppm

(a) Calculate the cation exchange capacity of this soil and express your answer in cmolc kg^{-1}. [15]

(b) What is the percent base saturation for this soil? [5]

(c) Evaluate this soil in terms of its suitability for optimum growth of most crop plants [5]

[25]