Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	CHEMICAL INDUSTRY UNIT PROCESS AND OPERATION
COURSE CODE	:	BWK 20603
PROGRAMME CODE	:	BWK
EXAMINATION DATE	:	JULY/ AUGUST 2023
DURATION	:	3 HOURS
INSTRUCTION		1. ANSWER ALL QUESTIONS
		2.THIS FINAL EXAMINATION IS CONDUCTED **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 **THREE (3)** PAGES

Q1 (a) Distinguish the mechanism between unit process and unit operation in chemical industry.

(5 marks)

(b) Illustrate and briefly explain the methods of unit operation in term of chemical industry application.

(8 marks)

(c) The air bubble formed by explosion inside water perform oscillations with time period (T) which depends on pressure (P), density (f) and energy due to explosion (E). Establish the relationship between P, f, E and T.

(12 marks)

Q2 (a) A 0.50 molar aqueous solution of H_2SO_4 flows into a process unit at a rate of 1.25 m/min. The specific gravity or density of the solution is 1.03 g/cm^3. The molar mass of H_2SO_4 is 98.08 g/mol. Calculate the mass concentration of H_2SO_4 in kg/m^3.

(5 marks)

(b) 500 gallons of a mixture containing 75wt % ethanol and 25% water (mixture specific gravity = 0.877) and a quantity of a 40wt % ethanol-60% water mixture (specific gravity = 0.952) is blended to produce a mixture containing 60wt % ethanol.

(i) Sketch a flowchart diagram for this process and label the inlet and outlet accordingly.

(10 marks)

(ii) Calculate the required volume of the 40% mixture.

(10 marks)

Q3 (a) Batch reactors are considered as one of the important operating operations in industrial chemical unit process and operation. Hence, it is a vital step to choose the correct reactor to be applied in specific application of chemical process either liquid or gas phase reactor. Choose **ONE (1)** batch reactor and sketch the batch reactor for its specific application.

(5 marks)

(b) Explain the properties of the chosen batch reactor in term of the phase, usage, advantages, and disadvantages.

(10 marks)

(c) Filtration is one of many processes of separation where mass transfer was occurred in industry. State the **THREE (3)** types of filtrations applied in the industry.

(3 marks)

(d) Based on the answer of **Q3(c)**, choose **ONE (1)** type of filtration process and explain the process of the filtration. Diagram can be used to assist the explanation.

(7 marks)

Q4 (a) The transfer of energy in the form of heat occurs in many types of chemical and other types of process. Explain the process of conduction based on Fourier's Law.

(5 marks)

(b) A cold storage room is constructed of an inner of 12.7 mm of pine, a middle layer of 101.6 mm of cork board and an outer layer of 76.2 mm of concrete. The wall surface temperature is 255.4 K inside the cold room and 297.1 K at the outer side surface of the concrete. Calculate the heat loss, W for 1 m^2 and the temperature at the interface between the wood and cork board. (Conductive, k of pine, cork board and concrete are 015, 0.0433 and 0.762 W/mK, respectively).

(10 marks)

(c) In process industries many operations are dependent on effective agitation and mixing of fluids. Explain the differences between mixing and agitation.

(5 marks)

(d) Mixing of liquids is the most common mixing operation in industry such as emulsification and dissolution. Illustrates the process of mixing and agitation of liquid and liquid, in term of impeller used in the operation.

(5 marks)

-END OF QUESTIONS-