UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 6 Examination in Engineering: November 2022

Module Number: CE 6253 **Module Name: Ecological Engineering**

[Three Hours]

[Answer **all questions**, each question carries TWELVE marks]

Q1. a) An ecosystem includes all living organisms and their interactions with the non-living environment in a particular area.

i) Describe the influence of topographic factors on formation of an ecosystem.

[3 Marks]

ii) Explain unique characteristics of river ecosystems.

[2 Marks]

b) Modern agricultural ecosystems are extremely dominant, productive, and unstable. Provide examples to back up this claim.

[4 Marks]

c) Explain the importance of temperature as an environmental factor in the functioning of an ecosystem.

[3 Marks]

Q2. a) Environmental pollution is defined as the contamination of the physical and biological components of the earth/atmosphere system to such an extent that normal environmental processes are adversely affected.

i) Describe the most common causes of land pollution.

[3 Marks]

ii) Describe the main cause of eutrophication of lake ecosystems and the related human activities.

[3 Marks]

b) Environmental pollution and ecosystems degradation both are influenced by human activities.

i) What are the most significant human interactions causing depletion of forest ecosystems?

[3 Marks]

ii) Discuss the potential effects of invasive species distribution on ecosystem health, using examples from Sri Lanka.

[3 Marks]

Q3. a) Constructed wetlands and constructed floating wetlands both are manmade ecosystems aimed for removal of pollutants from water.

i) When and where floating wetlands and constructed wetlands are applicable?

[3 Marks]

ii) Compare surface flow constructed wetlands and subsurface flow constructed wetlands.

[3 Marks]

b) There are two proposals for arranging floating constructed wetlands in an urban lake as shown in figure Q3 (a) and (b). Select the most suitable arrangement among them. Explain the reasons for the choice.

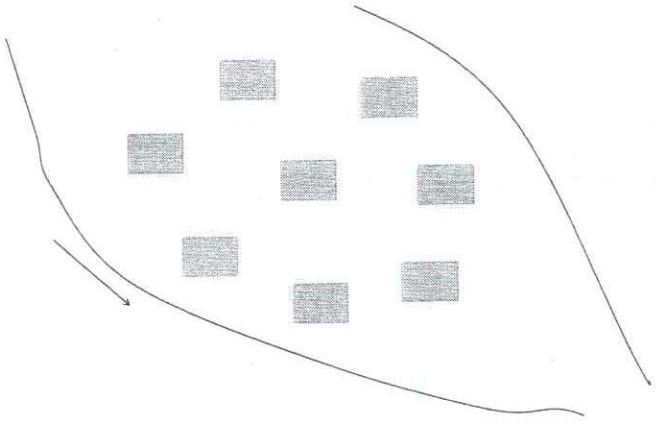

Figure Q3 (a)

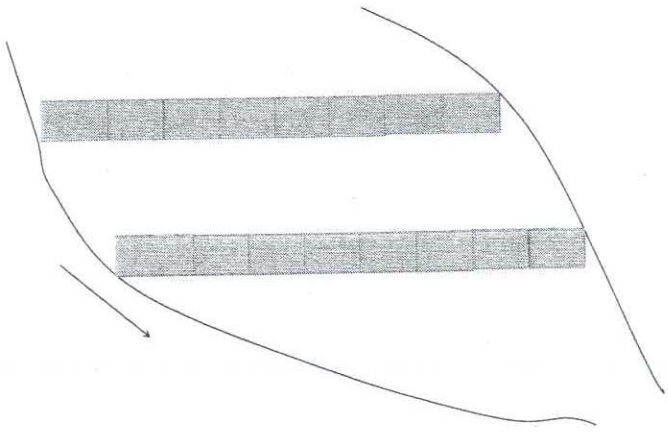

Figure Q3 (b)

[2 Marks]

c) Describe the most important factors in selecting substrate materials and plant types for constructed wetlands relating them to the pollutant removal mechanisms.

[4 Marks]

Q4. Stormwater drainage in urban areas has become a challenge due to the rapid and random growth of urban areas.

a) Analyze the connection between urban flooding and rapid urbanization.

[3 Marks]

b) Describe the function of permeable pavements in urban storm water management.

[3 Marks]

c) Stromwater management system of the City A consists of a network of roadside drains connect to an artificial canal system which transport stormwater directly to River A. It has been found that city's stromwater is rich in nutrients. Propose suitable techniques that can be applied to reduce nutrient loading to the river because of the stormwater flow.

[6 Marks]

Q5. a) A riverside land has been subjected to open dumping of solid waste for nearly a year. Given the ecosystem degradation caused by the activity, the city council has decided to restore the land and convert it to a park. Discuss the potential effects of solid waste dumping on this land and propose the major steps of a restoration plan.

[6 Marks]

b) Restoration is not a substitute for conservation. Analyze this claim and support it with examples.

[3 Marks]

c) In ecosystem restoration, use of passive restoration and design for self-sustainability are valued over more active alterations and continuous maintenance. Explain the reasons for such practice.

[3 Marks]