UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2021/2022

COURSE NAME	:	DESIGN OF WATER SUPPLY
COURSE CODE	:	BFA 40203
PROGRAMME	:	BFF
EXAMINATION DATE	:	JULY 2022
DURATION	:	3 HOURS
INSTRUCTION	1.	ANSWER ALL QUESTIONS
	2.	THIS FINAL EXAMINATION IS AN **ONLINE ASSESSMENT** AND CONDUCTED VIA **CLOSED BOOK.**
	3.	STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

TERBUKA

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1   (a)   **FIGURE Q1(a)** shows a news entitled "Sungai Semenyih Water Treatment Plant Shutdown Following an Odour Pollution Incident at Sungai Semenyih" from Air Selangor on 16 December 2021.

   (i)   Suggest **FOUR (4)** effective actions to the state government on how to avoid contamination from recurring.

(8 marks)

   (ii)   Explain **THREE (3)** methods that can be applied to remove odour from raw water sources.

(6 marks)

(b)   In 2030, government has plan to build a new water treatment plant located at Yong Peng, Batu Pahat and hired you as a consultant. Explain the factors need to be considered for selecting a raw water as raw source intake for water supply treatment.

(8 marks)

Q2   (a)   **FIGURE Q2(a)** illustrates rural household scale drinking water purification system to remove chemical pesticides, biological contaminants and constructed by the system's operators using simple, inexpensive and locally abundant materials. Gravity-fed system will employ a sand pre-filter followed by pulverized charcoal filter medium supported on a bed of gravel and finally exposure to UV radiation after filtration.

   (i)   Identify **THREE (3)** major treatment functions for household drinking water purification system.

(6 marks)

   (ii)   Briefly describe how they function.

(6 marks)

   (iii)   Explain the purpose of gravel in this system.

(4 marks)

   (iv)   Explain the important of turbidity control for disinfection of drinking water.

(4 marks)

Q3   (a)   **TABLE Q1(a)** is tabulation of estimated water demand rate for planning of external water reticulation system. Based on **TABLE Q1(a)**, calculate water demand for project entitled:

The proposed project comprises of medium low cost apartments (40 units), medium cost apartments (258 units) with 3 storey car parks, commercial lots (8 lots), management office (150 m^2), community centre (700 m^2), kindergarten (60 pupils) and mosque (100 persons). This project site is approximately 8.5 acres and located on Lot 15881, Jalan Kluang Lama, Batu Pahat, Johor. Its southern and western boundaries are bounded by existing main roads which are Jalan Sri Lanang and Jalan Mewah.

(10 marks)

(b)   Design the rectangular settling tank(s) for the city of Batu Pahat water treatment plant using the design overflow rate 35 m^3/d. m^2. The maximum day design flow is 23,000 m^3/d. Assume a water temperature of 25^{0}C. Design criteria for rectangular settling tank according MWA Design Guidelines for Water Supply Systems are as follows:

     i.   the overflow ranges from 0.85 to 1.5 m^3/m^2/hour
     ii.   detention time 4 hour
     iii.   the length to width ratio between 3:1 to 5:1
     iv.   the depth is in range of 3 to 5 m
     v.   the length to depth ratio is $4.2 < L/D < 25$
     vi.   velocity (v_f) range from 0.005 to 0.018 m/s
     vii.   a diffuser wall is required at inlet where the velocity of flow should be not more than 0.1 m/s
     viii.   loading of outlet launders should not exceeded 8 m^3/hr/m
     ix.   space to be provided for accumalation of sludge should be 10 to 15 percent of volume
     x.   floor slope is recommended to be 1:50.

(20 marks)

Q4   (a)   Diffentiate using sketch diagram between branching system and grid system in distribution water supply.

(4 marks)

(b)   **FIGURE Q4(b)** shows the series system pipe with flowrate of 0.04 m^3/s, determine the pressure and total heads at point A, B and D. Assume that the full turbulent flow for all cases and the pressure head at point A is 40 m

(16 marks)

(c)   Design a service reservoir if Q_{daymax} is 2800 m^3. Two pumps are working at constant rate of 170 m^3/hr. Determine pumping hours and resevoir capacity.

