UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME : WASTEWATER TREATMENT TECHNOLOGY

COURSE CODE : DAK20803

PROGRAMME : DAK

EXAMINATION DATE : JULY / AUGUST 2023

DURATION : 2 HOURS 30 MINUTES

INSTRUCTION : 1. ANSWER **ALL** QUESTIONS

2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK**.

3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA **CLOSED BOOK.**

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

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Q1   (a)   Define wastewater and explain the **two (2)** broad classifications of wastewater.

(4 marks)

(b)   The characteristics of wastewater are categorized into physical, chemical and biological. Give **two (2)** chemical characteristics of wastewater and briefly explain each characteristic.

(4 marks)

(c)   Biochemical oxygen demand (BOD) is an important parameter for wastewater quality monitoring.

     (i)   Describe the procedure to carry out experiment on biochemical oxygen demand (BOD).

(6 marks)

     (ii)   Explain the purpose of preparing blank when conducting BOD experiment.

(1 marks)

(d)   A 100 ml of sample is filtered, the filter membrane is rinsed and evaporated in the oven at 105°C. The initial weight of a dry filter membrane is 1.028 g. The new weight of filter membrane and dry solids is 1.132 g. The filtrate is then placed in a dish and dried in an oven at 105°C, then cooled. The weight of an empty dish is 48.6220 g. The new weight of the dish and dried solids is 48.7224 g. Calculate the total solids of the sample. Express the results in mg/L.

(5 marks)

Q2   (a)   State **four (4)** objectives of wastewater treatment.

(4 marks)

(b)   Explain **four (4)** objectives of pre-treatment stage in wastewater treatment.

(4 marks)

(c)   Describe the main components in pre-treatment stage in wastewater treatment.

(6 marks)

(d)   Calculate the settling velocity (v_s) in msec^{-1}, to remove sand particles in wastewater with density of 3050 kgm^{-3} and diameter of 0.25 mm. The sand is assumed in spherical form and the temperature of wastewater is 20°C. Given the density of fluid = 1000 kgm^{-3}, viscosity of fluid = 1.0×10^{-3} kgm^{-1}s^{-1}.

(6 marks)

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Q3 (a) State **four (4)** elements that are required in the consideration to design sedimentation unit process.

(4 marks)

(b) Describe **three (3)** advantages of primary settling tank in a wastewater treatment plant.

(6 marks)

(c) Differentiate between physical and chemical adsorption in wastewater treatment unit process.

(4 marks)

(d) Primary sedimentation is carried out in a variety types of tanks. Explain **three (3)** types of sedimentation tanks available in industry.

(6 marks)

Q4 (a) Anaerobic wastewater treatment systems are designed to treat wastewater in a cost effective and efficient manner.

(i) Demonstrate the mechanisms involved in the anerobic digester.

(8 marks)

(ii) Discuss **three (3)** factors that will influence the growth of microorganisms during the anaerobic process.

(6 marks)

(b) Dispersed growth is defined as those aerobic processes that achieve a high suspended micro-organism concentration through the recycle of biological solids.

(i) List **two (2)** examples of dispersed growth system available in the wastewater treatment industry.

(2 marks)

(ii) Elaborate each system mention in **Q4 (b) (i)**.

(4 marks)

Q5   (a)   Advanced treatment solutions have become an area of global interest as individuals, communities, and industries identify ways to keep essential resources available and suitable for use.

(i)   Point out **two (2)** examples of advance treatment unit process suitable for textile industries.

(2 marks)

(ii)   Explain the advantages of each unit process mention in **Q5 (a) (i)**.

(8 marks)

(b)   Explain **three (3)** considerations for constructing a wastewater treatment facility in the palm oil industry.

(6 marks)

(c)   The food industry's sludge contains a high amount of protein, fats, and fibre. Discuss **two (2)** sludge disposal techniques that can be used in wastewater treatment facilities serving the food industry.

(4 marks)

- END OF QUESTIONS-

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