

EGERTON



UNIVERSITY

UNIVERSITY EXAMINATIONS

NJORO CAMPUS

SECOND SEMESTER 2012/2013

FIFTH YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN
AGRICULTURAL ENGINEERING

AGEN 557: AGRICULTURAL AND DOMESTIC WASTE MANAGEMENT

STREAM: 2008 (Y5) B. SC. AGEN

TIME: 2 hours

DAY/TIME: WEDNESDAY, 03.00 – 05.00 PM

DATE: 15-05-2013

INSTRUCTIONS:

1. The paper consists of **FIVE** questions in two sections.
 2. Attempt **ALL** questions in **Section A** and **any TWO** in **Section B**.
 3. Marks for each question are shown in parenthesis.
 4. Calculators may be used.
 5. **EACH QUESTION SHOULD BE STARTED ON A NEW PAGE.**
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SECTION A (ATTEMPT ALL QUESTIONS)

QUESTION ONE

- (a) There is need for good waste management in our day to day life. Discuss the effects of poor waste management. (10 marks)
- (b) Differentiate between the following terms as used in agricultural and domestic waste;
- (i) Pollutants and contaminants (1 mark)
 - (ii) Hazardous and non- hazardous waste (1 mark)
- (c) In recent years waste is becoming an environmental problem and there has been an increase in waste generation worldwide. What do you think are the reasons for the increase? (4 marks)
- (d) During wastewater treatment there is need for maturation ponds. What are functions of maturation ponds in wastewater treatment process? (4 marks)

QUESTION TWO

- (a) A household in Njoro district disposes its waste into a dumpsite while another household composts its waste. What are the benefits of composting to household B? **(5 marks)**
- (b) Discuss the hierarchy of integrated solid waste management. **(7 marks)**
- (c) Determine the field capacity and volume of water that can be held by a landfill measuring 800 m and 400 m under the following conditions of operation, 1 year of operation, density of the compacted waste is 950 kg/m^3 , moisture content of 30% by volume and a the landfill has a lift of 9 m . **(6 marks)**
- (d) Define the terms “attenuation” and “containment” as used in landfills. **(2 marks)**

SECTION B (ATTEMPT ANY TWO QUESTIONS)**QUESTION THREE**

- (a) State the different types of refuse collection vehicles used and give the key advantage and disadvantage for each. **(4 marks)**
- (b) Describe the conditions of water pollution and disruption of the aquatic ecosystems with the entry of organic waste into rivers **(6 marks)**
- (c) There are 120,000 people residing in Njoro district. Within this division there are several households with an average of 5 persons per household. Following an Environmental impact assessment conducted by a lead expert, a new landfill site was identified 15 km to the west of Njoro town. In the EIA report it was recommended that the height of the land fill be limited to 10 m and the projected life of the land fill be 30 years. If the amount of waste generated is $2.5 \times 10^4 \text{ g}$ per household per week and the density of waste is 0.45 tonnes/m^3 , determine the area in hectares required for the new land fill. **(5 marks)**

QUESTION FOUR

- (a) Briefly discuss the factors to be considered in pond design. **(4 marks)**
- (b) Discuss various parameters required by micro-organisms to turn waste into compost. **(5 marks)**
- (c) Design a horizontal flow grit chamber to remove grit of sizes greater than 0.2 mm with a through flow rate of $10,000 \text{ m}^3/\text{day}$, specific gravity of particles is 1.9 and viscosity of the liquid medium is 1.002×10^{-3} . The velocity of flow is 0.3 /s. State any necessary assumption. **(6 marks)**

QUESTION FIVE

- (a) Design an anaerobic pond given the following information:
- $Q = 80 \text{ l/person/day}$ and serves a population of 20,000 persons
 - BOD removal efficiency in pond is 60%
 - Influent BOD $L_i = 450 \text{ kg BOD/ day}$

- Temperature = 22°C.
- Lambda (λ) is 291.39 kg/ha/day
- Net evaporation is 2.00 mm

(7 marks)

(b) Waste water can be treated using stabilization ponds or the constructed wetland. What do you understand by the term constructed wetland and compare the different types of constructed wetlands on basis of flow path of the wastewater through the constructed wetlands.

(5 marks)

(c) Briefly explain **three** factors that influence the process of resource recovery.

(3 marks)
