UNIVERSITY OF RUHUNA

Final Examination in B.Sc. Agricultural Resource Management and Technology (Part I)

June 2016

SS 4101 Soil Physics

Answer **04 (Four)** questions only **Time: 2h 30 min**

Each question carries a total of 100 marks

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1. I. a) Define particle size distribution in soils. (5 marks)

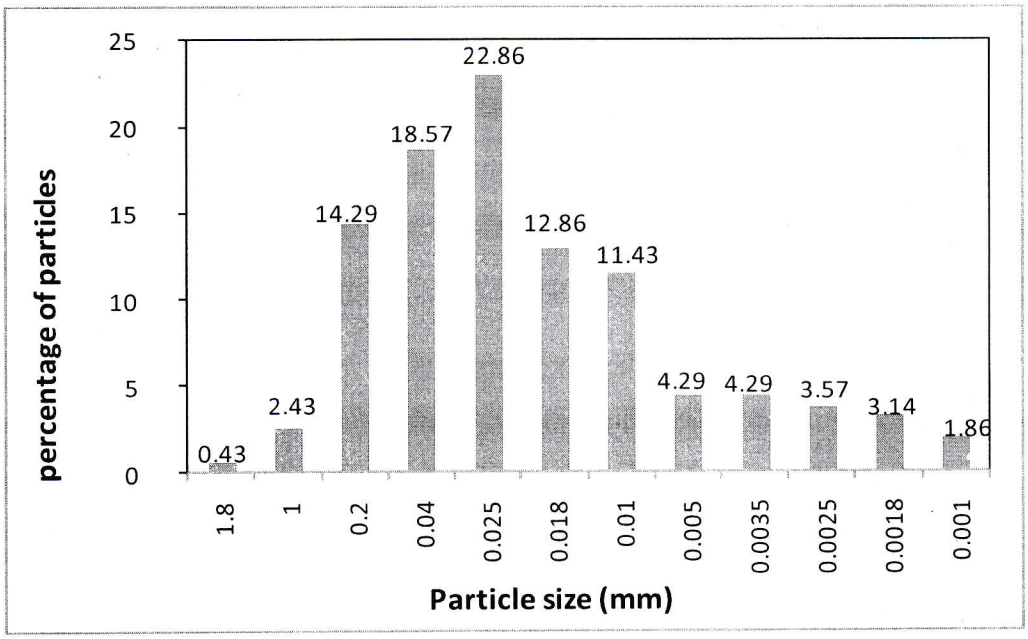
b) Explain briefly the relation of texture and particle size distribution of soils. (10 marks)

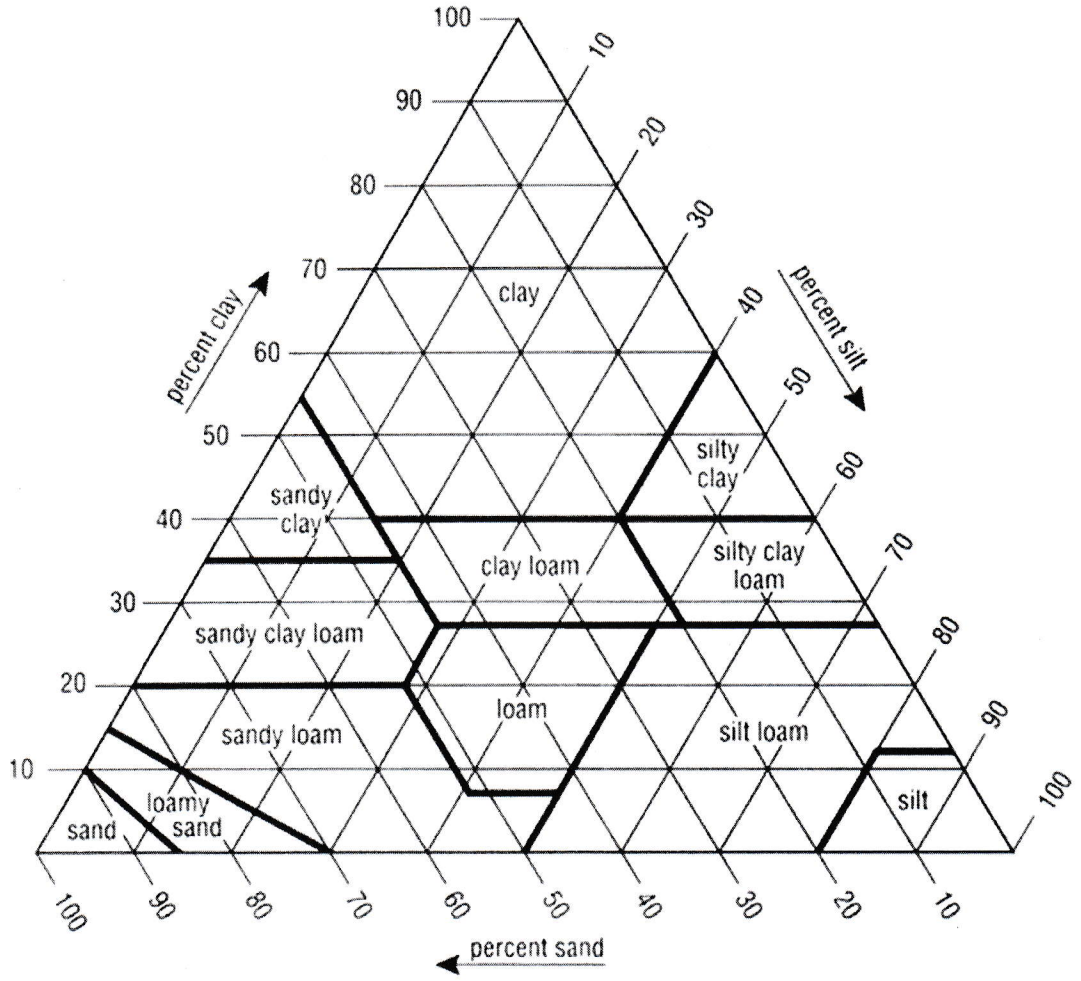
c) Name and explain the properties that are related with soil texture. (10 marks)

