Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2014/2015

COURSE NAME	:	ENVIRONMENTAL ENGINEERING
COURSE CODE	:	BFC 32403
PROGRAMME	:	BACHELOR OF CIVIL ENGINEERING WITH HONOURS
EXAMINATION DATE	:	JUNE 2015 / JULY 2015
DURATION	:	3 HOURS
INSTRUCTIONS	:	ANSWER **FIVE (5)** QUESTIONS FROM **SIX (6)** QUESTIONS.

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

Q1 (a) List **four (4)** government agencies and their responsibilities either direct or indirect involved in handling environmental quality issues.

(4 marks)

(b) Explain river classification with reference to the Interim National Water Quality Standard (INWQS) for Malaysia.

(6 marks)

(c) Eutrophication and acid rain are phenomena due to water pollution problem

i. Discuss briefly **two (2)** most common causes of each of the above phenomena

(6 marks)

ii. Explain **two (2)** environmental impacts of each of the above phenomena

(4 marks)

Q2 (a) Briefly explain biological indicator. Give **two (2)** examples of biological indicator and their function in environmental monitoring.

(5 marks)

(b) The reaction of decomposition organic waste in the river produces acetic acid (CH_3COOH) as shown below:

$$CH_3COOH + 2O_2 \leftrightarrow 2CO_2 + H_2O$$

i. Define theoretical oxygen demand (ThOD).
(2 marks)

ii. Determine ThOD of 300 mg/L acetic acid.
(1 mark)

iii. If the BOD of a river water sample at the end of 7 days is 60 mg/L and the ultimate BOD is 85 mg/L, calculate the rate constant.

(2 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 Parit Raja Creek. The creek has a 7-day low flow of 1.7 m^3/s. Upstream of the slaughterhouse, the BOD_5 of the creek 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 creek. The temperature of both creek and the slaughterhouse wastewater is 20°C. Calculate the initial ultimate BOD after mixing. Provide **two (2)** suggestions to reduce the water pollution at Parit Raja Creek.

(10 marks)

Q3 (a) Explain the function of grit removal system in the water treatment process.

(6 marks)

(b) Identify the roles of water industry's stakeholders in reducing non-revenue water.

(6 marks)

(c) Calculate the detention time for a circular clarifier with a 15 m diameter, 2.5 m depth, 3000 m^3/d design flow and 0.0002 m/s overflow rate.

(8 marks)

Q4 (a) Biological wastewater treatment process often associated with microorganisms. Briefly explain the following terms:

i. Log-growth phase
ii. Stationary phase
iii. Dispersed growth
iv. Fixed growth

(4 marks)

(b) With the aid of diagram, explain a wastewater treatment process.

(8 marks)

(c) A primary settling tank is constructed to handle maximum flow of wastewater with capacity of 0.5 m^3/s at an overflow rate of 35 m/d. Provided the tank depth is 3.2 m , calculate:

i. surface area of the tank
ii. hydraulic detention time

(8 marks)

Q5 (a) Population in town A is 10 000 people. Town A is located in Malaysia. Calculate the amount of municipal solid waste generated in town A by using the average per capita generation of solid waste value in Malaysia.

(3 marks)

(b) A new landfill is going to be constructed in an area that has low ground water and ground soil which needs minimum excavation work. As a sanitary engineer, propose a suitable landfilling method for this particular area.

(2 marks)

(c) Sketch the hierarchy of **six (6)** elements in integrated solid waste management and label the most to least favored options.

(5 marks)

(d) Propose a suitable storage method for the following waste:

i. Selenium
ii. Chloroform

(10 marks)

Q6 (a) Define air pollution.

(2 marks)

(b) Differentiate between primary and secondary air pollutant by giving at least **two (2)** examples for each pollutant.

(4 marks)

(c) In a construction site, it is found that the particulate matter is less than 10 μm. Identify the major concerns of health impact to surrounding people and environment.

(4 marks)

(d) Explain the application of a device that can be used in controlling the following pollutant emission at its source:

i. Particulate matter
ii. Gaseous

(10 marks)

- END OF QUESTION -