



UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF CHEMICAL AND BIOENGINEERING TECHNOLOGY

FINAL EXAMINATION
OCTOBER 2025 SEMESTER

COURSE CODE	: CLD 20202
COURSE NAME	: PROCESS INSTRUMENTATION
PROGRAMME NAME	: DIPLOMA IN CHEMICAL ENGINEERING TECHNOLOGY (FOOD)
DATE	: 29 JANUARY 2026
TIME	: 02.00 PM – 04.00 PM
DURATION	: 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please **CAREFULLY** read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of **TWO (2)** sections; Section A and Section B.
4. Answer **ALL** questions in Section A and **THREE** questions in Section B.
5. Please write your answers on the OMR answer script and answer booklet provided.
6. Answer all questions in English language **ONLY**.

THERE ARE 9 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 25 marks)**INSTRUCTION: Answer ALL questions.****Please use the objective answer sheet (OMR) provided.**

1. Identify the primary purpose of process instrumentation in an industrial plant.
 - A. To improve product packaging
 - B. To measure and control process variables
 - C. To increase manual labor efficiency
 - D. To reduce raw material cost

2. _____ is known as a sharp and rough temperature sensing element.
 - A. Thermocouple
 - B. RTD
 - C. Bimetallic thermometer
 - D. Thermowell

3. A temperature measurement system consists of a thermocouple connected to a transmitter. Identify the main function of the thermocouple.
 - A. Amplify the signal
 - B. Convert temperature into an electrical signal
 - C. Transmit the signal to the control room
 - D. Display temperature readings

4. In an RTD temperature measurement, an increase in temperature causes the sensor resistance to _____.
 - A. Remain constant
 - B. Change exponentially
 - C. Increase linearly
 - D. Decrease linearly

5. A type J thermocouple is manufactured from _____.
 - A. Aluminum and Tungsten
 - B. Iron and Constantan
 - C. Copper and Constantan
 - D. Chromel and Alumel

6. It is essential to have a reference junction in a thermocouple-based system because _____.
- A. Copper extension wire has a tendency to corrode
 - B. Thermocouples are inherently nonlinear
 - C. The reference junction generates a temperature-dependent voltage
 - D. The junction's electrical resistance varies with temperature
7. In an instrumentation loop, identify the element that is responsible for correcting deviations from the desired process condition.
- A. Sensor
 - B. Transmitter
 - C. Controller
 - D. Indicator
8. The following key word is considered a basic process variable.
- A. Profit
 - B. Flow rate
 - C. Plant layout
 - D. Operator skill
9. Express the Bernoulli's Equation.
- A. The ratio of kinetic to viscous forces in a flow stream
 - B. Friction loss as fluid moves through a rough pipe
 - C. Potential and kinetic energies in a flow stream
 - D. Fluid density and compressibility in a restriction
10. The fluid effect created by a flag flapping in the breeze is _____.
- A. Cavitation
 - B. Vortex shedding
 - C. Transitional flow
 - D. Turbulent flow
11. As the system passes through a restriction, then _____.
- A. Velocity decreases and pressure increases
 - B. Velocity increases and pressure increases
 - C. Velocity increases and pressure remains the same
 - D. Velocity increases and pressure decreases

12. An orifice plate measures flow rate based on the principle of _____.
- A. Positive displacement
 - B. Variable area
 - C. Pressure drop across a restriction
 - D. Electromagnetic induction
13. The installation as depicted in Figure 1 is suitable for _____.

