



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2019/2020**

COURSE NAME : BIOPRODUCT FACILITY DESIGN  
COURSE CODE : BNN 40104  
PROGRAMME CODE : BNN  
EXAMINATION DATE : DECEMBER 2019/JANUARY 2020  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER **ALL** QUESTIONS

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

- Q1** Pre-commissioning, commissioning and start-up a new/modified plant are important as it constitutes one of the main procedure for designing a new/modified plant.
- (a) Describe the significance of mechanical completion activities in a new/modified plant.  
(2 marks)
  - (b) List **THREE (3)** main activities that need to be conducted in order to achieve the main objective of mechanical completion.  
(3 marks)
  - (c) Differentiate between “commissioning” and “start-up” in terms of their objectives and significance for a new/modified plant.  
(4 marks)
  - (d) Describe the effect of commissioning and start-up activities on the plant operation and schedule.  
(2 marks)
  - (e) Explain **TWO (2)** main objectives of the performance test in a new/modified plant. Thoroughly explain the activities that need to be carried out in order to achieve the objectives.  
(4 marks)
  - (f) As the head of commissioning engineers, you are responsible on the preparation and planning of a plant start-up. Plan the activities that you and your team will conduct in a bioproduct plant, based on the commissioning standard implementation path.  
(10 marks)
- Q2** Problem solving in bioproduct plant operation requires an understanding of the commissioning and start-up conceptual and their effect on the plant operation.
- (a) Explain the objective and significance of pre-commissioning in a new/modified plant.  
(2 marks)
  - (b) As a process plant engineer, you are responsible on the preparation and planning of plant pre-commissioning. Prepare a checklist for the effective pre-commissioning activities.  
(8 marks)
  - (c) A process engineer should perform plant inspection during the pre-commissioning/commissioning activities. Propose **EIGHT (8)** main activities that should be conducted during the plant inspection.  
(8 marks)
  - (d) Determine and explain in detail the activities that should be conducted during the routine checks of equipment in a bioproduct plant.  
(7 marks)

**Q3** Effective plant inspection is necessary to ensure the equipment/plant are installed and functioning in accordance with the standards and specifications.

(a) List **FOUR (4)** major electrical tests that need to be conducted in a new/modified plant. (4 marks)

(b) As the head of commissioning engineers, you are responsible on the laboratory commissioning in a bioproduct industry. Propose the checklist of laboratory checks activities for each of following categories:

- i. Biological safety
- ii. Chemical Safety
- iii. Flammable liquids
- iv. Radiation safety
- v. Emergency Planning & Procedures
- vi. Escape Route
- vii. Security
- viii. Staff awareness

(13 marks)

(c) Differentiate between the main reason for carrying out a “welding procedure qualification test” and “welder qualification test”. (4 marks)

(d) Record must be kept for the life of the equipment/plant until they are scrapped. Explain thoroughly the significance of register and record keeping of the equipment/plant. (4 marks)

(4 marks)

**Q4** Plant cleaning should be conducted in a new/modified plant to remove any foreign material that may have been left behind during the construction period or formed during piping work.

(a) Discuss the primary steps in a good cleaning protocols. (4 marks)

(4 marks)

(b) Describe the effects of following variables that are commonly considered in developing a cleaning regime of equipment/plant:

- i. Solution temperature
- ii. Duration of application
- iii. Chemical concentration
- iv. Soil solubility
- v. Water hardness

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(15 marks)

- (c) There are different types of pressure cleaners available for mechanical cleaning and the choice will always be a compromise between various advantages and disadvantages. Differentiate between “high pressure-low volume system” and “low pressure-high volume system” for mechanical cleaning of a plant.

(6 marks)

**- END OF QUESTIONS -**

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