Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER I
SESSION 2021/2022

COURSE NAME	:	INTRODUCTION TO ENVIRONMENTAL ENGINEERING
COURSE CODE	:	BNP 21403
PROGRAMME CODE	:	BNA / BNB / BNC
EXAMINATION DATE	:	JANUARY/FEBRUARY 2022
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS
		2. THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **CLOSE BOOK**

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

Q1 (a) Dissolved substance is a solid (for instance metal alloys), liquid (i.e. usually a solid solute dissolved in a solvent such as water or ethanol) and, gas matter dissolved in a solvent.

(i) List **FOUR (4)** dissolved substances in water.

(4 marks)

(ii) Identify how does water pick up dissolved substances.

(2 marks)

(b) Chemical Oxygen Demand (COD) is an important water quality parameter and is used in a wide range of applications. Despite the test being entrenched in legislation there are numerous problems and challenges associated with use of the test. Outline **THREE (3)** challenges associated with COD monitoring.

(6 marks)

(c) Biological parameters are important factor that determine quality of water. It is more important than physical and chemical parameters in term of direct effect on human health. Some biological characteristics include bacteria, protozoa, virus and algae. As water resources engineer in charge of water quality examine **THREE (3)** effects of biological parameters on water quality.

(6 marks)

(d) The BOD_5 of the raw Harmoni Vista Residential, Pagoh wastewater is 225 mg/L. A long term BOD test has revealed that this wastewater also has an ultimate carbonaceous BOD of 325 mg/L. Plant effluent testing has shown that the BOD_5 drops by 92% across the plant. Long term tests on the effluent also show that the BOD decay coefficient is half the original value in the raw wastewater. Compute:

(i) The BOD decay coefficient of the raw wastewater.

(2 marks)

(ii) The ultimate carbonaceous BOD of the effluent wastewater.

(5 marks)

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Q2 (a) As an engineering technologist at a water treatment plant, you are required to design a horizontal-flow sedimentation tank with the optimum process. Demonstrate **FOUR (4)** important zones and explain thoroughly their importance to design the good quality of sedimentation tank.

(8 marks)

(b) A water treatment plant has a horizontal-flow sedimentation tank with an overflow rate of 30 $m^3/d.m^2$ and wishes to remove particles that have settling velocities of 0.2 mm/s. Analyze the percentage of removal that should be expected for each particle in the ideal sedimentation tank.

(6 marks)

(c) Rapid sand filters are going to be installed in a water treatment plant. As an engineering technologist at the plant, you are required to analyze how much filter surface area should be provided for their design flow rate of 0.3 m^3/s and loading rate to the filter is 185 $m^3/d.\ m^2$.

(3 marks)

(d) An engineering technologist should perform disinfection in a water treatment plant in order to reduce pathogens to an acceptable level. Show the suitable disinfectant properties that are required to ensure the good practical service.

(8 marks)

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Q3 (a) Define the purpose of equalization in wastewater treatment.

(3 marks)

(b) A secondary treatment using a mixed reactor activated sludge system having a flow rate of 10,000 m^3/d of municipal wastewater. The BOD after primary clarification is 150 mg/L. It is desired to have not more than 5 mg/L of soluble BOD in the effluent. It was found from the laboratory testing that the kinetic values of the system having Y = 0.5 kg/kg and $k_d = 0.05\ d^{-1}$. Assume that the MLVSS concentration in the secondary treatment is 3000 mg/L and its concentration in returned sludge is 10,000 mg/L.

(i) By choosing **TWO (2)** optimum sludge age, find the volume of the reactor.
(12 marks)

(ii) Calculate the mass of solid that must be wasted each day for each of the selected sludge age.

(4 marks)

(iii) Calculate the volume of solid that must be wasted each day for each of the selected sludge age.

(4 marks)

(iv) Summarize the relationship between θ_c, volume of the reactor used, mass wasted and volume wasted of the given secondary treatment operation.

(2 marks)

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Q4 (a) Proper solid waste management present an opportunity not only to avoid the detrimental impacts associated with waste, but it can recover resources, environment, economic, social benefits which towards to the sustainable future. List **THREE (3)** characteristics of sanitary landfill that differ from open dumping.

(6 marks)

(b) Factors that must be considered in evaluating potential sites for the long-term disposal of solid waste include (1) haul distance (2) location restrictions (3) available land area (4) site access (5) soil conditions and topography (6) climatological conditions (7) surface water hydrology (8) geologic and hydrogeology conditions (9) local environmental conditions and (10) potential ultimate uses for the completed site. Explain any **FOUR (4)** of the factors above when you plan to develop new sanitary landfill in your area.

(8 marks)

(c) The Department of Environment (DOE) of Malaysia contracted out national air quality monitoring to a private company, Alam Sekitar Malaysia (ASMA) Sendirian Berhad. Investigate the role of air quality monitoring in air quality management in Malaysia.

(5 marks)

(d) Air pollution has been defined as the presence of chemicals in the atmosphere in quantities and duration that are harmful to human health and the environment. Classify **THREE (3)** air pollutants with examples.

(6 marks)

- END OF QUESTIONS -

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