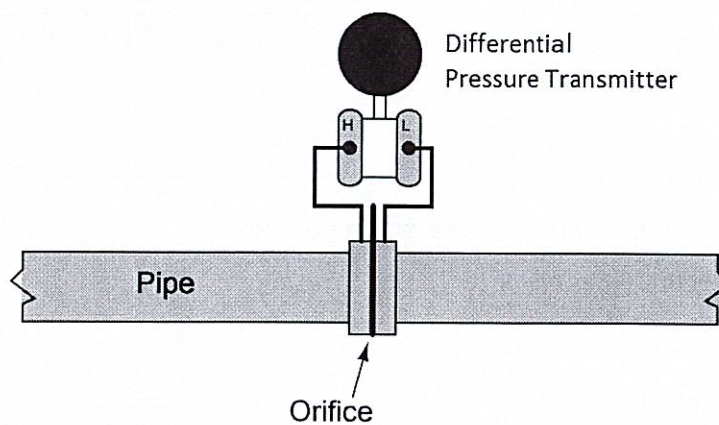


Figure 1

- A. Slurry flow
 - B. Oil flow
 - C. Gas flow
 - D. Steam flow
14. The instrument used for the measurement of pressure is _____.
- A. Bellows.
 - B. Diaphragms.
 - C. Fiber optic pressure sensors.
 - D. All of these.
15. A _____ is used to monitor pressure measurement.
- A. Manometer.
 - B. Diaphragm.
 - C. Bourdon tube.
 - D. Bellows.

16. A sensor is described as a device that _____.
- A. Displays the measured value
 - B. Converts a physical quantity into a usable signal
 - C. Controls the process automatically
 - D. Stores process data
17. An electrical strain gauge works on the principle of _____.
- A. Variation of resistance.
 - B. Variation of capacitance.
 - C. Variation of conductivity.
 - D. Variation of area.
18. Commonly used elements for wire strain gauges are _____.
- A. Nickel and Copper.
 - B. Nickel and Gold.
 - C. Gold and Brass.
 - D. Silver and Aluminum.
19. The piezoelectric materials used for converting energy are called _____.
- A. Converters.
 - B. Actuators.
 - C. Dielectric.
 - D. Transducer.
20. A piezoelectric transducer is a device that uses the piezoelectric effect to measure changes in
- I Acceleration
 - II Pressure
 - III Force
- A. Only I and II.
 - B. All of the above.
 - C. Only II and III.
 - D. Only I and III.

21. The following statement is not a disadvantage of Piezoelectric transducer.
- A. It is very difficult to give the desired shape to this material and also desired strength.
 - B. The output is low so some external circuit is attached to it.
 - C. External voltage is required to produce output.
 - D. It is affected by temperatures.
22. In ultrasonic level gauge, the ultrasonic source is placed at the _____.
- A. Bottom of the vessel containing the liquid.
 - B. Top of the vessel containing the liquid.
 - C. Middle of the vessel containing the liquid.
 - D. Far from the vessel containing the liquid.
23. Assume a storage vessel is filled with a liquid of uncertain density. Identify which level measurement technology will not maintain accurate measurement of liquid height in the vessel as the liquid density changes.
- A. Magnetic gauge
 - B. D/P Transmitter
 - C. Ultrasonic sensor
 - D. Float and tape
24. In a basic instrumentation system, this component sends the measured signal to the controller.
- A. Final control element
 - B. Transmitter
 - C. Actuator
 - D. Control valve
25. Select the statement that best describes the operating principle of a gauge glass:
- A. A gauge glass is controlled by the flow of pressurized air.
 - B. The level in a gauge glass is half that in a tank.
 - C. Liquid levels equalize in containers that are connected together.
 - D. Fluid flow in a gauge glass varies with the size of the orifice plate in the tank.

SECTION B (Total: 75 marks)

INSTRUCTION: Answer THREE questions ONLY.

Please use the answer booklet provided.

Question 1

- (a) Identify the four basic components used to measure process variables as shown in Figure 2.

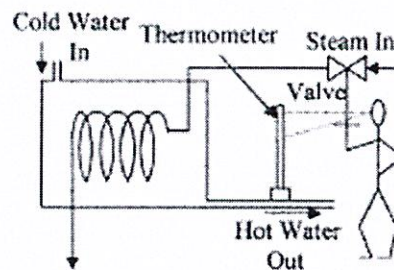


Figure 2

(4 marks)

- (b) Briefly describe all the terms used to characterize the performance of instruments.

(12 marks)

- (c) Describe the working principle of the instrument displayed in Figure 3.

