



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2019/2020 ACADEMIC YEAR**

FOURTH YEAR FIRST SEMESTER EXAMINATIONS

**FOR THE DEGREE
OF
BACHELOR OF TECHNOLOGY EDUCATION
(CIVIL AND STRUCTURAL ENGINEERING)**

COURSE CODE: TEB 403

COURSE TITLE: WATER SUPPLY TECHNOLOGY

DATE: MONDAY 13TH JANUARY 2020 TIME: 12.00–2.00PM

INSTRUCTIONS:

1. This paper contains FIVE Questions
2. Answer FOUR Questions only
3. Marks for each question are indicated in the parenthesis.
4. It is in the best interest of the student to write legibly
5. Examination duration is **2 Hours**

MMUST observes ZERO tolerance to examination cheating

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

QUESTION ONE

- a) Explain how water demand in a city is estimated [5 marks]
- b) A 0.4m diameter well fully penetrates an unconfined aquifer whose bottom is 80m below the undisturbed ground water table. When pumped at a steady rate of $1.5\text{m}^3/\text{min}$, the drawdowns observed in two observation wells at radial distance of 5m and 15m are, respectively, 4m and 2m. Determine the drawdown in the well [7 marks]
- c) Define fluoridation and defluoridation, and explain the circumstances for each case [4 marks]
- d) At a water treatment plant, 12×10^6 litres of water is treated using ferrous sulphate and lime. If the dosage of ferrous sulphate is 10 mg/l, determine the total quantities of ferrous sulphate and lime required daily. Take molecular weight of lime as 56.08 and that of ferrous sulphate as 278.028. The reaction of ferrous sulphate and lime is 1:1 [4 marks]

QUESTION TWO

- a) The monthly inflow and monthly pan-evaporation during a critical dry year at the site of a proposed reservoir are given below.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Inflow (ha-m)	10	10	4	2	1	200	2000	4000	1500	100	15	10
Pan evaporation (cm)	8	10	10	12	15	20	15	15	15	12	10	8
Precipitation (cm)	2	0	0	0	0	30	40	45	40	10	0	2
Demand (ha-m)	150	150	50	50	50	50	50	50	150	150	150	150

The net increase in pool area is 500 ha and the prior rights require the release of the full stream flow or 10 ha-m, whichever is less. Assume that 40% of the precipitation that has fallen on the submerged area reached the stream earlier and 60% of that directly falls on the reservoir. Determine the storage capacity. Take pan coefficient as 0.80 [12 marks]

- b) Outline the advantages and disadvantages of gravity sand filters [8 marks]

QUESTION THREE

- a) A source of water from a borehole in Kakamega has the following characteristics: high fluoride content, very high hardness, unpleasant odour, bitter or metallic taste, brownish or dark brown colour. Sketch a treatment flow diagram clearly labelling the units and their functions [8 marks]
- b) Find the dimensions of a rectangular sedimentation basin for the following data:

- Volume of water to be treated = 3×10^6 litres per day

- Detention period = 4 hours
 - Velocity of flow = 10 cm/min
 - Depth of the tank = 3 m
- [6 marks]
- c) Explain the mechanism of disinfection [6 marks]

QUESTION FOUR

- a) Outline the factors affecting the disinfection process [4 marks]
- b) A pump is connected to a suction pipe, length 2.5 m and diameter 300 mm diameter, and a discharge pipe, length 40m and a diameter 200 mm. water is pumped from a level 1.5 m below the pump centerline and the discharge is at a level 16.5 m above the pump. Determine the flow rate in m³/h if the test on a centrifugal pump which rotates at 1400 r/min supplied the following results

Discharge, Q (m ³ /s)	0	0.08	0.16	0.24	0.32
Total pressure head, H (m)	44	42	37	28	15

- Assume pipe friction factor, $4f = 0.008$ [10 marks]
- c) Outline the points of chlorination [6 marks]

QUESTION FIVE

- a) Outline the characteristics of a good distribution system [6 marks]
- b) Using a suitable sketch, describe a river intake [6 marks]
- c) Define the following terms as applied in groundwater supply [4 marks]
- i) aquifer, ii) aquiclude, iii) aquitard and iv) aquifuge
- d) Why is groundwater preferred source of water? [4 marks]