UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME : WATER TREATMENT TECHNOLOGY

COURSE CODE : BNA 31203

TERBUKA

PROGRAMME CODE : BNA

EXAMINATION DATE : DECEMBER 2019 / JANUARY 2020

DURATION : 3 HOURS

INSTRUCTION : ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 (a) What is the primary objective of water supply development in Malaysia.

(4 marks)

(b) Explain potability of water.

(6 marks)

(c) Population forecasting is commonly used to design water supply for future requirements. Muar is a city that has a present population of 100,000. It is estimated to increase to be 350,000 in the next 10 years. The existing treatment plant capacity is 60 mgd. The rate of input to the treatment plants is 173 gallons per person per day.

(i) Calculate the population after 10 years

(5 marks)

(ii) Analyze for how long will the treatment plant be adequate?

(10 marks)

Q2 (a) Name **FIVE (5)** main category of water treatment process.

(5 marks)

(b) Briefly discuss **FIVE (5)** purpose of aeration process.

(5 marks)

(c) Sembrong Timur WTP is a conventional treatment plant that has a capacity of 50 MLD.

(i) Sketch the water treatment process of the plant.

(7 marks)

(ii) Estimate the required water surface area of a cascade used for aeration by using design criteria of 12 m^2 of exposed water surface for every 40 L/s of design flow.

(8 marks)

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Q3 (a) List **FOUR (4)** types of coagulant that are commonly used in water treatment process.

(4 marks)

(b) Illustrate the process of particle destabilization by coagulation and flocculation treatment.

(6 marks)

(c) A water sample was collected from a coagulation tank where 2 mg/L of alum is used in the process. As environmental technologist engineer, you are required to analyze the water sample by:

(i) Determine the alkalinity consumed (expressed in $CaCO_3$). Given the molecular weight for alum is 594 g/mole and alkalinity is 61g/mole.

(5 marks)

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(ii) Evaluate a bar graph which shows the constituent of TH, CH, NCH, and alkalinity when the water has the concentration of ions and molecular weight as shown in **Table Q3 (c)(ii).**

(10 marks)

Q4   (a)   Fluoridation of water involves the addition of predetermined amounts of a fluoride containing chemical to the water during the water treatment process. Give **THREE (3)** methods of feeding fluoride compounds into water.

(6 marks)

(b)   Water distribution system is design to distribute water to the consumer based on the layout of the system. Sketch the design layout for Branching and Radial System.

(4 marks)

(c)   Sedimentation is a process by which particulates settle to the bottom of a liquid and form a sediment.

(i)   Classify in details **FOUR (4)** zones in the sedimentation tank.

(8 marks)

(ii)   Measure the dimensions for rectangular sedimentation tanks with flow of 0.030 m^3/s. Use a design overflow rate of 22 m/day, detention time of 3 hours, and L:W = 4:1

(7 marks)

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-END OF QUESTIONS-

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Table Q3(c)(ii)

Ion	Concentration (mg/L)	MW (mg/mmol)
Ca^{2+}	40	40.1
Mg^{2+}	9	24.3
Na^+	8	23.0
K^+	6	39.1
HCO_3^-	98	61.0
SO_4^{2-}	66	96.1
Cl^-	9	35.5

Equations

$$\text{Alkalinity Expressed in } CaCO_3 = HCO_3^- \times \frac{EW\ CaCO_3}{EW\ HCO_3^-}$$

$$Area\ (A) = \frac{Q}{v} \qquad Flowrate\ (Q) = \frac{V}{t} \qquad Depth\ (D) = \frac{V}{A}$$