



MACHAKOS UNIVERSITY

University Examinations for 2024/2025 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR FIRST SEMESTER EXAMINATION FOR DEGREE IN
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 303: PUBLIC HEALTH ENGINEERING I

DATE: 23RD JANUARY, 2025

TIME: 11.00 AM – 1.00 AM

INSTRUCTIONS:

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

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Discuss the importance of meeting bacteriological water quality requirement for drinking water (5Marks)
- b) Calculate the terminal settling velocity for sand in water at 10°C having particle diameters of 70 and 220 μm and a density of 2650 kg/m^3 (5 Marks)
- c) Sedimentation is the separation of suspended particles that are heavier than water by gravitation settling. Explain physical Four factors that influence this operation. (8 Marks)
- d) Distinguish between type I particle settling and Type II particle settling in sedimentation (6 Marks)
- e) Describe the process of membrane filtration in water treatment. (6 Marks)

QUESTION TWO (20 MARKS)

- a) Describe the significant role of the coagulation and flocculation processes in water treatment. (10 Marks)
- b) Describe the chemicals used as coagulants and the primary mechanisms that coagulants use to destabilize particles. (10 Marks)

QUESTION THREE (20 MARKS)

- a) Describe the use of aeration in water treatment and give the conditions necessary for its effectiveness in water treatment. (10Marks)
- b) A small community water supply scheme is considering rainwater harvesting as the source of water supply. Design the roof catchment area required for a discharge of 1200 Litres/day if the 90% probability annual rainfall for the area has been estimated by the meteorological department to be 820mm (10Marks)

QUESTION FOUR (20 MARKS)

- a) Examine the three stages of chlorine application in water disinfection and indicate the significance of each stage (10Marks)
- b) Discuss Four characteristics of disinfectants commonly used in drinking water treatment (10 Marks)

QUESTION FIVE (20 MARKS)

Assume you have been requested to design a water supply scheme for a high-class housing suburb in Kitui town and the design life of the system is to end in the year 2040. The demand is purely residential. The population in this section of town has been obtained by census every 10 years by the Kenya National Bureau of Statistics as tabulated in Table 05. Calculate the initial, future and ultimate water demand using 2020 as the initial (base year). The design population in the town should be estimated using geometric growth projection

Table 05: Population for Kitui from KNBS

Year	Population
1930	1235000
1940	160000
1950	160000
1960	195000
1970	195000
1980	210000
1990	290000

2000	330000
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