UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMME: BACHELOR OF SCIENCE IN AGRONOMY YEAR 3 AND BACHELOR OF SCIENCE IN AGRICULTURAL EDUCATION YEAR 3

COURSE CODE : CP 302

TITLE OF PAPER : CROP NUTRITION

TIME ALLOWED : TWO AND A HALF (2.5) HOURS

INSTRUCTIONS : ANSWER FOUR (4) QUESTIONS, WITH AT LEAST ONE QUESTION FROM EACH SECTION.

DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE CHIEF INVIGILATOR

SECTION 1: SOIL CHEMISTRY

QUESTION 1

(a) Discuss the effects of soil acidity on plant growth **[15]**

(b) What remedial actions would you recommend to improve plant growth in such soils? **[4]**

(c) An acid soil was found to contain 4 m.e exch. Al per 100g soil. Calculate the amount of limestone in tonnes ha^{-1} required to neutralize the exchangeable Al to a depth of 15 cm. The soil had a bulk density of 1.2 Mg/m^3 and the limestone had a neutralizing value of 90%. **[6]**

(25 MARKS)

QUESTION 2

(a) Describe the various ways in which organic and inorganic colloids obtain negative charges **[5]**

(b) Discuss the significance of clay minerals when soils are used for crop production or as a medium for the disposal of Municipal waste. **[20]**

(25 MARKS)

QUESTION 3

Discuss the interactions of sesquioxides with anions in soils and highlight the implications of these reactions in the mineral nutrition of plants **[25]**

SECTION 2: CROP NUTRITION

QUESTION 4

(a) Describe the transformations of phosphorus in soils and highlight the implications of such transformations on phosphorus nutrition of plants. **[6]**

(b) Discuss the factors which influence the availability of phosphorus to plants in soils and indicate the strategies you would recommend to increase the availability of phosphorus to plants in such soils. **[14]**

(c) A chemical analysis of a soil revealed that it had a phosphorus soil test of 8 mg kg^{-1} soil and the sufficiency level for most crop plants is 20 mg kg^{-1} soil. The efficiency of conversion of fertilizer P to soil P is 20%. Calculate the amount of triple superphosphate (22% P) that is required to increase the soil test P to the sufficiency level. **[5]**

(25 MARKS)

QUESTION 5

(a) Discuss the ways in which nitrogen may be added to soils **[15]**

(b) Discuss the management strategies you would recommend to improve the efficiency of nitrogen uptake and utilization by plants **[10]**

(25 MARKS)

QUESTION 6

(a) Discuss three methods of fertilizer application which you would recommend to farmers in your country and indicate the merits and demerits of each method **[13]**

(b) A fertilizer recommendation for maize in the middleveld of Swaziland was given as follows:

N - 60 kg ha-1

P - 50 kg ha-1

K - 40 kg ha-1

(i) Calculate the amount of the compound fertilizer 2:3:2 (38) that must be added to supply all the N requirement **[5]**

(ii) How much P and K would the quantity of 2:3:2 (38) fertilizer obtained in (i) above supply to the maize plants? **[4]**

(iii) What is the disadvantage of using compound fertilizer in such recommendations? **[3]**

(25 MARKS)