



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING
ECV 4506 : PUBLIC HEALTH ENGINEERING III
END OF SEMESTER EXAMINATION
SERIES: JANUARY 2025
TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** questions.

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

Do not write on the question paper.

QUESTION ONE (COMPULSORY) 30 Marks

- Conventional sewerage system as a method of human excreta disposal in rural areas and isolated buildings is inappropriate. Discuss the reasons why this is so and which, are the appropriate methods of sewage disposal in these circumstances. **(6 Marks)**
- Describe three sources of sludge and in each case discuss the properties of the sewage sludge. **(6 Marks)**
- State three preliminary operations prior to sewage sludge treatment. **(6 Marks)**
- Describe two methods of disposal of sewage sludge. **(4 Marks)**
- Discuss the environmental benefits of industrial wastewater treatment before discharging it into the environment **(4 Marks)**
- Discuss solid waste hierarchy as an important principle in modern solid waste management practice. **(4 Marks)**

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO (20 Marks)

- Explain the importance treating sewage sludge before disposal. **(2 Marks)**
- Describe two methods of sewage sludge stabilization. **(4 Marks)**
- Explain the effects of discharging untreated sewage sludge into the environment. **(4 Marks)**
- What is sewage sludge dewatering? Briefly describe two methods of sludge dewatering. **(4 Marks)**

- e. A sewage sludge has a solid content of 4% with dry solids (DS) having a specific gravity (sg) of 1.30. So one tonne of sludge will contain 40kg of DS and 960kg of water. Calculate the volume occupied by one tonne of wet sludge and after dewatering to 35% DS. **(6 Marks)**

QUESTION THREE (20 Marks)

- a. Discuss the disadvantages of using a tradition pit latrine as a form of alternative sanitation. **(5 Marks)**
- b. Discuss the advantages of using ECOSAN toilet as a method of excreta disposal. **(5 Marks)**
- c. Discuss two design parameters of a septic tank. **(4 Marks)**
- d. Design a septic tank for a secondary school in a rural area using the data given hereunder.
- i. Number of students 1000
 - ii. Number of teaching and non-teaching staff together with their families 150
 - iii. Detention period 24hours
 - iv. Rate of water consumption 50l/h/d for students and 100l/h/d for staff and their families.
 - v. Sludge accumulation is assumed to be 30l /head /year.
 - vi. Sludge is removed once every year.
- (6 Marks)**

QUESTION FOUR (20 Marks)

- a. What is “solid waste management” as used in sanitary engineering? **(4 Marks)**
- b. Briefly outline the various stages of solid waste management from the point of generation to the final disposal area. **(4 Marks)**
- c. What is the importance of refuse separation? Explain how it is done. **(4 Marks)**
- d. Explain the basic principle behind solid waste disposal by composting. **(4 Marks)**
- e. Briefly describe landfilling and salvaging as methods of refuse disposal. **(4 Marks)**

QUESTION FIVE (20 Marks)

- a. Define the term “adsorption”. **(2 Marks)**
- b. State the conditions for adsorption process to occur. **(4 Marks)**
- c. Differentiate between physiosorption and chemisorption adsorption. **(4 marks)**
- d. Discuss the factors that affect the rate of adsorption. **(4 Marks)**
- e. Discuss what is meant by “adsorption equilibrium”. **(2 Marks)**
- f. There are many practical applications of the principle of adsorption. Describe two of these applications. **(4 Marks)**