Uva Wellassa University, Sri Lanka
End Semester Examination – Feb/ March 2012
MRT 482-1 Advanced Water Treatment Methods

Duration: One (01) hour

Uva Wellassa University

Total four **(04)** Questions
Answer all questions
Draw sketch diagrams where necessary

01) Ion exchange is the reversible interchange of ions between a solid ion exchange medium and a solution. This is commonly used in applications like water softening. In general, there are cation and anion exchangers. Cation exchangers have a negatively charged framework with the pores containing cations. Saturated ion exchangers have to be regenerated or replaced.

(i) Describe applications of ion exchange process in the advanced water and wastewater treatment. (15 marks)

(ii) Briefly explain about the chemical regeneration of ion exchangers with NaCl rich solution.
(Hint: You may use general chemical equations as needed.)
(10 marks)

02) Classification of microorganisms is very important to understand their metabolism and function in biological nutrient removal processes. In order to reproduce and function properly, an organism must have sources of energy, carbon and other elements. Accordingly, microorganisms can be classified base on the energy and carbon sources involved in the metabolism.

(i) Describe the basic classification of microorganisms based on the energy and carbon sources involved in biological reactions.
(15 marks)

(ii) Explain briefly about the function of batch, complete-mix, plug-flow, packed-bed and fluidized-bed reactors applied in wastewater treatment facilities.
(10 marks)

03) Anaerobic biological treatment process has become popular in most of the countries due to many advantages such as energy recovery. Hence, it is applied in various technologies such as: anaerobic suspended growth, up-flow and down-flow anaerobic attached growth, fluidized bed attached growth, up-flow anaerobic sludge blanket (UASB), anaerobic lagoons and membrane separation anaerobic process.

(i) Discuss the advantage and disadvantages of anaerobic biological treatment over aerobic treatment to convince above statement.

(10 marks)

(ii) Usually in a biological wastewater treatment plant, aerobic processes are placed after the anaerobic processes. Explain very briefly on this concept.

(10 marks)

04) Nitrate pollution in groundwater is one of the major challenges faced by the water supp engineers in various part of world. Some parts of Sri Lanka such as Jaffna, Puttalum, and Nuwaraeliya also suffer from this problem.

(i) Explain the physical, chemical and biological processes include in nitrogen removal at wetland treatment technology.

(15 marks)

(ii) Even though nitrogen treatment is very significant in wastewater treatment, phosphrous removal is considered as the limiting factor in eutrophication (algae bloom in surface water bodies). Discuss above in brief.

(10 marks)