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
SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: MARCH 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.
Answer 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 a water supply project to the community. **(5 Marks).**
b) Briefly explain how to identify a suitable water source for a water supply project. **(5 Marks).**
c) Explain the importance of having proper sanitation facilities in the community. **(5 Marks).**
d) State the disadvantages of pumping sewage. **(5 Marks).**
e) Discuss why the financial and economic analysis is important in planning engineering projects. **(5 Marks).**
f) Discuss the relationship between anthropogenic activities and air pollution. **(5 Marks)**

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO 20 Marks

a) State the various stages of a water supply project during its lifespan. **(4 Marks).**
b) State the importance of metering the consumers in a public water supply project. **(2 Marks).**
c) Discuss the importance of project phasing in implementation of a water supply project. **(4 Marks).**

d) Discuss the meaning of "design period" as applied in planning and design of water supply projects. **(4 Marks).**

e) A water supply treatment plant is designed to treat water for a rural area with a design population of 10,000 people. The average rate of water consumption is 40l/h/d. Design slow sand filter units in the treatment plant. Assume the rate of filtration to be $0.2m^3/h/m^2$. **(6 Marks)**

QUESTION THREE 20 Marks

a) Discuss the relationship between level of wastewater treatment and water quality of the receiving natural water body. **(4 Marks)**
b) Explain the difference between Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) as applied in environmental management in water supply and sewerage projects. **(4 Marks).**
c) Define the following terms as used in sanitary engineering:
   i. Dry Weather Flow (DWF)
   ii. Sewage design flow
   iii. Sewer

   (6 Marks).
d) Design a grit chamber for a continuous flow of sewage for a population of 150,000 people with an average daily water consumption of 100 litres per person. Assume 80% of water consumed is converted into sewage and a detention time of 1 minute. **(6 Marks).**

QUESTION FOUR 20 Marks

a) Define the term "Economic Analysis" of Projects. **(4 Marks).**
b) Discuss the purpose of Economic Analysis of water supply and sewerage projects. **(4 Marks)**
c) Define the following terms as used in Financial and Economic analysis:
   i. Internal Rate of Return (IRR)
   ii. Capital costs
   iii. Recurrent costs

   (6 Marks).
d) A need has been identified to augment the existing water supply for a town which has been experiencing acute water shortages. A consultant who was engaged to identify and design the augmentation works has come up with two possible alternatives. One alternative involves having a gravity system from a surface water source and the other is to utilize a groundwater source. Discuss how you will choose the best alternative out of the two. **(6 Marks)**