NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOLOGY
FACULTY OF APPLIED SCIENCES

DEPARTMENT OF ENVIRONMENTAL SCIENCE AND HEALTH

FINAL EXAMINATIONS

ENVIRONMENTAL ENGINEERING: TCW 3105

January 2013 **Time Allowed: 3 Hours** **Total Marks 100**

INSTRUCTIONS TO CANDIDATES:

Answer any FOUR questions. Each question carries 25 marks.

Question 1

Discuss major sources and effects of green house gases.

Question 2

Give a detailed analysis of measures that can be adopted by local councils in Zimbabwe to reduce land pollution.

Question 3

Discuss processes involved in urban water treatment.

Question 4

a) Describe factors which determine the choice of a treatment process in raw water treatment. **(12 marks)**

b) Explain the factors which affect the coagulation process. **(13 marks)**

Question 5

a) Explain the term population equivalents in industrial wastewater. **(5 marks)**

b) A brewery processing about 100 tonnes of liquor daily produces 200 000 litres per day of wastewater with a BOD of 1000 mg/l. Compute the following:

i. Flow per 1000kg of liquor produced **(5 marks)**
ii. BOD per 1000 kg of liquor produced **(5 marks)**

iii. Hydraulic equivalent population for the wastewater **(5 marks)**

iv. BOD equivalent population for the wastewater **(5 marks)**

Question 6

a) Analyse treatment methods that can be used to treat water in rural areas of Zimbabwe.

(10 marks)

b) Discuss health problems posed by sanitation technologies used in areas without connected water supplies. **(15 marks)**

End of question paper

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SUPPLEMENTARY EXAMINATIONS

ENVIRONMENTAL ENGINEERING: TCW 3105

Year 2013 **Time Allowed: 3 Hours** **Total Marks 100**

INSTRUCTIONS TO CANDIDATES:

Answer any FOUR questions. Each question carries 25 marks.

Question 1

a) Discuss problems caused by air pollution on human health. **(15 marks)**

b) Suggest solutions to air pollution problems on water sources. **(10 marks)**

Question 2

a) With reference to a specific project how can the EIA process be integrated into the project cycle? **(10 marks)**

b)Explain the importance of integrating EIA process into the project cycle. **(15 marks)**

Question 3

Compare and contrast waste stabilization ponds and activated sludge systems.

Question 4

a) Describe and explain the processes of coagulation and flocculation. **(15 marks)**

b) Explore the importance of the processes in question (a) in water treatment. **(10 marks)**

Question 5

a)Define hydraulic population equivalents **(3 marks)**

b)The combined wastewater from a municipality with a sewered population of 3 500 people includes wastewater from a dairy and a metal tool manufacturing plant. The milk processing wastewater is $75m^3$/day with a BOD concentration of 1100mg/l. The manufacturing plant wastewater is $280m^3$/day with a BOD concentration of 50mg/l after pre-treatment at the plant to remove heavy metals and normalize ph.

i) Estimate the total combined wastewater flow in m^3/day. **(6 marks)**
ii) Calculate the average BOD concentration in mg/l. **(6 marks)**
iii) Calculate the hydraulic equivalent populations of the combined wastewater. **(3 marks)**
iv) Calculate the BOD equivalent populations of the combined wastewater. **(3 marks)**

c) Describe the relationship between BOD and COD of the effluent from the municipality's treatment plant. **(4 marks)**

Question 6

Discuss onsite sanitation technologies that can be used by rural communities for good sanitation practices.

End of question paper