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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2018/2019**

COURSE NAME : PROCESS PLANT &
EQUIPMENT DESIGN

COURSE CODE : BNQ 30204

PROGRAMME CODE : BNN

EXAMINATION DATE : JUNE/JULY 2019

DURATION : 3 HOURS

INSTRUCTION : ANSWER ALL QUESTIONS

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

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Q1 The general term plant design includes all engineering aspects involved in the development of either a new, modified or expanded industrial plant.

(a) As an engineering technologist at a chemical/biochemical plant, you are required to modify/improve the plant. Propose the plant improvement procedures according to the following categories:

- (i) Debottlenecking Plant
- (ii) Decrease costs
- (iii) Pollution minimization

(12 marks)

(b) The geographical location of any industrial plant has strong influence on the success of the project. Describe **FOUR (4)** factors that must be considered in selecting plant location for a chemical process plant site.

(4 marks)

(c) As an engineering technologist at a chemical process plant, you are required to decide the optimum process for vinyl chloride manufacturing. Propose the steps for the process creation of vinyl chloride manufacturing.

(9 marks)

Q2 The most effective way of communicating information about a process is through the use of block flow process diagram, block flow plant diagram, process flow diagram (PFD) or piping and instrumentation diagram (P&ID).

(a) Design the following diagrams for a chemical/biochemical plant and describe their differences:

- (i) Block Flow Process Diagram
- (ii) Block Flow Plant Diagram

(6 marks)

(b) Explain in detail the following basic information that provided by a process flow diagram (PFD).

- (i) Pcess topology
- (ii) Stream information
- (iii) Equipment Information

(9 marks)

(c) List **SIX (6)** main purposes of P&ID in a chemical/biochemical plant.

(4 marks)

- (d) Differentiate between the following common diagrams in terms of their features and significance:
- (i) Plot plan
 - (ii) Elevation drawing
 - (iii) Foundation drawing
 - (iv) Electrical drawing

(6 marks)

Q3 Once the connectivity or topology of the PFD has been understood, it is necessary to understand why an equipment is operating at a given pressure and temperature.

- (a) As an engineering technologist at a chemical/biochemical plant in Pengerang Johor, you are required to in charge an inspection of the plant. Prepare a simple report on the differences between “conditions that do not cause severe difficulties” and “conditions of special concern” for the guidelines of the inspection.

(4 marks)

- (b) Produce a report for separators under the special concern.

(12 marks)

- (c) Explain the justification and penalties for nonstoichiometric feeds under the following conditions:

- (i) Inerts
- (ii) Excess reactant
- (iii) Product in feed stream

(9 marks)

Q4 An engineering technologist must be able to make rough cost estimates to decide between project alternatives and optimize the design.

- (a) Define the consequences of the following situation:

- (i) Too high of a production cost estimation
- (ii) Under estimating a production cost

(4 marks)

- (b) Differentiate between “direct plant expenses” and “indirect expenses” for cost estimation of a chemical/bioprocess plant.

(8 marks)

(c) Imagine that you are a chemical/biochemical engineering technologist and have to analyze the cost estimation of the plant. Prepare an analysis of the production cost for the plant, according to the different categories:

- (i) Capital costs
- (ii) Product costs

(8 marks)

(a) Working capital is the amount of capital required to start up the plant and finance ordinary amounts to the production cost for one month of operation before revenues from the process start. Explain **THREE (3)** categories that can be invested under the working capital for an industrial plant.

(5 marks)

- **END OF QUESTIONS** -