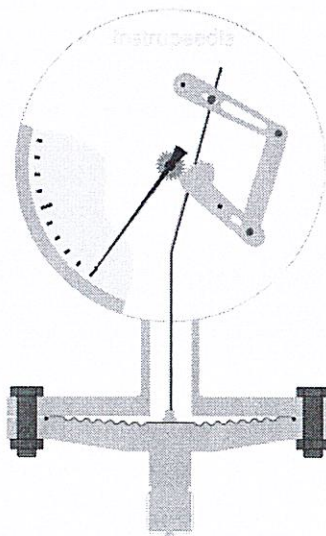


Figure 3

(3 marks)

- (d) Explain all safety precautions and maintenance practices for pressure measurement.

(6 marks)

Question 2

- (a) Explain the working principle of the device as shown in Figure 4.

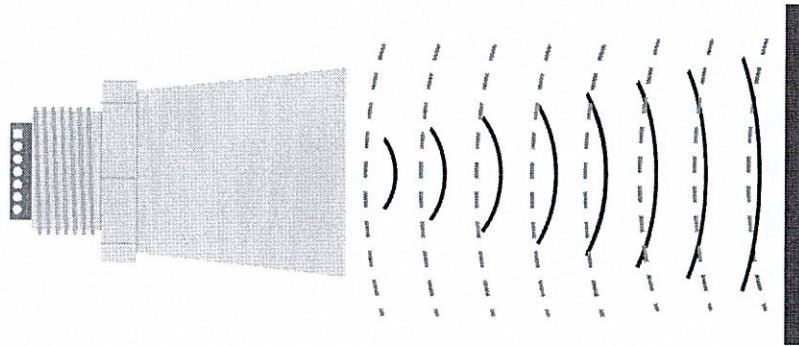


Figure 4

(9 marks)

- (b) Identify all the orifice plates shown in Figures 5(a)-(c) and interpret the fluid conditions applicable to each plate.

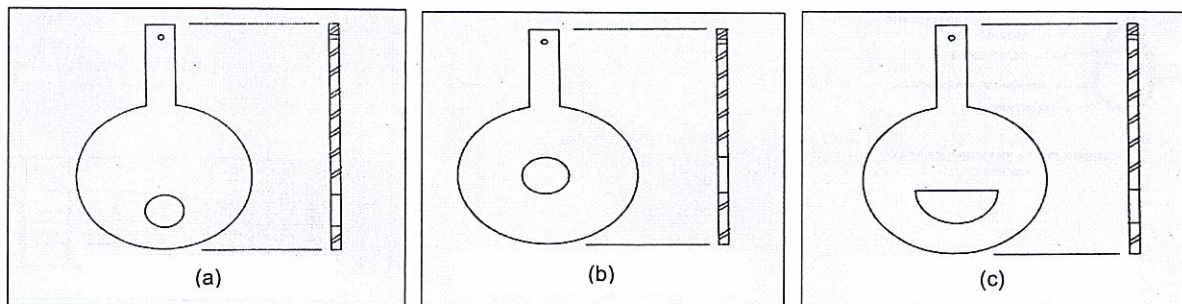


Figure 5

(6 marks)

- (c) Differentiate the element types of a Resistance Temperature Detector (RTD). (6 marks)
- (d) Explain the principle of a bimetallic thermometer in measuring temperature. (4 marks)

Question 3

- (a) Identify two common calibration methods for instruments.

(4 marks)

- (b) Explain the operating principles of each device used for level measurement.

- i) Leadline
- ii) Dipstick
- iii) Sight glass
- iv) Float device
- v) Magnetic gauge

(15 marks)

- (c) Discuss the operational of capacitance and conductivity methods for level measurement.

(6 marks)

Question 4

- (a) Interpret all factors that can affect liquid pressure.
(6 marks)
- (b) Explain the principle of U-tube manometer, inclined manometer and well manometer used to measure pressure.
(6 marks)
- (c) Differentiate the temperature range and one industrial application of thermocouple Type R, Type B and Type S.
(6 marks)
- (d) Sketch a diagram of a rotameter and explain its operation for measuring flow.
(7 marks)

END OF EXAMINATION PAPER

