UNIVERSITY OF SWAZILAND

Faculty of Health Science

Department of Environmental Health Sciences

Supplementary Examination 2009

Title of paper: INDUSTRIAL WASTE MANAGEMENT 11

Course code: EHS 554

Time allowed: 2 hours

Marks allocation: 100 Marks

Instructions:

1) Read the questions and instructions carefully
2) Answer FOUR questions
3) Each question is weighted 25 marks
4) Write neatly and clearly

This paper is not to be opened until the invigilator has granted permission

Question one

a) A company produces wastewater with pollution levels exceeding limits for municipal sewer line discharge; describe how you will persuade the company to install an onsite pre treatment before discharging into a municipal sewerage system.
(10 marks).

b) You are an environmental health officer employed by the Government of Swaziland. You are asked to design a trickling filter system to treat wastewater. Describe the data you will need and its purpose? (15 marks)

Question two

a) In the activated sludge process of wastewater treatment, the ratio of F: M need to be controlled and monitored. What can go wrong in the treatment if there is imbalance of the ratio? (10 marks)

b) Calculate the ratio of F:M when the flow (Q) =30 m^3/s, [BOD] load rate of 200 $mgBOD/m^3/m^2$ .d, MLSS = 4kg and volume = $4000m^3$ (5 marks)

c) Calculate the retention time of the tank if the volume is 14 000 m^3 (5 marks).

Question three

The design of a trickling filter is based on the following parameters:

1. Volumetric Loading rate = $0.2m^3$
2. BOD loading rate = 30 mgBOD/l /s

a) Calculate the surface area of the trickling filter tank when the depth is 3m (5 marks)

b) How many trickling filter tanks do we need for the plant? (5 marks)

c) Explain how activated carbon adsorption is used to purify effluent for stringent wastewater quality requirement. (10 marks)

Question four

a. With an aid of a diagram describe the biological phosphorus removal during wastewater treatment. (10 marks)

b. With the aid of a diagram describe the process of nitrification and denitrification in the extended aeration oxidation ditch. (10 marks)

c. What are the three advantages and two disadvantages of denitrification in the operation of extended aeration (in the wastewater treatment) for nutrients removal? (5 marks)

Question five

Given that:

i. Flow rate is 20 m^3/s
ii. Tank volume of 12000m^3
iii. [BOD] of 400mg/ l

What is the

a) Volumetric loading rate (5 marks)
b) Organic loading rate (5 marks)
c) Retention time (5 marks)
d) Diameter of the thank when depth is 10m (5 marks)

(20 marks)