



UNIVERSITY OF SWAZILAND
Faculty of Health Sciences

DEGREE IN ENVIRONMENTAL HEALTH
SUPPLEMENTARY EXAMINATION PAPER 2005

- TITLE OF PAPER** : **INDUSTRIAL WASTE MANAGEMENT**
- COURSE CODE** : **EHS 522**
- DURATION** : **3 HOURS**
- MARKS** : **100**
- INSTRUCTIONS** :
- READ THE QUESTIONS & INSTRUCTIONS CAREFULLY**
 - ANSWER FIVE QUESTIONS**
 - EACH QUESTION CARRIES 20 MARKS.**
 - WRITE NEATLY & CLEARLY**
 - NO PAPER SHOULD BE BROUGHT INTO NOR OUT OF THE EXAMINATION ROOM.**
 - BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.**

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.

Question one

- a) What does retention time mean in relation to sedimentation of wastewater?
(4 marks)
- b) In a sedimentation tank with a detention time of 2.5hrs and a tank depth of 5m, what is the velocity of particles that could settle and be retained at the bottom of the tank?
(8 marks)
- c) If the tank is circular and the inflow is $30\text{m}^3/\text{s}$, what is the flow area and the volume of the tank (assume the depth)?
(8 marks)

Question two

- a) If the retention time of wastewater in an activated sludge is less than a day will nitrification and denitrification take place? Give reasons for your answer.
(5 marks)
- b) What conditions that must be fulfilled for biological, phosphorus removal to take place?
(3 marks)
- c) What are five reasons for pretreatment in a company?
(5 marks).
- d) In relation to wastewater screen design what are the acceptable estimate for the following? And give reasons for your answer.
- Depth of the approach channel
 - Thickness of the screen bars
 - Slope of the channel
 - Clear opening between bars
 - Velocity of flow of the approach channel

Question three

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

- Volumetric Loading rate = 0.2
- BOD loading rate = 30 mgBOD/l / s
- Flow = $10\,000\text{m}^3$

- a) Calculate the surface area of the trickling filter tank when the depth is 3m
(15 marks)
- b) How many trickling filter tanks do we need for the plant?
(5 marks)

Question four

Given that the wastewater generated from the city of Manzini is 20000m^3 and a BOD of 250 mg per m^3 per day. MLSS OF 450 mg / m^3 flowing into a tank volume of 18000m^3 with a BOD removal rate of 60%.

- i. Calculate Food / micro-organism rate (5marks)
- ii. Why should we maintain a certain level of F/M in an activated sludge process? (2marks)
- iii. What is the SPR_{spec} of the treatment process? (5marks)
- iv. What is the sludge average age? (8marks)

Question Five

(20 marks)