



UNIVERSITY OF SWAZILAND
Faculty of Health Sciences

DEGREE IN ENVIRONMENTAL HEALTH

SUPPLEMENTARY EXAMINATION PAPER 2009

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| TITLE OF PAPER | : | INDUSTRIAL WASTEWATER |
| COURSE CODE | : | EHS 553 |
| DURATION | : | 2 HOURS |
| MARKS | : | 100 |
| INSTRUCTIONS | : | READ THE QUESTIONS & INSTRUCTIONS CAREFULLY |
| | : | ANSWER ANY FOUR QUESTIONS |
| | : | EACH QUESTION CARRIES 25 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

- i. What would be an environmental impact of indiscriminate disposal of industrial wastewater? Mention 5 impacts (10 marks)
- ii. 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? (7 marks)
- iii. 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

- i. Municipalities not always have to accept industrial wastewater in their sewerage system. Explain three reasons for the restrictions. (9 marks)
- ii. Wastewater of about 400mg per litre BOD was found to be oxidized at a rate of 0.22 per day. How much BOD will remain after five days? Calculate using a first order kinetics of BOD reduction. (10 marks)
- iii. Will you allowed an industry to discharge this effluent to the environment? Explain your answer. (6 Marks)

Question three

- (b) Given that parameters for the design of a wastewater screen are as follows:
- i. Flow rate is $1.0\text{ m}^3/\text{s}$
 - ii. Horizontal flow velocity is 0.8 m/s
 - iii. Bar thickness of 10mm
 - iv. Depth 1.2m
 - v. $F_a = 0.5$ $F_c = 0$ $\sin = 30^\circ$
- (b) What is the cross sectional area of the approach channel? (10 marks)
- (c) How many bars does the screen need? (10 marks)
- (d) 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? (5 Marks)

Question four

You are an environmental health officer employed by the Government of Swaziland or Lesotho. You are asked to design a primary wastewater treatment plant. Describe how you will go about your design. (25 marks)