



**TECHNICAL UNIVERSITY OF MOMBASA**  
FACULTY OF ENGINEERING AND TECHNOLOGY  
DEPARTMENT OF BUILDING & CIVIL ENGINEERING  
**UNIVERSITY EXAMINATION FOR:**  
BACHELOR OF SCIENCE IN CIVIL ENGINEERING  
**ECE 2512 : PUBLIC HEALTH ENGINEERING IV**  
SPECIAL SUPPLEMENTARY EXAMINATION  
**SERIES: SEPT. 2017**  
**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)**

- a). Namanga town with a population of 50,000 people has an area of 2000 hectares of land, out of this area, 200 and 100 hectares are zoned commercial and industrial respectively. The average water consumption is 200 l/ha/day and that 85% of the water is converted to sewerage. On the basis of sewer gauging, the average flow from the commercial, domestic, industrial and infiltration/inflow are 3.0, 1.85, 1.72 and 1.60 respectively. Using an industrial allowance of 5000 litres/hectares/day and 570 l/ha/day for infiltration/inflow. Determine the following:
- i). Average wastewater flow
  - ii). Peak wastewater flow rate
  - iii). The overall peaking factor
  - iv). What is the effect of commercial, industrial and infiltration/inflow on the overall peaking factor (14 Marks).
- b). Describe any three types of screens used in wastewater treatment plants (6 Marks).
- c). Explain the importance of the following parameters in the design of a sewer system
- i). Maximum Dry Weather Flow Rate ( $Q_d$ )
  - ii). Maximum Wet Weather Flow Rate ( $Q_w$ )
  - iii). Minimum Flow Rate ( $Q_{min}$ ) (6 Marks).
- d). What are the main objectives of sewerage treatment? (4 Marks).

## ATTEMPT ANY TWO QUESTIONS

### QUESTION TWO

- a). Design a circular primary settling tank for a population of 35,000 people with water supply of 200 l/capita/day. Assume suitable design criteria (12 Marks).
- b). Describe three ways in which an engineer can control odour in an anaerobic pond (6 Marks).
- c). Define the term **infiltration** as used in wastewater design (2 Marks).

### QUESTION THREE

- a). Discuss any three types of sewerage systems (6 Marks).
- b). Design a coagulation sedimentation tank with a continuous flow for treating water for a population of 30,000 people with an average daily consumption of 100 litres per person. Assume a surface loading rate of  $0.9 \text{ m}^3\text{m}^{-2}\text{h}^{-2}$  and the weir loading rate is within the acceptable limits (12 Marks).
- c). What is clarification? (2 Marks).

### QUESTION FOUR

- a). Discuss procedures of economic analysis of water supply projects (8 Marks).
- b). Moiben town has a population of 45,000 people and an average water consumption of 150 litres/person/day with an effluent flow of 100 litres/day. Determine the following: Mid-depth area, detention time and organic loading, use  $K = 0.3 \text{ day}$ , and  $D = 1.20 \text{ m}$  (6 Marks).
- c). Discuss ANY three methods of disposal of screenings (6 Marks).

### QUESTION FIVE

- a). Design a sedimentation tank for a flow (Q) of  $1500 \text{ m}^3/\text{day}$ . Determine the dimensions of the tank and the outflow weir length. Assume suitable design criteria (12 Marks).
- b). Make short notes under the following surveys undertaken for project preparation
  - i). Reconnaissance survey
  - ii). Socio-economic survey
  - iii). Contingent Valuation Method
  - iv). Water Supply facilities survey(8 Marks).