II. A student has conducted an experiment to determine the particle size distribution of a soil. He developed a graph (given below) using the particle sizes and their approximate percentages. Data labels indicate the percentage of the particular size fraction in the soil sample.

a) Give the approximate sand, silt, and clay fractions of the soil according to the **ISSS** classification? (10 marks)

b) Find the soil texture according to the **ISSS** classification system of the soil (soil textural triangle is attached) (10 marks)





III a) Differentiate between infiltration and permeability. (15 marks)

b) Compare the expected distribution of porosity and pore space distribution (macropores and micropores), percolation, and leaching between sandy, loamy, and clayey soils. (20 marks)

c) Explain why clayey soils are termed "heavy", implying lower porosity? (20 marks)

2. I. a) Name the most important components of the total water potential in soil. (5 marks)

b) What is the matric potential of a free water surface? (5 marks)

c) Differentiate between permanent wilting point and hygroscopic coefficient. (10 marks)

d) Explain briefly the terms:

i. Adhesion water (5 marks)

ii. Cohesion water (5 marks)

iii. Gravitational water (5 marks)

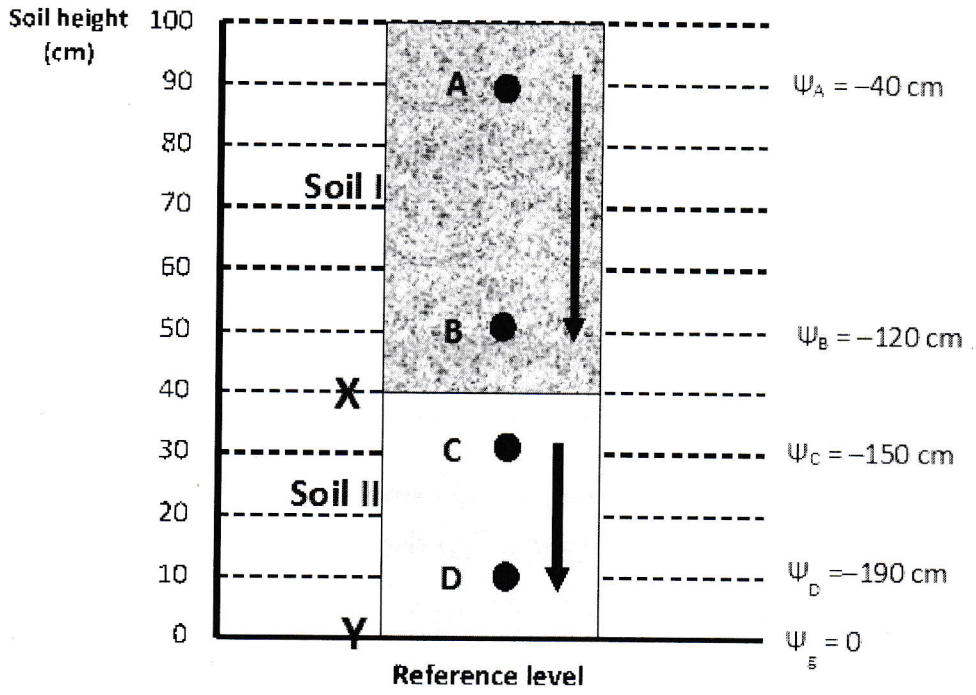
iv. Field capacity (5 marks)

II) a) A laboratory experimental setup for determining saturated hydraulic conductivity is given below.

i. Find the hydraulic gradient between points A and B. (10 marks)

ii. Find the hydraulic gradient between points C and D. (10 marks)

b) If the hydraulic flux at Point X and Y are 10 cm/h and 6 cm/h, calculate the saturated hydraulic conductivities of Soil I and Soil II. (20 marks)



c) Considering their saturated hydraulic conductivities found in section b, comment on the possible textures of the two soils (comparing Soil I and Soil II). (20 marks)

3. I. a) What is meant by the term 'compaction' in soil? (10 marks)

b) Name causes of compaction. (10 marks)

c) Explain the roles of soil moisture content and texture on soil compaction. (20

II. a) State the effects of compaction. (10 marks)

b) Explain the root growth of a compacted soil comparing it with a normal soil. (20 marks)

III. a) Name the parameters that can be used to identify harmful soil compaction. (10 marks)

b) Explain the strategies that can be used to minimize and prevent soil compaction. (20 marks)

4. I. a) What is meant by the term 'tillage'? (10 marks)

b) What is meant by 'conservation tillage'? (10 marks)

c) Name the soil properties that are affected by tillage. (10 marks)

II. a) Define 'soil structure'. (10 marks)

b) Name the factors affecting soil structure. (10 marks)

c) Explain the mechanisms of soil aggregation. (20 marks)

d) Explain in detail the relation of farm tillage to soil structure and erosion. (30 marks)

5. I. a) Explain the ways of water losses from soils. (10 marks)

b) Explain briefly the role of soil as a water reservoir. (20 marks)

II. a) What is meant by 'soil erosion'? (5 marks)

b) State the main principles of erosion control. (10 marks)

c) Name the major factors causing erosion with at least three examples of each factor. (15 marks)

III. A farmer has a land with 5% slope, which he cleared completely, hoping to establish a coconut land. As his consultant, you are expected to advice the farmer on a soil conservation plan. Explain your plan in detail. (40 marks)