Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2022/2023

COURSE NAME	:	WASTEWATER TREATMENT: BIOCHEMICAL TECHNOLOGY
COURSE CODE	:	BNN 40703
PROGRAMME CODE	:	BNN
EXAMINATION DATE	:	FEBRUARY 2023
DURATION	:	3 HOURS
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 MATERIAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK.

THIS QUESTION PAPER CONSISTS OF **THREE (3)** PAGES

Q1 (a) Demonstrate and describe wastewater treatment involving trickling filter process in detail.

(10 marks)

(b) You are an engineer at a wastewater treatment plant that involves the application of a trickling filter process. You have been informed by your subordinates that there are undesirable biofilm growth/biofouling. Besides that, the dissolved oxygen (DO) concentration is low and there is an odor problem.

(i) Propose**ONE (1)**possible cause of the biofouling.

(2 marks)

(ii) Propose**TWO (2)**solutions to prevent biofouling in the future.

(6 marks)

(iii) Relate the issue of biofouling with the low DO concentration and odor problem.

(2 marks)

(iv) Propose **TWO (2)** solutions to increase the DO concentration and solving the odor problem.

(5 marks)

Q2 (a) State **THREE (3)** advantages and **THREE (3)** disadvantages of anaerobic digestion.

(3 marks)

(b) Explain **THREE (3)** important factors controlling anaerobic digestion

(6 marks)

(c) BOD removal efficiency of an upflow anaerobic sludge blanket process for the treatment of municipal sewage is between 75% and 85%. If the BOD removal efficiency reduces to lower than 50%,

(i) suggest **FOUR (4)** main influencing parameters which need to be investigated in order to determine the actual problem causing the reduction in the removal efficiency.

(4 marks)

(ii) If the problem is found to be caused by **THREE (3)** of the parameters answered in **Q2(c)(i),** propose a solution for each of the causes.

(9 marks)

(d) Propose **THREE (3)** causes of the ineffectiveness of the anaerobic attached-film expanded-bed and fluidized-bed reactor process for wastewater treatment.

(3 marks)

Q3 (a) Explain **THREE (3)** sources of nitrogen in wastewater.

(6 marks)

(b) Describe **TWO (2)** nonbiological/nonbiochemical technologies available for the nitrogen removal.

(4 marks)

(c) A chemist at the wastewater treatment plant that you are working at informed you that nitrogen removal by use of nitrification-denitrification method in plat based on activated sludge system suddenly reduced to less than 50%. Propose **TWO (2)** possible causes and **TWO (2)** solutions to prevent the problem from reoccurring in the future

(8 marks)

(d) Suggest **TWO (2)** parameters that are important for the effectiveness of the sidestream processes for the phosphorus removal.

(4 marks)

(e) Propose **ONE (1)** condition for a high phosphorus removal efficiency in an anaerobic/oxic process consists of a modified activated sludge system.

(3 marks)

Q4 (a) Explain the following terms.
(i) Secondary sludge
(ii) Thickening

(4 marks)

(b) Aerobic digestion consists of adding air or oxygen to sludge contained in an open tank. Suggest**ONE (1)**solution to prevent production of foul odors.

(3 marks)

(c) Suggest **FOUR (4)** methods to remove pathogen and parasites during sludge treatment. Explain your answers.

(14 marks)

(d) Propose **TWO (2)** methods of sludge disposal.

(2 marks)

(e) The pathogen risk from the consumption of vegetable root crops grown on sludge-treated soils has been quantified. Propose **ONE (1)** solution to this problem.

(2 marks)

- END OF QUESTION –