



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2504: PUBLIC HEALTH ENGINEERING III
SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: SEPTEMBER 2018
TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

-Drawing instruments.

This paper consists of four questions.

Answer question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE (COMPULSORY) 30 Marks:

- a) Pit latrines have been used satisfactorily from time immemorial as an alternative form of sanitation system where it is not possible to have conventional sewerage. However they have a disadvantage of producing bad smell as well as providing conducive environment for breeding of flies and mosquitoes. To minimize or eliminate these disadvantages improved forms of pit latrines have been developed. One such improved type of pit latrine is the Ventilated Improved Pit (VIP) latrine. Describe some of the salient feature of a VIP latrine and how they minimize or eliminate the bad smell and also control breeding of flies. **(6 Marks)**

- b) What is the purpose of sewage sludge treatment? **(4 Marks)**
- c) Explain the meaning of the following terms as used in sanitary engineering.
 - i. Sludge concentration
 - ii. Gravity thickening

iii. Anaerobic sludge digestion

(6 Marks)

- d) In solid waste management, recovery of refuse is an important aspect. Outline the methods of recovery of useful substances contained in the refuse. **(6 Marks)**
- e) A retired hotelier has decided to start a hotel business in a rural set up where there is no conventional sewerage system. The hotel will have 100 beds and to be three star. The proprietor intends to drill a borehole which will cater for all the water needs of the hotel. He is unsure which type of sanitation system that he should use for treatment and disposal of sewage generated in the hotel. Recommend which type of sanitation he should use and give reasons for your choice. **(8 Marks)**

ANSWER ANY TWO QUESTIONS

QUESTION TWO (20 Marks)

- a. Write short notes on design parameters of a septic tank. **(8 Marks)**
- b. Explain why rectangular septic tanks are preferred to circular tanks. **(2 Marks)**
- c. Design a septic tank using the data given hereunder. Sketch the tank.
- i. The septic tank is for a school
 - ii. Number of people to be served 1200
 - iii. Detention period 24hours
 - iv. Rate of water consumption 100l/h/d
 - v. Sludge accumulation is assumed to be 30l/head/year.
 - vi. Sludge is removed once a year.

(10 Marks)

QUESTION THREE (20 Marks)

- a. Industrial wastes disposal require consideration from the view point of the industrialist, the public and the sanitary engineer. Discuss the concerns and role of each of these stakeholders in safe industrial wastewater disposal. **(5 Marks)**
- b. What are the categories of contaminants in industrial wastewater? **(3 Marks)**
- c. List the methods of industrial waste disposal? **(2 Marks)**
- d. Describe briefly two industrial processes and how their wastes are treated. **(10 Marks)**

QUESTION FOUR (20 Marks)

- a) What are the broad classifications of solid wastes? Which of these categories is more offensive and why? **(5 Marks)**
- b) Define the following terms as used in solid waste management.
 - i. mixed refuse
 - ii. Commercial/trade refuse
 - iii. Garbage
 - iv. Ashes

(4 Marks)

- c) What are the factors which influence the frequency of refuse collection? **(3 Marks)**
- d) Discuss the importance of record keeping in solid waste management. **(4 Marks)**
- e) What is the purpose of refuse disposal? **(4 Marks)**