



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of BUILDING & Civil engineering

UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING
ECV 4520: PUBLIC HEALTH ENGINEERING IV
END OF SEMESTER EXAMINATION

SERIES: APRIL 2025

TIME: 2 HOURS

PAPER 1.

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

- a) Discuss the importance of water engineering. **(4 Marks)**
- b) Discuss the difference between flocculation and coagulation in water treatment. **(4 Marks)**
- c) Explain the significance of break point chlorination in disinfection of water supplied to the public. **(4 Marks)**
- d) At the initial stages of planning a water supply project, it is important to formulate a number of possible alternative water systems. Explain the procedure of selecting the best alternative from among the formulated possible alternatives. **(4 Marks)**
- e) Discuss the purpose of studying financial and economic analysis in civil engineering course. **(4 Marks)**
- f) Describe the effects of air pollution. **(4 Marks)**
- g) A town in Kenya is estimated to have a population of 200,000 people. The average rate of water consumption in the town is 150l/h/d. Design a sedimentation tank for water treatment for the town. Assume design flow to be 120% of average flow and detention time of 2 hours. For ease of maintenance and repair as and when required, provide two tanks in parallel. **(6 Marks)**

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO (20 MARKS)

- a) State two preliminary units of a wastewater treatment plant and explain their functions. **(4 Marks).**

- b) In the recent past environmental and social matters have become very important in planning and implementation of projects. Nowadays it is mandatory for Environmental and social impact assessment (ESIA) to be undertaken for all sewerage projects before they are approved for implementation. Discuss the importance of ESIA in the planning and implementation of sewerage projects. **(4 Marks)**.
- c) In planning and design of a sewerage project, it is necessary to conduct field investigation to obtain information and data necessary for proper planning and design. Briefly discuss three field investigations required for this purpose. **(6 Marks)**.
- d) Design trickling filters for a continuous flow of sewage for a population of 150,000 people with an average daily water consumption of 200 litres per person. Assume volumetric loading per day of 400 litres per m³ of filter media and that 80% of water consumed is converted into sewage. Make any other necessary assumptions. **(6 Marks)**

QUESTION THREE (20 MARKS)

- a) Discuss the meaning of “design period” of a water project. **(4 Marks)**
- b) Discuss the purpose of cost estimates of a water supply project in planning and implementation process. **(4 Marks)**
- c) Explain the meaning of a master plan as applied in planning and design of water supply projects. **(4 Marks)**.
- d) Discuss the different sources of financing for water and sewerage supply projects. **(4 Marks)**.
- e) What is the role of legislation in safeguarding the environment from pollution by wastewater? **(4 Marks)**

QUESTION FOUR (20 MARKS)

- a) Define “Financial Analysis of Projects”. **(4 Marks)**.
- b) Discuss the purpose of Financial Analysis of water supply projects. **(4 Marks)**
- c) Discuss the difference between Financial and Economic analysis of projects. **(4 Marks)**.
- d) A need has been identified to augment the existing water supply for a rural area which has been experiencing acute water shortages. A consultant who was engaged to identify and design the augmentation works has come up with final design. Economic and Financial analysis show that the proposed project is economically viable but not financially viable. Discuss the circumstances under which the project can be implemented without compromising service delivery. **(8 Marks)**

QUESTION FIVE (20 MARKS)

- a) Explain when “air can be said to be polluted”. **(4 Marks)**
- b) Describe the following sources of air pollution and give an example of each of them.
 - i. Natural air pollution sources
 - ii. Manmade air pollution sources.**(6 Marks)**
- c) Discuss the difference between particulate and gaseous air pollutants. **(3 Marks)**
- d) Describe how air pollution has contributed to global warming phenomena. **(4 Marks)**
- e) Discuss the role of legislation in air pollution control. **(3 Marks)**