UTHM
Universiti Tun Hussein Onn Malaysia

# UNIVERSITI TUN HUSSEIN ONN MALAYSIA

## FINAL EXAMINATION
## (ONLINE)
## SEMESTER II
## SESSION 2019/2020

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|---|---|---|
| COURSE NAME | : | ENVIRONMENTAL ENGINEERING |
| COURSE CODE | : | BFC 32403 |
| PROGRAMME | : | BFF |
| EXAMINATION DATE | : | JULY 2020 |
| DURATION | : | 6 HOURS |
| INSTRUCTIONS | : | ANSWER **ALL** QUESTIONS |

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

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**Q1** (a) The measurement of physical parameter is a key test of water quality. Differentiate between suspended solids (SS) and turbidity.

(4 marks)

(b) You are required to conduct a BOD test in the lab for a wastewater sample. The wastewater sample inserted to BOD bottle is 10 mL. The 300 mL BOD bottle is filled up with dilution water. Calculate the $BOD_5$ for the wastewater by using the given data in **Table Q1(b)**. Given: $BOD_5 = (D_1 - D_2)/P$

**Table Q1 (b)**: Data of DO concentration for Day 1 and Day 5

| Day | Day 1 | Day 5 |
|---|---|---|
| Concentration of DO | 8.2 | 5.0 |

(2 marks)

(c) (i) Define ultimate BOD, $L_o$.

(2 marks)

(ii) The BOD of a municipal wastewater at the end of day 7 is 120 mg/L and the ultimate BOD is 250 mg/L. Determine the reaction rate constant (base *e*), *k* if the temperature is 20°C.

(3 marks)

(d) (i) Give **ONE (1)** effect of water with high hardness concentration.

(2 marks)

(ii) Determine the total hardness (in mg/L as $CaCO_3$) for groundwater samples that contain $Ca^{2+}$= 180 mg/L, $Mg^{2+}$= 92 mg/L. Given atomic weight: $Ca^{2+}$ = 40.1 , $Mg^{2+}$ = 24.3

(2 marks)

(e) Explain the water purification system by using DO sag curve diagram.

(5 marks)

**Q2** (a) Distinguish between surface water and ground water resources.

(4 marks)

(b) Estimate the peak flow for a new development area consists of 700 unit houses and a market of 25 stalls.

Given:
Dry weather flow = 225 L/day/cap
Residential= 5 PE/unit
Market= 3 per stall
Peak flow = $4.7 \times p^{-0.11} \times 0.0093$ $m^3/s$

(6 marks)

(c) In the primary settling tank of the water treatment plant handle a maximum hourly flow of 0.6 $m^3/s$ at an overflow rate of 60 m/d. The effective tank depth is 3.0 m;



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Given:
$t_o = Q/V$

Determine:
(i) Surface area of a primary settling tank.

(4 marks)

(ii) Effective theoretical detention time.

(4 marks)

(d) Briefly discuss briefly the aim of filtration process in water treatment for potable water supply.

(2 marks)

**Q3** (a) Explain the purpose of equalization basin and primary treatment in a wastewater treatment system.

(4 marks)

(b) Compare between attached growth and suspended growth in secondary wastewater treatment system by giving **ONE (1)** example of each process.

(5 marks)

(c) **TWO (2)** activated sludge aeration tanks are operated in series to treat wastewater in residential area. Each tank has the dimension of 7.5 m wide, 28 m long and depth of 5.2 m. Calculate the aeration period, F/M ratio and SVI if the plant operating parameters are as follows:

Flow = 0.065 $m^3/s$
Soluble $BOD_5$ after primary settling = 130 mg/L
MLVSS = 1,500 mg/L
MLSS = 1.40 (MLVSS)
Settled sludge volume after 30 min = 230.0 mL/L
Aeration tank liquid temperature = $15^0C$

Given:

$$\frac{F}{M} = \frac{QS_o}{VX}$$

$$\text{SVI} = \frac{\text{Sludge volume x 1000 mg/g}}{\text{MLSS}}$$

(9 marks)

(d) Propose **ONE (1)** sludge treatment methods for secondary treatment of domestic wastewater after thickening and conditioning processes prior to be disposed.

(2 marks)

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**Q4** (a) Recently, South East Asian countries has been flooded with plastic waste which came from developed nations such as the USA, Australia and Britain. It was found that the plastic waste was imported illegally by unscrupulous local traders merely for profit. As a response, many of the affected countries pushed back against global garbage trade, particularly plastic waste. You are required to discuss this type of trade and state whether you agree with the actions of the local traders. In addition, propose more effective waste management methods to protect the environment.

(10 marks)

(b) Landfill has been proposed as a better disposal method compared to incineration and composting. State whether you agree with the statement and discuss the advantages and disadvantages of the disposal method.

(10 marks)

**Q5** (a) Briefly describe the **THREE (3)** major air pollutants as follows.

(i) Carbon monoxide

(2 marks)

(ii) Sulphur dioxide

(2 marks)

(iii) Hydrocarbons

(2 marks)

(b) Suggest and discuss a suitable control method for the following industrial sources of particulate emissions:

(i) Portland cement industry

(3 marks)

(ii) Wood factory

(3 marks)

(iii) Glass fiber industry

(3 marks)

(c) Briefly explain **ONE (1)** of the noise monitoring objectives.

(3 marks)

(d) Briefly describe **ONE (1)** type of noise measurement at construction site.

(2 marks)

**- END OF QUESTIONS -**



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