UNIVERSITY OF FORT HARE

INTRODUCTION TO SOIL SCIENCE
AGS 211

JUNE SUPPLEMENTARY EXAMINATIONS

2018

TIME : 3 HOURS
SUBJECT : AGS 211
MARKS : 100

This paper consists of 3 pages including the cover page

INTERNAL EXAMINERS
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INSTRUCTIONS
1. Answer ALL questions.
2. It is in your best interest to write clearly and legibly.
QUESTION 1 (25)

a) Describe the Hans Jenny’s model. [2]

b) Discuss four (4) ways in which climate influences soil formation. [8]

c) List FIVE (5) topographical factors that influence soil formation. [5]

d) Give the term used to describe each of the parent materials
   (i) Transported and deposited by wind [2]
   (ii) Transported and deposited under the influence of gravity [2]
   (iii) Transported by water and deposited in lakes [2]
   (iv) Transported by water and deposited in flood plains [2]
   (v) Transported and deposited by ice [2]

QUESTION 2 (25)

(a) Name THREE (3) types of colloids. [3]

(b) Discuss the development of temporary charge on soil colloids [8]

(c) Discuss the effects of soil pH on availability of macro and micronutrients. [6]

(d) Outline FOUR (4) sources of acidity in soils. [6]

QUESTION 3 (25)

1. List and describe the various structural types found in the soil. [6]

2. Clearly explain what is meant by the following terms.
   i. Water potential [2]
   ii. Capillary water [2]

3. A wet undisturbed soil sample with a mass of 1.32 kg and a volume of 800 cm$^3$ is oven dried at 105 °C until a constant weight, being 1.1 kg, is reached. The
density of the solid particles \((p_s)\) is 2600 kg m\(^{-3}\) and the density of water \((p_w)\) is 1000 kg m\(^{-3}\). Calculate the:

(i) Dry bulk density \((\rho_b)\)  \hspace{1cm} [3]

(ii) Porosity \((\phi)\)  \hspace{1cm} [2]

(iii) Void ratio \((e)\)  \hspace{1cm} [2]

(iv) Gravimetric water content \((\theta_m)\)  \hspace{1cm} [2]

(v) Volumetric water content \((\theta_v)\)  \hspace{1cm} [2]

4. The following diagram represents the different soil moisture content levels, constants, soil water classifications and their water potentials. Name the points indicated with numbers 1, 2, 3 and 4 on the diagram.  \hspace{1cm} [4]

**QUESTION 4 (25)**

(a) Which nutrients are taken up by plants with the support of mycorrhizae? How do mycorrhizae help in the uptake process of those beneficial nutrients?  \hspace{1cm} [4]

(b) Explain the difference between macronutrients and micronutrients? Give four examples to each of them.  \hspace{1cm} [5]

(c) Clearly explain what is meant by the following terms.

i. Ammonification  \hspace{1cm} [2]

ii. Volatilization  \hspace{1cm} [2]

iii. Nitrification  \hspace{1cm} [2]

(d) What is a fertilizer? State the three classes of fertilizers.  \hspace{1cm} [5]

(e) A common fertilizer mixture is 2:3:2 (22).

i. Explain what the ratio stands for as well as the number in brackets.  \hspace{1cm} [2]

ii. Calculate the amounts of nutrients in a 100 kg bag of this fertilizer mixture.  \hspace{1cm} [3]