FACULTY OF AGRICULTURE - UNIVERSITY OF RUHUNA

THIRD EXAMINATION IN B. Sc. Agricultural Resource Management & Technology / B. Sc. Agribusiness Management (PART I) – July 2018

SS3101 Land Resource Management   **Time: 03 Hours**

Answer **05 (FIVE)** questions only

Each question carries a total marks of 100

---

1. **I.** a) How do you define land use? *(5 marks)*

b) What are the major uses of land? *(10 marks)*

c) Differentiate the terms 'land use planning' and 'land suitability evaluation'. *(15 marks)*

II. a) What is meant by soil spatial variability? *(5 marks)*

b) Give examples for small, medium and large-scale variability of soil. *(20 marks)*

c) What are the main steps involved in mapping the soil of a given area? *(20 marks)*

d) State modern technologies used in soil investigations and mapping. *(10 marks)*

e) What are the main steps involved in a soil survey? *(15 marks)*

2. **I.** a) What are the characteristics of a saline soil? *(10marks)*

b) Explain briefly the difference between alkaline and saline soils. *(15 marks)*

c) What is the importance of knowing the electrical conductivity in soil? *(10 marks)*

d) Why do you think that the sodic soils are problematic soils? *(15 marks)*

II. a) Write an equation for Exchangeable Sodium Percentage (ESP). *(10 marks)*

b) Explain briefly the actual acid sulfate (AAS) soils. *(10 marks)*

c) Explain and illustrate the fate of liming materials in soil using liming reactions. *(10 marks)*

d) A field of *Capsicum* has shown the soil acidity problem. The land extent is 15 ha. It was found that the cation exchange capacity (CEC) of this soil is 20 cmolc/kg of soil. The prevailing percentage base saturation (% BS) of soil is 10%. By applying a liming material it should increase up to 30%. Average bulk density of the soil is 1.6 Mg/m^3 and the root zone depth is 10 cm.

   i) Calculate the mass of soil in the given area. *(10 marks)*

   ii) If $CaCO_3$ is to be used as the liming material, calculate the pure $CaCO_3$ needed (in kilograms) to achieve the required base saturation level. *(10 marks)*

3. I. a) What is meant by soil conservation? *(5 marks)*

   b) Differentiate between;

   i) Weathering and erosion. *(10 marks)*
   ii) Rill erosion and gully erosion. *(10 marks)*
   iii) Conventional tillage and zero tillage. *(10 marks)*

   c) Explain briefly the type of erosion that will <u>occur first</u> due to the rain drop impact. *(15 marks)*

II. a) Name two main effects/types of wind erosion. *(5 marks)*

   b) Explain briefly the effects/types of wind erosion you have mentioned in part **II a)**. *(10 marks)*

   c) What is meant by the Universal Soil Loss Equation? *(10 marks)*

   d) Name the inherent factors or the factors that would determine the highest potential soil loss of a particular area? *(10 marks)*

   e) You have a land with an area of 320 acres where no management practices have been established to control erosion.
   Using the following information, find the <u>annual soil loss of the total land area</u>. *(15 marks)*
   Rainfall factor = 300; Soil erodibility factor = 0.46; Slope length and gradient (L×S) factor = 2.4; Crop factor = 0.18.

4. **I.** a) What is meant by erosion control? *(5 marks)*

b) Name two erosion control methods come under each of the following groups:
   i) Natural or organic based methods *(5 marks)*
   ii) Unnatural or inorganic based methods *(5 marks)*
   iii) Vehicular methods *(5 marks)*

c) State <u>five</u> impacts of river and reservoir sedimentation *(10 marks)*

d) Name the <u>four</u> basic principles of erosion control. *(10 marks)*

e) Name the basic erosion control principles that are related to the <u>each of the terms</u> given below:
   i) Contour ploughing *(5 marks)*
   ii) Mulching *(5 marks)*

II. a) Explain briefly the following terms that are used in erosion control.
   i) Wind break *(10 marks)*
   ii) Fiber roll *(10 marks)*
   iii) Silt fence *(10 marks)*

b) A land owner consults you regarding the conservation of his land. He expects you to completely stop the erosion in his land. In your opinion, is it a possible and appropriate task (Yes/No)?
Justify your answer. *(20 marks)*

5. **I.** a) How do you define land degradation? *(10 marks)*

b) What are the main causes of land degradation? *(15 marks)*

c) Out of the list given above (**b**), what is the most severe cause of land degradation in Sri Lanka? *(5 marks)*

d) Comment on the vicious cycle of land degradation. *(10 marks)*

II. a) What are the on-site and off-site impacts of land degradation? *(20 marks)*

b) Explain briefly an <u>off-site</u> impact of land degradation using a Sri Lankan example. *(20 marks)*

c) State <u>five</u> important manifestations (expressions) of the land degradation problem in Sri Lanka. *(20 marks)*

6. I. a) Define sustainable land management. *(10 marks)*

b) Why do we need to adopt sustainable land management practices? *(10 marks)*

c) State the principles of sustainable land management in farming systems. *(20 marks)*

d) What are the new technologies/options that could be used in sustainable land management? *(20 marks)*

II. a) Define ecosystem services. What are the four main categories of ecosystem services? *(15 marks)*

b) State the types of ecosystem services generated by sustainable land management. *(25 marks)*