Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2021/2022

COURSE NAME	:	DESIGN OF WASTEWATER ENGINEERING
COURSE CODE	:	BFA 40403
PROGRAMME CODE	:	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

THIS QUESTION PAPER CONSISTS OF **FIVE (5)**

Q3 (a) During the pandemic, wastewater treatment plants increased their chlorine usage for disinfection in indoor and outdoor settings and during wastewater treatment, potentially increasing disinfection by-product levels. Describe the primary concern of disinfection by-products in the treated wastewater resulting from the disinfection process.

(5 marks)

(b) Outline **FOUR (4)** factors that should be considered before adopting a strategy to reuse the industrial effluent to promote the national water reclamation initiatives.

(8 marks)

(c) Given the following data:

Average flow rate = 18,950 m^3/d
Peak flow factor = 2.5
Depth of chamber = 3 m.
Air supply = 0.32 m^3/min per m of length.
Amount of grit collected at peak flow = 0.03 $m^3/1000\ m^3$
Number of tanks in a grit chamber to be provided = 2 units
Detention time at peak flow > 3 minutes
Depth to width ratio = 1:1.2

Design an aerated grit chamber by providing the detailed calculations of the following data:

(i) Dimensions of the tank

(6 marks)

(ii) Total air supply required

(3 marks)

(iii) Quantity of grit accumulated

(3 marks)

Q4 (a) Differentiate between adsorption and membrane filtration technology regarding their treatment mechanism and operational cost.

(6 marks)

(b) Illustrate a flow diagram for a process that will remove suspended particles, organic debris, and pathogens from municipal wastewater. Also, indicate a sludge treatment alternative in the diagram.

(7 marks)

(c) Relate the following wastewater treatment plants emerging issues with the future areas of energy generation and beneficial reuse of biosolids by giving appropriate explanations and examples for the respective issues.

Issue 1: Rising energy costs for the operation of treatment plants

Issue 2: Disposal of biosolids in a sustainable manner

(12 marks)

-END OF QUESTIONS-

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FORMULAE

$$A_s = \frac{Q_{peak}}{SLR} \qquad A_s = \frac{Q_{peak}}{v_h} \qquad Q_{peak} = Q_{avg} \times PFF \qquad Q_{peak} = Q_{avg} \times PF$$

$$PF = 4.7 \times p^{-0.11} \qquad Q_{avg} = PE \times Q_{design} \qquad Volume = Q \times t$$

$$Efficiency_{bar\ screen}(\%) = \frac{Clear\ opening}{Width\ of\ chamber}$$