



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: JANUARY 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.

Answer question ONE (COMPULSORY) and any other TWO questions

Do not write on the question paper.

QUESTION ONE (COMPULSORY) 30 Marks

- a) Discuss the relationship between water supply and wastewater engineering. **(4 Marks)**
- b) What is the importance of disinfection in water treatment? **(4 Marks)**
- c) Explain the purpose of the service reservoir in a water distribution system. **(4 Marks)**.
- d) Discuss the general considerations for planning and design of a sewerage project. **(4 Marks)**
- e) State the preliminary treatment units in a sewage treatment plant and explain the function of the units. **(4 Marks)**
- f) Explain the importance of financial and economic analysis of water supply and sewerage projects important. **(4 Marks)**
- g) A medium size town in Kenya is estimated to have a current (2024 population of 300,000 people and the projected population growth rate is 2% in the foreseeable future. The government has just completed rehabilitating and augmenting the water supply of the town to meet its water demand into the future. However, the existing sewerage facilities are not adequate to handle the additional wastewater to be generated due to improved water supply. It is projected that the average rate of water consumption is 120l/h/d. Calculate the total current and future year domestic wastewater generated in the town if

wastewater generated is 80% of the water consumed if the initial year for the sewerage project is 2026. **(4 Marks)**

Calculate the design flow in the future year, if design flow is 150% of the average flow. **(2 Marks)**

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO 20 Marks

- a) In planning and design of a water supply project, it is necessary to conduct field investigations to obtain information and data necessary for proper planning and design. Briefly discuss why information on existing water supply system and water consumption per capita is important. **(4 Marks)**.
- b) Explain the importance of Resettlement Action Plan (RAP) in the implementation of water supply and sewerage projects. **(4 Marks)**.
- c) Discuss the importance of aeration in water treatment. **(4 Marks)**
- d) Explain the importance of the flow peak factor in the design of water distribution systems. **(4 Marks)**
- e) Determine the velocity and discharge in a 45cm diameter pipe running full at a slope of 1 in 1000. Assume 0.012 to be the pipe Manning's roughness coefficient. **(4 Marks)**

QUESTION THREE 20 Marks

- a) Discuss the importance of having a sewerage system. **(4 Marks)**
- b) Explain the term "masterplan" as applied in planning and design of sewerage projects. **(4 Marks)**
- c) It is important to control environmental pollution. Discuss. **(4 Marks)**
- d) Discuss the role of legislation in protection of the environment against pollution. **(4 Marks)**
- e) You have been hired as a consultant to plan a sewerage project for an urban area in Kenya. One of the key components of the sewerage system is the sewage treatment plant. Discuss how you will decide the best method of wastewater treatment. **(4 Marks)**

QUESTION FOUR 20 Marks

- a) Define "Net Present value" as used in financial and economic analysis of Projects. **(4 Marks)**.
- b) Discuss the objectives of economic analysis of water supply and sewerage projects. **(4 Marks)**
- c) Discuss the difference between Financial and Economic analysis of projects. **(4 Marks)**.
- d) A town in Kenya with no functional form of sanitation has been earmarked for construction of a conventional sewerage system. A consultant was commissioned a year ago to plan and design the sewerage project. The consultant has come up with two alternative designs. One alternative involves pumping sewage but with one Sewage Treatment Plant while the other involves a fully gravity system with two STP at different locations. Discuss how you will choose the best alternative out of the two. **(8 Marks)**

QUESTION FIVE 20 Marks

- a) Discuss the importance of controlling air pollution. **(4 Marks)**
- b) Discuss how human activities have contributed to air pollution. **(4 Marks)**
- c) Discuss the difference air pollution control by process change versus air pollution control by downstream devices. **(4 Marks).**
- d) Explain how air pollution has contributed to destruction of Ozone layer in the atmosphere. **(4 Marks).**
- e) Briefly discuss difference between particulate and gaseous air pollutants. **(4 Marks).**