UNIVERSITY OF FORT HARE

INTRODUCTION TO SOIL SCIENCE
AGS 211

SPECIAL EXAMINATIONS

January 2019

TIME : 3 HOURS
SUBJECT : AGS 211
MARKS : 100

This paper consists of 3 pages including the cover page

INTERNAL EXAMINERS

DR A. MANYEVERE

DR T.A. WELDESLASSIE

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.

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

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

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

QUESTION 2 (25)

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

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

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

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

QUESTION 3 (25)

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

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

3. A wet undisturbed soil sample with a mass of 1.32 kg and a volume of 800 cm³ 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 \( (\rho_b) \)  
(ii) Porosity \( (\phi) \)  
(iii) Void ratio \( (e) \)  
(iv) Gravimetric water content \( (\theta_m) \)  
(v) Volumetric water content \( (\theta_v) \)  

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.

**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?

(b) Explain the difference between macronutrients and micronutrients? Give four examples to each of them.

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

   i. Ammonification  
   ii. Volatilization  
   iii. Nitrification

(d) What is a fertilizer? State the three classes of fertilizers.

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

   i. Explain what the ratio stands for as well as the number in brackets.  
   ii. Calculate the amounts of nutrients in a 100 kg bag of this fertilizer mixture.