Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(TAKE HOME)
SEMESTER I
SESSION 2020/2021

COURSE NAME	: WATER TREATMENT TECHNOLOGY
COURSE CODE	: BNA 31203
PROGRAMME CODE	: BNA
EXAMINATION DATE	: JANUARY/FEBRUARY 2021
DURATION	: 2 HOURS 30 MINUTES
INSTRUCTION	: ANSWERS **ALL** QUESTIONS **OPEN BOOK EXAMINATION**

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

Q1 (a) State the Department with the Ministry that responsible for monitoring the river water quality in Malaysia and describe **THREE (3)** objectives of the National Drinking Water Standard.

(5 marks)

(b) Batu Pahat is a city that recorded population of 20,000 in 2014 and 23,250 in 2020. The existing treatment plant capacity of the city is 10 mgd. The rate of input to the treatment plants is 145 gallons per person per day.

(i) Calculate the population in year 2022

(4 marks)

(ii) Based on the year 2020, estimate for how long will the treatment plant be adequate?

(6 marks)

(c) The management of water resources is important for the sustainability of potable water supply. Discuss **THREE (3)** of the water resources quality issues in Malaysia and propose **TWO (2)** ways to tackle these issues.

(10 marks)

Q2 (a) Identify **THREE (3)** of the primary treatments for the standard water treatment Class C and briefly explain the treatments.

(6 marks)

(b) Aerator is a device that is used for aeration or mixing air with water to add oxygen to the water.

(i) Sketch a cascade aerator and a pack-tower stripping aerator.

(4 marks)

(ii) A Water Treatment Plant that located at Taman Pagoh Jaya 2 has a plant capacity of 20 MLD. Estimate the required water surface area of a cascade used for aeration by using design criteria of 15 m^2 of exposed water surface for every 54 L/s of design flow.

(6 marks)

(c) Intake structures are used for collecting water from the surface sources such as river, lake, and reservoir and conveying it further to the water treatment plant.

(i) Discuss the advantages and disadvantages of the following intake structure.

(a) Tower

(b) Shore

(c) Pier

(6 marks)

(ii) Propose a way for the dry intake tower from collapse during the absence of water.

(3 marks)

Q3 (a) List **TWO (2)** examples of compound that can be remove in coagulation process and explain **FOUR (4)** properties of coagulant.

(6 marks)

(b) (i) Show how the trivalent cations is considered as good coagulant.

(4 marks)

(ii) A water treatment plant at Bukit Gambir uses rapid mixer for the dispersion of the coagulant to achieve the adsorption/destabilization reaction. Estimate the volume of the coagulation tank and the power usage for water flows of 150 MLD. Given velocity gradient, G = 3000/s; dynamic viscosity; and $\mu = 1.081 \times 10^{3}$ Pa.s.

(6 marks)

(c) (i) Calculate the constituent of TH, CH, and NCH when the water has the concentration of ions and molecular weight as shown in **Table Q3 (c) (i)**.

(6 marks)

(ii) Build a bar graph showing the TH, CH, and NCH values

(3 marks)

Q4 (a) State **TWO (2)** main type of sedimentation basins and compare the condition for the Vs and Vo with respect to the particles removel for each basin.

(6 marks)

(b) (i) Sketch the top view and cross section view of circular and rectangular basin.

(4 marks)

(ii) Analyze the dimensions of rectangular sedimentation tank with flow of 0.024 m^3/s. Use a design overflow rate of 26 m/day, detention time of 4 hours, and L:W = 3:1.

(5 marks)

(c) (i) Water distribution system is a network of pipelines that distribute water to the consumers. Tree system is one of the distributions methods that is commonly used. Discuss briefly **FIVE (5)** downsides of using this system

(5 marks)

(ii) Water disinfection is the process of removing, deactivate or killing the pathogenic microorganisms in the water that resulting in termination of growth and reproduction. As an environmental technologist engineer, you are required to design a pump injector system that can supply chlorine gas into the water.

(5 marks)

-END OF QUESTIONS –

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Table Q3 (c) (i)

Ion	Concentration (mg/L)	MW (mg/mmol)
Ca^{2+}	50	40.1
Mg^{2+}	8	24.3
Na^{+}	12	23.0
K^{+}	5	39.1
HCO_3^-	120	61.0
SO_4^{2-}	69	96.1
Cl^-	14	35.5