UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2016/2017

COURSE NAME	:	INTRODUCTION TO ENVIRONMENTAL ENGINEERING TECHNOLOGY
COURSE CODE	:	BNP 20503/BNP21403
PROGRAMME CODE	:	2BNA/BNB/BNC
EXAMINATION DATE	:	JUNE 2017
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1   (a)   Explain with an aid of sketches of the wastewater standards, Standard A and Standard B under Environmental Quality (Sewage) Regulations.

(4 marks)

(b)   Eutrophication and acid rain are phenomena due to water pollution problems.
(i)   Discuss briefly **TWO (2)** most common causes of each of the above phenomena

(4 marks)

(ii)   Explain **TWO (2)** environmental impacts of each of the phenomena

(4 marks)

(c)   Differentiate the primary and secondary air pollutant by giving at least **TWO (2)** examples for each pollutant.

(3 marks)

(d)   Discuss the application **ONE (1)** device to control the following pollutant emission at its source:

(i)   Particulate matter
(ii)   Gaseous

(5 marks)

Q2   (a)   State the different of total solid, suspended solid and volatile solid of a water sample.
(2 marks)

(b)   Explain the differences of the BOD and COD in determination of water quality.
(3 marks)

(c)   Briefly explain biological indicator and give **TWO (2)** examples of biological indicator and their function in environmental monitoring.
(5 marks)

(d)   By using Thomas' graphical method and the following data tabulated in **Table Q2**.

Table Q2: BOD value of wastewater sample

Time (day)	BOD (mg/L)
2	70.0
5	102.4
7	111.0
8	114.0
10	118.8

(i)   Plot graph $\left[\dfrac{t}{BOD_t}\right]^{\frac{1}{3}}$ versus time
(ii) Calculate the BOD rate constant, k
(iii) Calculate the ultimate BOD, L_o

(10 marks)

Q3   (a)   Sketch a schematic diagram of a softening water treatment plant.

(2 marks)

(b)   Briefly explain the water treatment processes listed below:

(i)   Aeration
(ii) Filtration
(iii) Disinfection

(6 marks)

(c)   Jar testing was performed using alum on a raw drinking water source that contained an initial turbidity of 20 NTU and alkalinity of 80 mg/L as $CaCO_3$. The optimum coagulant dosage was determined as 10 mg/L. Determine the quantity of alkalinity consumed as $CaCO_3$. Assume the following chemical reaction is applied. [Al=27, H=1, S = 32; O = 16; C = 12]

$$Al_2(SO_4)_3 \cdot 14H_2O + 6HCO_3^- \leftrightarrow 2Al(OH)_3(s) + 6CO_2 + 3SO_4^{2-} + 14H_2O$$

(6 marks)

(d)   Briefly describe the following water supply distribution system:

(i)   Gravity distribution
(ii) Pumping without storage distribution
(iii) Pumping with storage distribution

(6 marks)

Q4 (a) Sketch the typical unit processes in treating municipal wastewater and state the objectives of each treatment including pretreatment, primary and secondary treatment in a wastewater treatment processes.

(4 marks)

(b) Define the following terms of secondary treatment systems by giving **ONE (1)** example each:

(i) Suspended growth
(ii) Attached growth

(2 marks)

(c)

Design a primary settling tank is to handle maximum hourly wastewater flow of 0.5 m^3/s at an overflow rate of 35 $m^3/d/m^2$/day as the following:

(i) Surface area of the tank
(ii) Hydraulic detention time (HRT) if the tank depth is 3.2 m.

Give comments on your HRT value either within the acceptable range or not as the design criteria for HRT is between 1.5-2.5 hrs.

(6 marks)

(d) Differentiate the characteristics of sludge produced from primary and secondary clarifier in a wastewater treatment system.

(2 marks)

(e) Propose **TWO (2)** of the treatment methods of sludge produced from a wastewater treatment plant.

(6 marks)

Q5 (a) By giving **TWO (2)** specific examples, define the term garbage and rubbish.

(4 marks)

(b) Explain **THREE (3)** factors that may influence the rate of solid waste generation.

(6 marks)

(c) Discuss the importance of source separations of Municipal Solid Waste and how it will lead to successful of waste separation in Malaysia.

(4 marks)

(d) Briefly describe the following methods of landfilling:

(i)   Excavated trench/cell method
(ii) Area method
(iii) Canyon method

(6 marks)

- **END OF QUESTIONS-**