UNIVERSITY OF RUHUNA

FACULTY OF AGRICULTURE

Third Examination in BSc Agricultural Resource Management and Technology/ BSc Agribusiness Management (Part I)

July 2022

SS 3101 Land Resource Management (Compulsory - ARMT, Elective - AB)

Theory

INSTRUCTIONS

Answer five (05) questions ONLY.
Only non-programmable calculators are permitted.
Mobile phones are NOT permitted.
Each question carries a total mark of 100.

TIME: 3 (three) Hours

INDEX NUMBER

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1)

A) Following information was extracted from the National land use policy document of Sri Lanka.
"At the beginning of the twentieth century, the per capita extent of land in Sri Lanka was 10.53 hectares. By 2001 the per capita extent had decreased to 0.29 ha."

i) What is the percentage reduction of per capita extent of land during the concerned time period? (10 marks)
ii) What would be the possible reasons behind the decline stated above? (5 marks)
iii) Would you expect a continuation of above trend in future as well? (5 marks)
iv) State two major problems that would arise if the same trend continues? (10 marks)
v) State measures that can be taken to manage the problems you mentioned under question (iv) above. (10 marks)

B) "Land degradation is a serious threat to the survival of all living beings".
i) Why agriculture is among the worst hit industries affected by land degradation? (20 marks)
ii) State why the land degradation is high in developing regions compared to the developed regions of the world? (20 marks)
iii) Explain briefly why prevention of land degradation is recommended rather than trying to recover degraded lands? (20 marks)

2)

A)
i) Distinguish weathering and erosion. (05 marks)
ii) Name five climatic factors affecting soil erosion. (10 marks)
iii) Explain briefly following processes of water erosion.
a) Splash erosion (10 marks)
b) Sheet erosion (10 marks)
c) Rill erosion (10 marks)
d) Gully erosion (10 marks)

B)
i) State the Universal Soil Loss Equation. (05 marks)
ii) Name the basic factors used in the equation. (10 marks)
iii) State the inherent factors or the factors that would determine the highest potential soil loss of a particular area? (10 marks)
iv) Assume that a 300-acre land neighboring your home is a sloped land left fallowing, where management practices have not been established to control erosion. Using the following information, find the annual soil loss of the total land area. (20 marks)
R = 300; K = 0.46; L×S = 2.4

3)

A)

i) Explain briefly the formation of acid sulfate soils? (10 marks)

ii) List the possible reclamation methods of acid sulfate soils. (10 marks)

iii) Explain the reasons of soil salinization. (15 marks)

iv) Calculate the leaching requirement and the required amount of water to leach the excess salts in a saline soil using the information given. (15 marks)

Crop salt tolerance level (ECe) – 1.5 dSm^{-1}

Electrical Conductivity of irrigation water (ECw) – 0.75 dSm^{-1}

Evapotranspiration (ET) – 500 mm/season

B) i) Name three (03) liming materials that can be used to ameliorate an acidic soil. (5 marks)

ii) A 15-ha field of maize has shown a soil acidic problem. To ameliorate the soil with a liming material, the following information is given:

Cation Exchange Capacity (CEC) of the prevailing soil is 20 $cmol_c/kg$

Prevailing percentage base saturation (% BS) is 20%.

Bulk density of the soil is 1.3 Mg/m^3

root zone depth is 10 cm.

prevailing % BS should be increased up to 50%

liming material is $CaCO_3$

Calculate the mass of soil in the given field. (15 marks)

iii) Assume that the purity of $CaCO_3$ is 90%, calculate the amount of $CaCO_3$ needed (in kilograms) to achieve the required base saturation level. (30 marks)

Note: The molecular weight of $CaCO_3$ is 100.

4) A)

i) What is meant by 'erosion control'? (10 marks)

ii) Explain briefly the following terms that are used in erosion control:

a) Buffer strip (10 marks)

b) Strip farming (10 marks)

c) Crop rotation (10 marks)

d) Cover crop (10 marks)

e) Sand fence (10 marks)

B)

i) State the water quality problems caused by soil erosion. (10 marks)

ii) State five (05) impacts of river and reservoir sedimentation. (10 marks)

iii) A landowner 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) A) Proper land use planning starts with the identification of properties and potential uses of the land.

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

ii) State three (03) institutes established in Sri Lanka to handle land-related affairs. (15 marks)

iii) What are the tools available to acquire land information during large-scale land/soil surveys? (10 marks)

iv) What are the formats available to document and present the land-related information? (10 marks)

B)

i) Why soil management is a major component in land use planning? (15 marks)

ii) What are the major considerations of systematic land use planning? (20 marks)

iii) "***What would this country be without this great land of ours***" is a quote by the US president Ronald Reagan, which is applicable also to Sri Lanka. State five things that make Sri Lanka a great land. (20 marks)

6) A)

i) What is meant by sustainable land management? (10 marks)

ii) State the principles for sustainable land management in farming systems. (20 marks)

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

B)

i) Define ecosystem services. (10 marks)

ii) Briefly explain the concept of natural capital and its relationship with ecosystem services. (10 marks)

iii) State the types of ecosystem services generated by sustainable land management. (30 marks)