Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	ENVIRONMENTAL ENGINEERING TECHNOLOGY
COURSE CODE	:	BNN 30204
PROGRAMME	:	BNN
DATE	:	DECEMBER 2019/JANUARY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1 (a) Determine the characteristics of hazardous waste for the following materials.

(i) Halogenated phenols and other halogenated compounds
(1 mark)

(ii) A cyanide or sulfide bearing waste
(1 mark)

(iii) Oven cleaners, auto batteries and some spot removers.
(1 mark)

(iv) Toxic metals such as lead and mercury, organics such as benzene and chloroform, and pesticides such as endrin, furniture polishes and antifreeze
(1 mark)

(v) Organic solvents (Acetone, Benzene, Ethanol, Methanol), gasoline
(1 mark)

(b) (i) Define the term "Discharge of hazardous waste"
(2 marks)

(ii) Explain the responsibility of transporters if discharge of hazardous waste occurs
(4 marks)

(c) Compare municipal solid waste and hazardous waste in terms of their definition, and disposal.
(6 marks)

(d) Suggest **THREE (3)** ways/methods to reduce the amount of waste being sent to the landfill.
(3 marks)

(e) A town of 5000 generates 40,000 kg/d of solid waste where 10% of the amount of generated waste is recycled. The generated waste is collected by 5 trucks and 5 times weekly which operates 5 days per week. Determine

(i) The amount of solid waste generated per capita per day.
(1 mark)

(ii) The mass of the waste which enters the landfill per day. (1 mark)

(iii) If another town of 10,000 with a waste generation rate of 1 kg per capita per day also use trucks with similar capacity, determine the number of trucks required daily to bring the generated waste to the landfill. Consider 5 days per week.
(3 marks)

Q2 (a) EPA has set National Ambient Air Quality Standards for six principal pollutants, which are called "criteria" pollutants. List **ONLY FOUR (4)** principal pollutants.

(2 marks)

(b) Define the term "primary standard" and "secondary standard" which are two types of National Ambient Air Quality Standards.

(3 marks)

(c) Describe the effects of SO_2 on the environment.

(3 marks)

(d) **X** is produced by the incomplete burning of carbon-containing fuels, such as petrol, coal and wood.

(i) Determine **X.**

(2 marks)

(ii) Determine a suitable air pollution control method which uses emission pollution control devise in order to reduce emission of X. Explain the method.

(3 marks)

(iii) Suggest a technique without using emmission control devise

(2 marks)

(e) Particulate matter is known to be one of the pollutants produced by a portland cement industry. Suggest a pollution control method to reduce the emission of particulate matter in this case and explain the method.

(6 marks)

(f) Give **TWO (2)** examples of indoor air pollutants. Explain the effect of indoor air pollutants on health by giving **ONE (1)** example.

(4 marks)

Q3 (a) Numerous types of pollutant can present in wastewater. Give **TWO (2)** examples of micropollutants in wastewater.

(1 mark)

(b) Identify the source of water pollution for the following conditions:

(i) Wastewater which contains decomposable organic matter and pathogenic agents.

(2 marks)

(ii) Wastewater which contain toxic agents ranging from metal salts to complex synthetic organic chemicals.

(2 marks)

(c) Explain the purpose of primary treatment in wastewater treatment plant.

(2 marks)

(d) Numerous pollutants can present in treated wastewater and, therefore, advanced wastewater treatment is required after the primary and secondary wastewater treatment. Suggest an advanced wastewater treatment for micropollutant removal. Explain the technology.

(5 marks)

(e) (i) Demonstrate how trickling filter operates at a wastewater treatment plant

(2 marks)

(ii) Describe **TWO (2)** advantages and **TWO (2)** disadvantages of trickling filters in wastewater treatment plant.

(4 marks)

(f) The typical design parameters and values of a primary sedimentation tank are described below.

Detention time: 1.5-2.5 hours
Overflow rate: 25-60 m/day
Weir loading: do not exceed 250 m^3/d/m

Based on the above design parameters and values, compare primary sedimentation tank X and Y where the data of both settling tanks are shown in **Table Q3(f)**.

Table Q3(f): Data of Tank X and Y

Data	Tank X	Tank Y
Flow (m3/s)	0.2	0.15
Efficiency	40	50
Length (m)	40	45
Width (m)	16	15
Depth (m)	2.5	3
Weir length (m)	75	70

(7 marks)

Q4 (a) Draw a schematic diagram of a Coagulation Plant / Conventional Plant where the objective of the treatment is to remove turbidity and color from surface water.

(7 marks)

(b) Explain the purpose of aeration in a water treatment plant.

(4 marks)

(c) **Table Q4 (c)** below indicate data from a Jar Test experiment. Determine the optimum alum dosage in mg/L.

(5 marks)

Table Q4(c): Data from a Jar Test experiment

Parameters	Jar 1	Jar 2	Jar 3	Jar 4	Jar 5	Jar 6
pH	7	7	7	7	7	7
Alum Dose (mg/L)	3	4	5	6	7	8
Turbidity (NTU)	20	18	15	16	17	18

(d) Determine the percentage of removal should be expected for each particle in an ideal sedimentation tank of a water treatment plant if the overflow rate is $10 m^3/d.m^2$ and the particles settling velocities is 0.15 mm/s.

(3 marks)

(e) Data of a circular clarifier of a water treatment plant is shown below.

design flow:3500 m^3/d
overflow rate: 0.00015 m/s (SOR =$m^3/s/m^2$)
detention time: 2.5 h.

Determine the depth of the circular clarifier.

(6 marks)

- **END OF QUESTION -**