Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2021/2022

COURSE NAME	:	ENVIRONMENTAL ENGINEERING
COURSE CODE	:	BFC 32403
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 **CLOSE 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 **SIX (6)** PAGES

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Q1 (a) In the new developed city, few environmental issues have contributed to the negative impacts to the environment, social and economy. Analyse which agency and standard should be impose for law enforcement;

(i) Construction waste dumping was found near the reserve wetland area.

(2 marks)

(ii) An illegal water pipe extension to a construction site.

(2 marks)

(iii) The restaurants in the food court discharge the effluent without treatment and Fat, Oil and Grease trap into the drainage and possibly lead to the blockage of sewerage pipelines

(2 marks)

(b) A sewage treatment plant for the new residential area will be developed. As an EIA consultant, analyse the following environmental issue and propose mitigation measures for each potential impacts to environment during post-construction as follows;

(i) High flow of effluent discharge will change the water characteristic of the receiving water body.

(3 marks)

(ii) Improper handling of sewage sludge will lead to water pollution and health hazards.

(3 marks)

(c) A slaughterhouse with a wastewater flow of 0.011 m^3/s and a BOD_5 of 590 mg/L discharges into the Sungai Simpang Kanan. The river has a 7-day low flow of 1.7 m^3/s. Upstream of the slaughterhouse, the BOD_5 of the river is 0.6 mg/L. The BOD rate constants k are 0.115 d^{-1} for the slaughterhouse and 3.7 d^{-1} for the river, respectively. The temperature of both the river and the slaughterhouse wastewater is 28°C. Determine the initial ultimate BOD after mixing. Provide **TWO (2)** suggestions to reduce the water pollution at Sungai Simpang Kanan.

(8 marks)

Q2 (a) State the arrangement of the screens in surface water treatment and provide its purpose.

(2 marks)

(b) A raw surface water causes red stain in white cloth if used without treatment. Explain a suitable physical treatment method that can be used at the pretreatment stage to solve this problem from treated surface water.

(4 marks)

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(c) Effluent from the aeration stage flown at 200 MLD into the coagulation chamber. Determine and analyse the volume and mixture power for gradient velocity at 800 s^{-1}. Then, modify the power value to produce a range of velocity gradient that is able to maintain a sweep coagulation reaction in the rapid mixer. State the range of power required for this removal mechanism.
(Dynamic viscosity,1.06 x 10^{-3} Pa.s; t=1 s)

(14 marks)

Q3 (a) Describe **TWO (2)** priorities for mitigating issues involved with grit and grease in wastewater treatment facility operations.

(4 marks)

(b) A primary circular clarifier for a municipal wastewater treatment plant is to be designed for an average flow rate of 3570 m^3/d. Given the surface loading rate is 35 m^3/day.m^2 and assume that the peak flow factor is 2.5. Calculate:

(i) Peak flow rate

(2 marks)

(ii) Surface area of the clarifier

(2 marks)

(iii) Diameter of clarifier

(2 marks)

(c) As an experienced engineer in the organisation, you have been asked to deliver a talk at Universiti Tun Hussein Onn Malaysia on *'Mechanisms and Processes in an Anaerobic Digester for Sludge Treatment in Wastewater Treatment Plants'*. Outline **FIVE (5)** significant points regarding the subject to help in your explanation.

(10 marks)

Q4 (a) Source separation is the segregation of different types of solid waste at the location where they are generated. Explain **THREE (3)** advantages of source separation.

(6 marks)

(b) The population in Camilia Apartment is 3500 and solid waste is collected on Sunday and Wednesday in the morning. Determine the waste generation rate by using data in **TABLE Q4 (b)**. Determine the volume of storage containers that required for the apartment with density of waste is 310 kg/m^3.

(7 marks)

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(c) Separation of household scheduled waste has not yet been enforced in Malaysia. Based on your opinion, estimate the suitable year to enforce and explain the reasons.

(7 marks)

Q5 (a) Explain **THREE (3)** main air pollutants emitted from the industrial activities and their effects to environment and its potential health impacts.

(6 marks)

(b) As a civil engineer for construction of housing project, you are required to provide air monitoring station as stipulated by the Work Instruction (Arahan Kerja) by Department of Public Work or Department of Environment (DOE). Describe the objectives of the requirement and give **ONE (1)** example of air quality monitoring at site.

(6 marks)

(c) As a site engineer, analyse **FOUR (4)** precautionary measures for controlling noise at a construction site before work start.

(4 marks)

(d) Trucks supplying material (stone, concrete, steel) located in communities particularly sensitive to noise. As a site engineer, analyse and provide **FOUR (4)** significant factors should be considered in performing valid construction noise measurements.

(4 marks)

-END OF QUESTIONS-

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TABLE Q4 (b): Solid waste collection

House number	Family size	Amount of Solid Waste (kg)						
		Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
1-5	4	7.2	7.3	7.1	5.4	5.6	6.5	6.1
2-12	5	7.3	7.5	6.5	6.2	7.1	8.3	7.8
3-5	2	3.2	2.5	2.1	4.2	4.4	3.5	3.1
4-9	6	6.7	9.1	9.2	-	9.3	8.5	10.1
5-5	1	1.4	1.3	1.5	1.3	0.9	1.1	1.2

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Useful Equations

(1) $$DO = \frac{QwDOw + QrDOr}{Qw + Qr}$$

(2) $$La = \frac{QwLw + QrLr}{Qw + Qr}$$

(3) $$Tf = \frac{QwTw + QrTr}{Qw + Qr}$$

(4) $$L_t = L_0(1 - e^{-kt})$$

(5) $$k_T = k_{20}\,(\theta)^{T-20}$$

(6) $$S = \frac{K_s(+k_d\theta_c}{\theta_c(\mu_m - k_d) - 1}$$

(7) $$X = \frac{\theta_c(Y)(S_0 - S)}{t_c(1 + k_d\theta_c)}$$

(8) $$\theta = V / Q_0$$

(9) $$\Phi_c = VX / Q_0X_w$$

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