(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

FOURTH YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE
OF
BACHELOR OF TECHNOLOGY EDUCATION IN CIVIL ENGINEERING

COURSE CODE: **TEB 403**
COURSE TITLE: **WATER SUPPLY TECHNOLOGY**

DATE: MONDAY 25TH APRIL 2022 TIME: 8.00 – 10.00 AM

INSTRUCTIONS:
1. This paper contains FOUR Questions
2. Attempt Question ONE and any other TWO Questions only
3. Marks for each question are indicated in the parenthesis.
4. It is in the best interest of the candidate to write legibly
5. Examination duration is **2 Hours**

MMST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over.

QUESTION ONE (Compulsory)   [30Marks]

a) You are required to estimate the flows for the design of a water treatment and distribution system for a town having an area of 2500 ha. The residential area is 60% of the total area, whereas commercial and industrial areas are 30% and 10% of the total area, respectively. Of the residential area, 40% are large lots, 55% small single-family lots and 5% multi-storey apartments. The water demand from the residential area is estimated to be 200 L/c/d. The water demand from commercial and industrial areas is estimated to be 25000 L/ha/d and 40000 L/ha/d, respectively. The hourly and daily peak factors are 2.7 and 2.0 respectively   [12 marks]

Type of Area	Density (persons/ha)
Large lots	5-7
Small lots, single family	75
Small lots, two family	125
Multi-storey apartments	2500

b) Outline how sanitation practices affect water supply   [4 marks]

c) Outline the relevance of the following parameters in water supply engineering
    i) *Escherichia coli* ii) pH iii) Iron iv) dissolved oxygen   [6 marks]

d) Two primary settling basins are 25 m in diameter with 2.5 m side water depth. Single effluent weirs are located on the peripheries of the tanks. The water flow to be treated is 30,000 m³/d. Determine
    i) Surface area and volume of the tank, ii) surface loading (overflow rate)
    iii) Detention time iv) weir loading   [8 marks]

QUESTION TWO   [20 Marks]

a) Outline the advantages of using Galvanized Iron (GI) pipes in water distribution system   [3 marks]

b) Outline causes, effects and prevention of corrosion in water pipelines
          [12 marks]

c) Explain water quality analysis and its importance in water supply
          [5 marks]

d) Explain the importance of jar test   [3 marks]

QUESTION THREE   [20 Marks]

a) Water supply may be intermittent or continuous. Explain the merits and demerits of these two systems   [8 marks]

b) Monthly inflow rates and demands during a low-water period at the site of a proposed dam are tabulated in table. The corresponding monthly pan evaporation and precipitation at a nearby station are also tabulated. Prior water rights make it obligatory to release the full natural flow or 15 ha-m per month, whichever is minimum. If the net increased pool area is 300 ha, find the required storage capacity for the reservoir. Assume pan evaporation coefficient is 0.7 and also assume that only 28% of the rainfall on the land area to be flooded by reservoir has reached the stream in the past   (12 marks]

Inflow (Ha-m)	1.2	0	0	0	0	0	240	480	1	0.6	0.5	0.2
Pan evaporation (cm)	1.8	1.8	2.6	10.2	15.4	1.6	10.8	11.7	10.8	9.6	7.8	2
Rainfall (cm)	1.3	1.7	0.6	0	0	1.1	16.1	16.4	2.2	0.8	0	0
Demand (ha-m)	15.8	14.3	9.6	4.8	3.5	3.4	5	5	10	15.6	16.8	16.8

QUESTION FOUR   [20 MARKS]

a) A tube well penetrates fully an unconfined aquifer. Calculate the yield from the well under the following conditions   [5 marks]

Diameter of the well = 30 cm   Drawdown = 2 m

Coefficient of permeability = 0.05 cm/sec   Length of the strainer = 10 m

Radius of zero drawdown = 300 m

b) Sketch a water treatment flow diagram for a ground water with high levels of dissolved gases, Iron, organic chemicals, hardness, and total dissolved solids. Neatly label the treatment units   [5 marks]

c) A filter plant is to be constructed to process 757,000 m^3/d. Pilot plant analysis of media indicates that a filtration rate of 15 m/h will be acceptable. Assuming a surface configuration of approximately 5 X 8m, how many filter units will be required? Allow one unit out of service for backwashing.   (5 marks)

d) Describe the flocculation process   [5 marks]

END OF QUESTION PAPER