NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF APPLIED SCIENCES
DEPARTMENT OF ENVIRONMENTAL SCIENCE AND HEALTH
BACHELOR OF SCIENCE HONOURS DEGREE
FINAL EXAMINATION

ENVIRONMENTAL ENGINEERING: TCW 3105

December 2011   Time Allowed:3 Hours   Total Marks:100

INSTRUCTIONS TO CANDIDATES:

Answer any **four** questions. Each question carries **25 marks.**

Question 1

a) Describe the pre-treatment processes in a water treatment plant.   **(10 marks)**
b) Discuss the relationship between coagulation, flocculation and clarification in water
treatment.   **(15 marks)**

Question 2

   Discuss the physical, biological, and chemical water characteristics and their effects on
aquatic ecosystems.

Question 3

 Describe and explain how the integration of the EIA process and the project cycle can be used to
promote sustainable development in the mining sector in Zimbabwe.

Question 4

Give a detailed account of how wastewater is treated in biological attached growth systems.

Question 5

 a) In activated sludge systems define the following terms

    i) Return Activated sludge   (2 marks)

    ii) Waste Activated sludge   (3 marks)

   b) A conventional activated sludge plant operates under the following conditions.

- waste water flow 900m^3/day

- settled waste water BOD   700 grams/day

- liquid volume of aeration tank 600 m^3

- mixed liquor suspended solids 500g/m^3

- waste water BOD 300g/m^3

i) what is the aeration period.   (5 marks)

ii) calculate the BOD loading.   (7 marks)

iii) find the F/M ratio.   (8 marks)

Question 6

As an Environmental Health Technician whose duty area is in a peri-urban area, discuss sanitation technologies you would recommend to your community for good sanitation practices.

(End of question paper)

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SUPPLIMENTARTY EXAMINATION

ENVIRONMENTAL ENGINEERING: TCW 3105

July 2012   Time Allowed:3 Hours   Total Marks:100

INSTRUCTIONS TO CANDIDATES:

Answer any **four** questions. Each question carries **25 marks.**

Question 1

With the aid of examples explain how humans cause environmental degradation
as a result of tragedy of the commons.

Question 2

Focusing on any **four chemical** and **four physical** parameters that are routinely measured
in drinking water, discuss the implications of each on human health.

Question 3

a) Agriculture is a major source of non point pollution into water bodies. What are the possible
pollution measures to reduce this type of pollution.   **(10 marks)**

 b) Describe the ways in which groundwater contamination occurs.   **(15 marks)**

Question 4

a) What are the important design features of trickling filters.   **(10 marks)**

 b) Using a well labeled diagram describe and explain the treatment mechanism of

    Wastewater in trickling filters.   **(15 marks)**

Question 5

a) Define the following terms in relation to wastewater treatment

    i) BOD   **(2 marks)**

ii) COD   **(2 marks)**

iii) Sludge age   **(2 marks)**

b) Given the following characteristics of a community:

Number of residential units	2 500
Water consumption	200l/c/d
Return flow	80%
Industrial effluent	2 800m^3/d
BOD load	70g/c/d
BOD load for industrial effluent	2 200mg/l

Assuming a return factor of 0.80 and an average of 6 people per unit, calculate;

i) Domestic dry weather flow   **(2 marks)**

ii) Total flow   **(2 marks)**

iii) Average domestic BOD loading   **(2 marks)**

iv) Industrial BOD   **(2 marks)**

v) Total BOD loading   **(2 marks)**

c) What are the possible uses of wastewater?   **(9 marks)**

Question 6

Community participation is the key to sustainability in rural water supply and sanitation
Communities in both rural and urban water supply and sanitation projects. Discuss.

(25 marks)

(End of question paper)