



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

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

- COURSE NAME : PROCESS INSTRUMENTATION
- COURSE CODE : BNQ 30304
- PROGRAMME : BNN
- DATE : JULY/AUGUST 2023
- DURATION : 3 HOURS
- INSTRUCTION :
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 PAPER CONSISTS OF **THREE (3)** PAGES ONLY

- Q1** (a) (i) Describe the basic elements involves in the measurement system of an exhaust gas temperature of a reactor to be displayed in a display unit. (6 marks)
- (ii) Chemical processes are used to produce chemical products and are by definition processes which include chemical transformation(s). List any **THREE (3)** aspects of a chemical process. (3 marks)
- (b) Measurement and control systems are very important in process instrumentation as both systems are considered as fundamental.
- (i) Draw a complete flow chart for **both basic measurement and basic control system**. Ensure that the flow diagram drawn is labelled accordingly. (6 marks)
- (ii) Differentiate between the principal operations of both basic measurement and basic control systems based on the flow chart drawn in **Q1(b)(i)**. (4 marks)
- (c) Define the term '*precision*', '*bias*' and '*sensitivity*'. (6 marks)
- Q2** (a) Differentiate between feedback control loop and feed forward control loop together with their respective labelled block diagram. (8 marks)
- (b) Explain about '*Dynamic Characteristics*' and the purpose of the dynamic test. (5 marks)
- (c) (i) Name **SIX (6)** criteria that are required to be considered when selecting a transducer. (3 marks)
- (ii) Compare any **THREE (3)** of the following multiple type sensors in terms of their respective basic principle (with related equation).
- ✓ Magnetic Flow meter
 - ✓ Static Pressure Type Level Sensor
 - ✓ Piezoelectric Pressure Sensor
 - ✓ Radiation Pyrometer
 - ✓ Bimetallic Sensor

✓ Differential Pressure Flow Meter

(9 marks)

- Q3** (a) An analog to digital converter (ADC) for UTHM has a transition number of 7.
- (i) Calculate the number of output bits for the UTHM ADC converter (2 marks)
 - (ii) With the aid of a diagram, illustrate the relationship between digital output code and analog input signal for UTHM ADC converter. (3 marks)
 - (iii) UTHM changed their current ADC converter to a new 4 bytes ADC converter with ± 0.5 bytes of quantization error and 10 volts of input full scale voltage. Determine resolution, quantization error (volt) and accuracy percentage (full scale) of the new instrument. (6 marks)
- (b) (i) Define the term 'Filter' and 'Filtering Process' (2 marks)
- (ii) Differentiate between Band-pass filter and Band-stop filter in terms of purpose and output from each ideal filter. Show your answers in table form with output in diagram form. (8 marks)
- (c) Identify **FOUR (4)** types of computer-based controller (4 marks)
- Q4** (a) (i) Name **FOUR (4)** types of valves design (4 marks)
- (ii) Based on your answer in **Q4 (a)(i)**, build a table summarizing the applications, advantages, and disadvantages of all four types of the valve design (12 marks)
- (b) "The operation of a generator is based on Faraday's Law where the voltage will be induced when the conductor passes through magnet flux".
- With the aid of a few diagrams, illustrate the operation of basic DC generator for one complete cycle of induced voltage complete with label and brief description. (8 marks)
- (c) Name **TWO (2)** types of actuators used in the control system (1 mark)

-END OF QUESTIONS-