



**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**FACULTY OF INDUSTRIAL TECHNOLOGY**

**DEPARTMENT OF CIVIL AND WATER ENGINEERING**

**WATER QUALITY & TREATMENT**

**TCW 5101**

**Supplementary Examination Paper**

**JULY 2016**

This examination paper consists of 2 pages

**Time Allowed: 3 hours**

**Total Marks: 100**

**Special Requirements: NONE**

**Examiner's Name: ENG. A CHINYAMA**

**INSTRUCTIONS**

1. Answer ALL questions
2. Each question carries 25 marks
3. Use of calculators is permissible

**MARK ALLOCATION**

<b>QUESTION</b>	<b>MARKS</b>
1.	25
2.	25
3.	25
4.	25
5.	25
<b>TOTAL</b>	<b>100</b>

### **QUESTION 1**

- a. With the aid of a neat sketch describe how an activated sludge process can be modified to enhance nutrient removal. (10 marks)
- b. Describe the similarities in the treatment processes in the septic tank and the ventilated improved pit latrine. What are the design considerations for a ventilated improved pit latrine? (15 marks)

### **QUESTION 2**

- a. Determine the total sludge production from a treatment system consisting of primary clarification and a trickling filter plant treating  $1000\text{m}^3/\text{day}$  with a  $\text{BOD}_5$  of  $210\text{mg/l}$  and Suspended solids of  $260\text{mg/l}$ . Assume that primary clarification removes 30% BOD and 60% influent solids. (10 marks)
- b. With the aid of a neat sketch describe the processes which take place in a conventional wastewater treatment works. (15 marks)

### **QUESTION 3**

- a. Describe the processes involved in surface water self-purification. ( 5 marks)
- b. Describe 'nutrients' in relation to water quality and pollution. How do they affect water bodies and what conditions increase these effects? (10 marks)
- c. Suggest measures that can be put in place to control the effects of nutrients in surface water bodies. (10 marks)

### **QUESTION 4**

Design suitable dimensions of circular trickling filter units for treating 5 million litres of sewage per day. BOD of sewage is  $150\text{mg/l}$ . Assume organic loading is  $1500\text{kg/hectare/metre/day}$  and effective depth of filter as  $2\text{m}$ . (25 marks)