



**UTHM**  
Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2023/2024**

- COURSE NAME : PROCESS CONTROL AND INSTRUMENTATION
- COURSE CODE : DAK 22803
- PROGRAMME CODE : DAK
- EXAMINATION DATE : JULY 2024
- DURATION : 2 HOURS 30 MINUTES
- INSTRUCTIONS :
1. ANSWER ALL QUESTIONS
  2. THIS FINAL EXAMINATION IS CONDUCTED VIA
    - Open book
    - 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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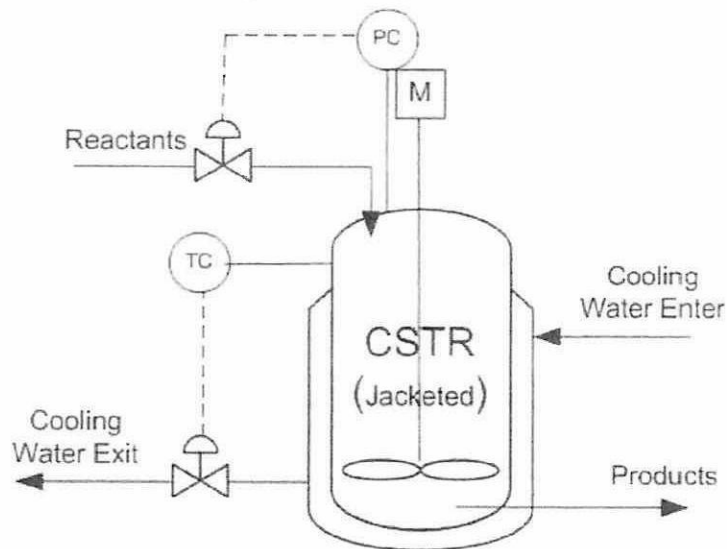
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**Q1** Piping and Instrumentation Diagrams (P&ID) are simple graphics that represent complex processes and convey the flow of material through a process.

- (a) Draw a proper P&ID diagram of the following process. A storage tank is filled with condensed products formed via the CSTR. The tank contains a level controller at a set point on the top of the tank. If this tank were to fill, materials would get clogged up in the reactor. Therefore, if the tank reaches 90% of its total capacity, the level controller will send an electric signal, which opens an emergency drainage line located at the bottom of the tank. The level controller will also activate an alarm alerting plant engineers that there is a problem with the storage tank. Finally, the level controller will close the inlet valve to the storage tank.

(10 marks)

- (b) Describe the following controlled process in words based on **Figure Q1.1**.



**Figure Q1.1**

(10 marks)

- (c) State one example of noise and disturbance for **Q1(b)**.

(2 marks)

- (d) Identify two (2) steps that help to reduce noise and disturbance for **Q1(b)**.

(3 marks)

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- Q2** (a) Describe the concepts and sketch the following measurement instrument.
- (i) Orifice Meter. (3 marks)
  - (ii) Differential Pressure Flowmeter. (3 marks)
  - (iii) Bellows Tube Sensor. (3 marks)
  - (iv) Resistance Temperature Detector (RTD). (4 marks)
- (b) Write six (6) major factors to consider when choosing the right measurement devices. (12 marks)
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- Q3** (a) Draw and describe the basic operation of a boiler for electricity generation. (4 marks)
- (b) Describe five (5) ways to improve the efficiencies of a boiler. (10 marks)
- (c) State two (2) advantages of using a boiler in a Plant instead of electricity from Tenaga Nasional Berhad (TNB). (4 marks)
- (d) Sketch the right steam distribution system for the following.
- (i) Drain Point. (3 marks)
  - (ii) Branch Line. (2 marks)

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(iii) Air Vent

(2 marks)

**Q4** (a) Define plant commissioning.

(2 marks)

(b) Describe four (4) importance of plant pre-commissioning.

(4 marks)

(c) Compare and sketch three (3) transmission media for data communication.

(9 marks)

(d) Describe how the control valve functions.

(2 marks)

(e) Illustrate and differentiate four (4) types of valves.

(8 marks)

- END OF QUESTIONS -

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