

**UNIVERSITY OF SWAZILAND**  
**Faculty of Health Sciences**

**DEGREE IN ENVIRONMENTAL HEALTH**

**FINAL EXAMINATION PAPER 2010**

TITLE OF PAPER : INDUSTRIAL WASTEWATER MANAGEMENT I

COURSE CODE : EHS 553

DURATION : 2 HOURS

MARKS : 100

INSTRUCTIONS : READ THE QUESTIONS & INSTRUCTIONS CAREFULLY

: ANSWER ALL 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**

1. Mention **four sources** of wastewater other than rain runoff and in each **mention two types** of pollutants contained (12 marks)
2. When do we consider rain runoff as wastewater of concern in the treatment plant? (5 marks)
3. Mention **four types of contaminants** of concern in industrial wastewater and explain why **these contaminants** need to be removed at the treatment plant before discharge of effluent to aquatic environment. (8 Marks)

**Question two**

1. Describe the four major attributes of industrial wastewater that help to define the physical characteristic of wastewater other than temperature and explain the effects of such pollutants to the environment. (12 marks)
2. Explain four points that make temperature important in industrial wastewater treatment and discharge to aquatic environment. (8 marks)
3. Explain five points; why there has to be stringent standards in the control of industrial wastewater discharge in the municipality sewerage system. (5 Marks)

**Question three**

1. Explain four reasons for conducting BOD<sub>5</sub> test from industrial wastewater treatment. (8 Marks)
2. Describe the procedure for determination of BOD<sub>5</sub> test from industrial wastewater (10 Marks)
3. Waste water was found to be oxidized as if it were a mixture of components of 40% was oxidized at rate of 0.8/d, 40% at oxidized at rate 0.08/d and 20% at 0.008/d. How much BOD remaining in a **day** and in **5 days**. (7 Marks)

**Question four**

1. Mention five major wastewater treatment processes classified as physical processes of treatment. (5 Marks)
2. Why velocity of flow should be controlled in grit chambers and what can go wrong if this control is not effected? (5 marks)

3. In the design of screens 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)
4. 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  $0.8 \text{ m/s}$
  - iii. Bar thickness of  $10\text{mm}$
  - iv. Depth  $1.2\text{m}$
  - v.  $F_a = 0.5$   $F_c = 0$   $\sin = 30^\circ$

How many bars does the screen need?

(10 marks)