Uva Wellassa University, Sri Lanka
End Semester Examination – March 2011

MRT 323-1 Pollutant Transport in Water

Time: One (01) hour

Total four (04) Questions
Answer **all** questions

01) i. Using contaminant loading history graphs, describe the characteristics of different water contamination sources. Give examples for each.

(10 marks)

ii. Discuss three (03) types of water contaminants with special emphasis on their chemistry, sources, and related health hazards.

(15 marks)

02) i. Explain the mixing processes taking place in estuaries.

(05 marks)

ii. Describe a calculation method that can be used to estimate the average flow velocity of a stream in the absence of measuring equipment.

(10 marks)

iii. A river flowing at the velocity of 1.5 m/s carries a uniformly distributed suspended chemical load having a concentration of 2.5 kg/m^3. If the cross sectional area of the river is 60 m^2, calculate the total flux of the chemical.

(10 marks)

03) i. Give a qualitatively description of the hydraulic conductivity of earth materials based on their texture. Explain it in relation to Darcy's law.

(10 marks)

ii. Distinguish between turbulent diffusion, molecular diffusion and dispersion of chemicals in water. Illustrate with examples.

(15 marks)

04) A chemical is continuously added to a river through an effluent discharge channel of a factory located on its right bank. The width of the river is 30 m and it flows at average velocity of 0.12 m/s. The transverse dispersion coefficient of the river has been estimated as 0.01 m^2/s. Calculate the length of the transverse mixing zone of the chemical (i.e. the length it travels to reach the opposite bank). Assume that the river has a nearly straight longitudinal section.

(25 marks)

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(10 mark)

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Part B

1.

a. Describe how velocity shear in a river leads to mixing of dissolved chemical mass. Illustrate your answer with diagrams.

b. Explain the characteristics of the "Transverse Mixing Zone" of a chemical released into a river from its bank. How can you estimate its length across the river?

c. Discuss mixing processes occurring in lakes.

d. Write a short note on the role of particles in surface waters in transporting pollutants.

(60 mark)