UNIVERSITY OF SWAZILAND

Faculty of Health Science

Department of Environmental Health Sciences

Final Examination 2007

TITLE OF PAPER	:	INDUSTRIAL WASTE MANAGEMENT
COURSE CODE	:	EHS 522
DURATION	:	2 HOURS
MARKS	:	100
INSTRUCTIONS	:	READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
	:	ANSWER ANY FIVE QUESTIONS
	:	EACH QUESTION CARRIES 20 MARKS
	:	NO PAPER SHOULD BE BROUGHT INTO NOR OUT OF THE EXAMINATION ROOM
	:	BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER

DO NOT OPEN THE QUESTION PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR.

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QUESTION ONE

a. What will be an environmental impact due to indiscriminate disposal of industrial wastewater (water course) containing the following parameters?
   1. Suspended solids
   2. Biodegradable organic matter
   3. Toxic metals
   4. Nutrients
   5. Oil and grease (10 marks)

b. Characteristics of wastewater can be classified as physical, chemical and biological. **Mention**
   i. Three physical properties that characterize wastewater. (3 marks)
   ii. Three chemical properties that characterize wastewater. (3 marks)
   iii. Two biological properties that characterize wastewater. (2 marks)

c. What unit is commonly used to express the quantity of inflow of wastewater per unit area? (2 marks)

QUESTION TWO

a) A company produces wastewater with pollution levels exceeding limits for municipal sewer line discharge; under what circumstances will it decide to have onsite pre treatment before discharging into a municipal sewerage system. (4 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 how you will go about your design. (14 marks)

c) What are the two major reason for wastewater sedimentation in a treatment plant (2 marks)

QUESTION THREE

a. In the design of coarse screen for an industrial wastewater treatment plant why the velocity in the approach channel should be kept between 0.5 and 0.8m/s? (2)

b. In the design of fine screen for industrial wastewater treatment plant why should the cross-sectional area of the approach channel be equal to the cross-sectional **passing** area of the screen? (4)

c. Why should the velocity of the flow between the bars of the screen not exceed 1.2m/s? (4)

d. In a grit chamber a particle settling travel a distance of 1m (one metre) with a velocity of 10 cm/s. What should be the retention time of the flow to allow the settling of all particles of the same size and bigger in the grit chamber before the flow passes over? (5)

e. What are the five benefits of using algal process in wastewater treatment? (5marks)

QUESTION FOUR

In the operation of the Rotating Biological contactor what could be the cause(s) of the following and what could be the solution?

a) There is a black slime in wastewater (4)
b) There is an obnoxious odours (4)
c) There is a white slime in the wastewater (4)
d) There is an excessive sloughing (4)
e) There is decrease in process efficiency (4)

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QUESTION FIVE

a. Describe the biological phosphorus removal during wastewater treatment. (5 marks)

b. Describe the process of nitrification and denitrification in the extended aeration oxidation ditch. (5 marks)

c. What are advantages of using extended aeration in the biological treatment of waterwater? (5 marks)

d. 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 SIX

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 assuming a reasonable flow rate. (5 marks).