(8 marks)

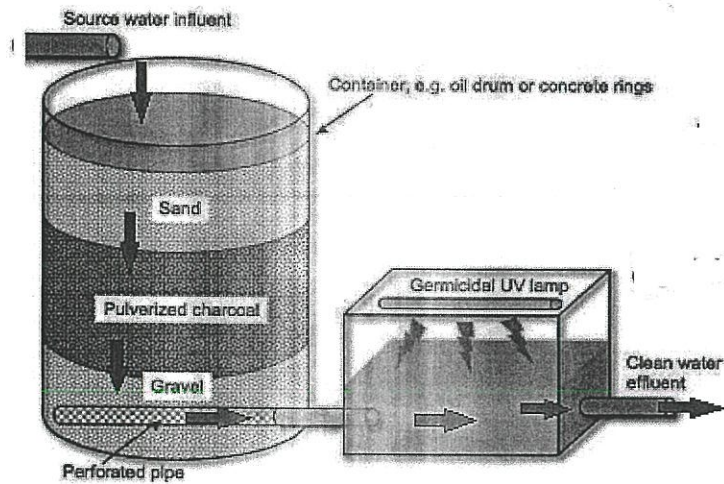- END OF QUESTIONS –

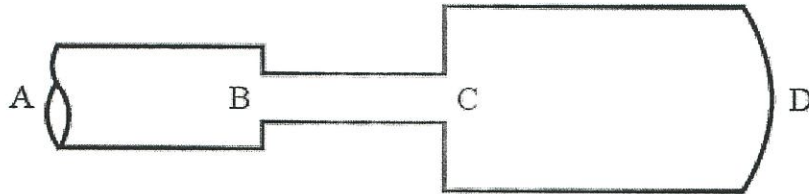**FINAL EXAMINATION**

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FIGURE Q1(a)

FIGURE Q2(a)

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TABLE Q1(a)

Type of Premises/Buildings	Average Daily Water Demand (Litres)
Low cost terrace house / low cost flat	1100 / unit
Single storey terrace house / low cost house (less than RM25,000) / low medium & medium cost flats	1300 / unit
Double storey terrace house / high cost flat / apartment / town house	1500 / unit
Semi detached house / cluster	2000 / unit
Bungalow / condominium	2000 / unit
Wet market	1500 / stall
Dry market	450 / stall
Shop house (single storey) / low cost shop	2000 / unit
Shop house (double storey)	3000 / unit
Shop house (three storey)	4100 / unit
Shop house (four storey)	4550 / unit
Light industrial workshop	1500 / unit
Semi detached / bungalow workshops	1500 / unit
Building for heavy industry*	65,000 / hectare
Building for medium industry*	50,000 / hectare
Building for light industry*	33,000 / hectare
Office / complex / commercial (domestic usage)	1000 / 100 square metre
Community centres or halls	1000 / 100 square metre
Hotel	1500 / room
Education institutions (other than school and kindergarten)	100 / student
Day school / kindergarden	50 / student
Fully residential school/ institution of higher learning with hostels facilities	250 / student
Hospital	1500 / bed
Mosque or other place of worship	50 / person
Prison	250 / person
Army camp	250 / person
Bus terminal	900 / service bay
Petrol kiosk (with car washing bay)	50,000 / unit
Petrol kiosk (without car washing bay)	10,000 / unit
Stadium	55 / person

$D_1 = 30$ cm $D_2 = 20$ cm $D_3 = 40$ cm

$L_1 = 2000$ m $L_2 = 1000$ m $L_3 = 2000$ m

$f_1 = 0.022$ $f_2 = 0.025$ $f_3 = 0.021$

$z_A = 20$ m, $z_B = 25$ m, $z_C = 32.5$ m, $z_D = 37.5$ m

FIGURE Q4(b)