

FACULTY OF AGRICULTURE - UNIVERSITY OF RUHUNA
FIRST EXAMINATION IN B. Sc. ARMT/AB/GT (PART II) – NOVEMBER 2017

SS1201 Introductory Soil Science

Time: 03 Hours

Answer **05 (FIVE)** questions only

Each question carries a total mark of 100

1. (a) I In your view, what is meant by physical properties of soils? (5 marks)
- II State the three color dimensions used in the determination of soil color. (5 marks)
- III Name four factors that affect soil color. (10 marks)
- IV Define the following terms with the inclusion of defined equations.
1. Bulk density (10 marks)
 2. Particle density (10 marks)
 3. Porosity (10 marks)
- (b) I Define soil structure. (5 marks)
- II Name five structural shapes (types) that can be found in soils. (5 marks)
- III Explain briefly the ability for water to move through soils with the five structural shapes (types) you have mentioned in part (b) II. Tabulate your answer with two columns for the structural type and nature of water movement. (15 marks)
- (c) I. What is meant by the term “specific surface area” of soil? (5 marks)
- II. Explain the effect of the (a) size of the particles and (b) shape of the particles on the specific surface area of a soil. Use illustrations and examples to justify your answer. (20 marks)

2. (a) I. Give the definitions of the following: (10 marks)
1. A mineral
 2. A rock
- II. Indicate two major differences between a **mineral** and a **mineraloid**. (10 marks)
- III. Give two examples for **mineraloids**. (5 marks)
- (b) I. What are the two major features used in mineral identification? (5 marks)
- II. Indicate five major structural types of silicate minerals. (10 marks)
- III. Give one example mineral for each structural type of silicate minerals which you have mentioned in the part b (II). (5 marks)
- IV. Sketch the basic building block of silicate mineral structures and calculate the net charge. (15 marks)
- (c) I. List five major physical properties used in mineral identification. (5 marks)
- II. Briefly describe three (3) physical properties selected from the list which you have mentioned in the part.c (I). (15 marks)
- III. **“Color is always a reliable property in mineral identification”**
Do you agree with this statement?
Justify your answer with examples. (20 marks)
3. (a) I. State the active factors of soil genesis. (5 marks)
- II. Define a soil profile. (5 marks)
- III. Name the master horizons from top to bottom. (5 marks)
- IV. Explain briefly the formation of ‘AC soil’. (10 marks)
- V. Explain subordinate distinctions by giving 3 examples. (10 marks)

- VI. Fill in the blanks according to the description given using the soil orders of USDA classification. (15 marks)

	Description	Soil order (USDA)
1.	Little or no horizon development	
2.	Soils located in arid climates	
3.	Soil formed in volcanic material	
4.	Soils containing permafrost	
5.	Shrinking and swelling clay soils	

- (b)
- I. List five naturally occurring diagnostic epi-pedons. (15 marks)
 - II. Explain briefly the processes in the formation of saline-alkaline soils. (10 marks)
 - III. Explain how a soil is classified according to several levels. Name these levels in descending order. (5 marks)
 - IV. What do you understand by a soil series? (5 marks)
 - V. An undergraduate student observed that the soil profile in Mapalana area has mottles/patches and clay materials are accumulated in B horizon. Briefly explain the reasons for these observations and indicate the subsurface diagnostic horizon according to these observations. (15 marks)
4. (a)
- I. List the three great soil groups found in wet zone of Sri Lanka. (15 marks)
 - II. State the equivalent USDA soil orders of the following great soil groups found in the dry zone of Sri Lanka. (15 marks)
 1. Reddish brown earths
 2. Low humic clay soils
 3. Alluvial soils
 - III Explain briefly the bog and half bog soils. (20 marks)

- (b) I. List the three types of rocks according to the method of formation (5 marks)
- I. Explain briefly the three types of rocks which you mentioned in the part **b (I)** (15 marks)
- (c) I. Define the term "**weathering of rocks**" (5 marks)
- II. Name the types of weathering (5 marks)
- III. "**Any type of rock can be changed in to another type of rock**" Justify this statement using the rock cycle (20 marks)
5. (a) I. What do you understand by the text underlined in the below given paragraph? (10 marks)
- "The living soil; VAST AND TEEMING – continents in breadth, mere feet in depth – soil pulses with life. From microbes to small mammals, plants and animals enrich soil as they live and die" – *an excerpt from the National Geographic Magazine*
- II. What major component in our soils makes it distinctively different from the material that occupy the surface of the moon? (10 marks)
- (b) I. Can the soil be called as an ecosystem? (5 marks)
- II. Justify your answer to the above **b (I)** question. (25 marks)
- (c) I. State two possible ways to categorize soil organisms. (10 marks)
- II. Explain briefly the associations between the following organisms. (20 marks)
1. Earthworm/Bacteria
 2. Algae/Fungi
 3. Termites/Fungi
 4. Actinomycetes/Bacteria
- III. Describe the ecological and agricultural significance of any soil organism you prefer. (20 marks)

6. (a) I. Define soil colloids. (10 marks)
- II. Explain briefly the general properties of soil colloids. (15 marks)
- (b) I. Illustrate two basic building blocks of silicate clay minerals. How do you classify clay minerals based on this? (15 marks)
- II. Name the three general types of 2:1 minerals coming under expanding, limited-expanding and non-expanding. (10 marks)
- III. Explain briefly the structural differences between kaolinite and vermiculite (15 marks)
- (c) I. What is meant by isomorphic substitution? (10 marks)
- II. What are the functional groups involved with pH dependent charges? (10 marks)
- III. Differentiate active, exchangeable and reserve acidities in a soil (15 marks)