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**UTHM**  
Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2022/2023**

COURSE NAME : PROCESS CONTROL AND INSTRUMENTATION

COURSE CODE : DAK 22803

PROGRAMME CODE : DAK

EXAMINATION DATE : JULY/ AUGUST 2023

DURATION : 2 HOURS 30 MINUTES

INSTRUCTIONS :

1. ANSWER ALL QUESTIONS
2. THIS FINAL EXAMINATION IS CONDUCTED VIA **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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**TERBUKA**

**Q1** Sketch Piping and Instrumentation Design (P & ID) for the following situation given.

- (a) When fluid is added into tank A, the temperature of the medium will be altered. The temperature-sensing element will detect these changes and send a signal to the temperature transmitter. The temperature transmitter will send an electric signal to the temperature indicator controller. The temperature indicator controller will send pneumatic pressure to the control valve to open the steam valve.

(5 marks)

- (b) On the same sketch diagram, a flow rate sensing element measures the flow rate. The flow rate sensing element will send data to the flow rate transmitter. The flow rate transmitter will send an electric signal to the flow rate indicator controller. The flow rate indicator controller will send pneumatic pressure to the control valve to control the opening of the pipeline.

(5 marks)

- (c) A simple tank containing a pH controller to adjust pH of the medium at 4 to 8.

(10 marks)

**Q2** (a) Describe the following measurement instrument.

- (i) Venturi Meter.

(3 marks)

- (ii) Electromagnetic Flowmeter.

(3 marks)

- (iii) Bourdon Tube Sensor.

(3 marks)

- (iv) Thermocouple.

(3 marks)

- (v) Resistance Temperature Detector.

(3 marks)

- (b) Write **FIVE (5)** major factors that need to be considered during choosing the right flow meter.

(5 marks)

- Q3**
- (a) Describe the basic operation of a boiler. (2 marks)
  - (b) Sketch and label the component of the water and fire tube boiler. (4 marks)
  - (c) State **FOUR (4)** advantages of using steam as the heating media compared to using hot water or oil. (4 marks)
  - (d) Sketch the right steam distribution system for the following.
    - (i) Drain point. (3 marks)
    - (ii) Branch line. (3 marks)
    - (iii) Filter. (2 marks)
    - (iv) Air vent. (2 marks)
- Q4**
- (a) Define plant commissioning. (1 mark)
  - (b) Describe **FOUR (4)** importance of plant pre-commissioning. (4 marks)
  - (c) List **FIVE (5)** examples of process machinery and **FIVE (5)** examples of instruments to be checked and tested during pre-commissioning of the plant. (5 marks)
  - (d) Describe in detail **FIVE (5)** elements of plant inspection. (10 marks)

**TERBUKA**

- Q5** (a) Compare **FOUR (4)** transmission media for data communication (8 marks)
- (b) Control valve regulates the flow rate of fluids through pipes in the processing system by adjusting an opening through which the material flows.
- (i) Under normal conditions, fluid passing through a valve will undergo a pressure drop across the valve orifice which is at its lowest pressure. Describe the meaning of flashing and cavitation conditions. (4 marks)
- (ii) Illustrate and differentiate **FOUR (4)** types of valves. (8 marks)

-END OF QUESTIONS -