

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. [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 cm³ is oven dried at 105 °C until a constant weight, being 1.1 kg, is reached. The

density of the solid particles (ρ_s) is 2600 kg m⁻³ and the density of water (ρ_w) is 1000 kg m⁻³. Calculate the:

- (i) Dry bulk density (ρ_b) [3]
- (ii) Porosity (α) [2]
- (iii) Void ratio (e) [2]
- (iv) Gravimetric water content (θ_m) [2]
- (v) Volumetric water content (θ_v) [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. [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? [4]

(b) Explain the difference between macronutrients and micronutrients? Give four examples to each of them. [5]

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

i. Ammonification [2]

ii. Volatilization [2]

iii. Nitrification [2]

(d) What is a fertilizer? State the three classes of fertilizers. [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. [2]

ii. Calculate the amounts of nutrients in a 100 kg bag of this fertilizer mixture.

[3]