



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2014/2015**

COURSE NAME : ENVIRONMENTAL ENGINEERING
TECHNOLOGY

COURSE CODE : BNP 20503

PROGRAMME : 2 BNA/BNB/BNC

EXAMINATION DATE : JUNE 2015/JULY 2015

DURATION : 3 HOURS

INSTRUCTIONS : ANSWER FIVE (5) QUESTIONS
ONLY

THIS PAPER CONSISTS OF FIVE (5) PAGES

- Q1** (a) State the **THREE (3)** new laws established in 2009 which have replaced the Environmental Quality (Sewage and Industrial Effluents) Regulations 1979. (3 marks)
- (b) List **THREE (3)** objectives of Environmental Impact Assessment (EIA) in order to assess the overall impact of development projects on the environment proposed by the public and private sectors. (3 marks)
- (c) For any **TWO (2)** of the environmental issues in **Table Q1**:

Table Q1

A	High nutrient loading in drainage water
B	Heavy metals in aquatic organisms
C	Pharmaceuticals residue in environment

- (i) Identify the sources of the selected environmental issue. (6 marks)
- (ii) Assess the impacts of selected environmental issue to the living things and the environment. (8 marks)
- Q2** (a) While the ultimate BOD increases with the increase of the biodegradable organic matter, explain **TWO (2)** factors influencing the biodegradation rate constant of the sample. (5 marks)

- (b) Yield of BOD analysis at 20°C with dilution factor, $p=0.1$ are as tabulated in **Table Q2**.

Table Q2

Time (day)	Dissolve Oxygen, DO (mg/L)
0	6.9
1	5.7
2	4.9
3	4.2
4	3.7
5	3.3

- (i) Plot graph $\left[\frac{t}{BOD_t} \right]^{1/3}$ vs time and determine the reaction rate constant, k at 20°C, k_{20} .
- (ii) Calculate the ultimate BOD, L_0 (9 marks)

- (c) Identify the pollutants produced from the following human activities. Categorize the identified pollutants into its category.
- (i) Cars and vehicles washing
 - (ii) Greywater from mosque
- (6 marks)

Q3 (a) A filter run in a water treatment plant is terminated as a result of either one of two conditions. State both conditions.

(2 marks)

(b) Summarize the coagulation and flocculation processes in water treatment with respect to the destabilization of colloid particles and favorable coagulant used.

(5 marks)

(c) Determine the alkalinity in mg/L as CaCO_3 of a water sample at pH 10. The water has 32.0 mg/L of CO_3^{2-} and 56.0 mg/L of HCO_3^- . (Given atomic weight of H=1 C=12, O=16)

(5 marks)

(d) Design a circular clarifier using the design criteria as follows:

Design flow	= 1000 m ³ /d
Retention time	= 3 hrs
Diameter to depth ratio	= 1.5 : 1
Weir length	= 10 m

Give comments on your answer regarding to the following:

Surface over flow rate	= 20 - 35 m ³ /day/m ²
Weir overflow rate	= 150 – 300 m ³ /day/m

(8 marks)

Q4 (a) (i) Define mean cell residence time, θ_c and F/M ratio in wastewater treatment.

(ii) θ_c and F/M ratio are controlled by wasting of organism. Explain on how θ_c , F/M ratio and wasting of organism are interrelated to each other and their effect to the efficiency of the wastewater treatment.

(6 marks)

(b) Compare the aerobic degradation and anaerobic degradation in terms of wastewater suitability, biomass produce and the end products of the process.

(3 marks)

(c) The influent BOD₅ and suspended solids concentration to a primary settling tank are 345 mg/L and 435, respectively. The average flowrate of is 0.050 m³/s. If the removal of BOD₅ and suspended solids are 30 percent and 60 percent, respectively, determine the concentrations of BOD₅ and suspended solids removed in the primary settling each day.

(4 marks)

- (d) A slaughterhouse generated $1036.8 \text{ m}^3/\text{d}$ of wastewater each day. The average BOD_5 of the raw wastewater before primary settling is 1400 mg/L . The aeration tank has effective dimensions of 8.0 m wide by 8.0 m long by 5.0 m deep. The activated sludge plant operating parameters are as follows:

Soluble BOD_5 after primary settling = 966 mg/L

$\text{MLVSS} = 2000 \text{ mg/L}$

$\text{MLVSS}/\text{MLSS} = 0.8$

Settled sludge volume after 30 min = 225 mg/L

Calculate:

- (i) The aeration period,
- (ii) F/M ratio and
- (iii) Sludge Volume Index (SVI).

(7 marks)

- Q5** (a) Define leachate and explain how it forms.

(3 marks)

- (b) With the aid of diagram, distinguish **FOUR (4)** major differences between conventional landfill and sanitary landfill.

(4 marks)

- (c) According to **Table Q5**, estimate;

- (i) Moisture content based on 100 kg solid waste sample
- (ii) Density based on $10,000 \text{ kg}$ sample of waste sample

Table Q5: Typical composition of solid waste

Component	Percent by mass	Moisture content (%)	Typical density (kg/m^3)
Food waste	15	70	290
Paper	45	6	85
Cardboard	10	5	50
Plastics	10	2	65
Garden trimmings	10	60	105
Wood	5	20	240
Tin cans	5	3	90

- (d) Diagnose the current situation in Malaysia towards the successfulness of waste minimization, treatment and disposal of solid waste. (7 marks)

- Q6** (a) Determine the density of carbon monoxide gas at a pressure of 102 kPa and a temperature of 298.0 K. (Given atomic weight: C=12 and O=16) (2 marks)
- (b) Differentiate the primary and secondary air pollutant by giving at least **ONE (1)** source of each type and their impact to human health. (6 marks)
- (c) Two observations have been reported in Town A.
Observation 1: Deterioration of their house structure
Observation 2: Elevated pH in lake and river
- (i) What is the possible phenomenon of this problem?
(ii) Give **TWO (2)** pollutants responsible for this phenomenon
(iii) Explain the mechanism of air pollutants that responsible for that occurrence. (6 marks)
- (d) With aid of the labeled diagram, discuss on the application of **ONE (1)** air pollution control device to control the emission of particulate matter from saw mill industry. (6 marks)

-END OF QUESTIONS-