
This paper consists of **FOUR (4)** pages including the front page.
Structured/Essay (6 questions – answer any **4 questions**)

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J5800 : Instrumentation and Control

QUESTION 1

- (a) What is the definition for instrument? (2 marks)
- (b) State **THREE (3)** functions of instrumentation process. (6 marks)
- (c) Explain why calibration process is needed in a control system. (3 marks)
- (d) Define error. List the different sources of errors in a measurement system. (6 marks)
- (e) State **FOUR (4)** types of output display in a measurement system. (8 marks)

QUESTION 2

- (a) List **FOUR (4)** types of measurement in industrial application. (4 marks)
- (b) Explain briefly with the aid of a diagram the principle of pressure gauge measurement using basic Bourdon gauge. (12 marks)
- (c) The methods of a liquid level measurement are direct and indirect mechanical. List **TWO (2)** types of direct and indirect mechanical liquid level measurement methods. (4 marks)
- (d) Discuss thermocouple junction and state the formula to calculate thermocouple temperature. (5 marks)

QUESTION 3

- (a) Explain whether the following is an open-loop or a closed-loop control:-
- i. Stopping a clothes dryer when the clothes are dry. (3 marks)
 - ii. Actuation of an ice maker when the supply of cubes is low. (3 marks)
- (b) Explain the servomechanisms control and give example for this type of control. (9 marks)
- (c) Differentiate between a resistor temperature detector (RTD) and a thermocouple. (10 marks)

QUESTION 4

- (a) State **FOUR (4)** differences between an open-loop system and a closed-loop system. (8 marks)
- (b) Sketch the block diagram of a closed-loop system which consists of **FIVE (5)** basic elements. (7 marks)
- (c) Explain briefly the function of each of the **FIVE (5)** basic elements stated in (b). (10 marks)

QUESTION 5

- (a) Explain and sketch the working principle of a bimetallic strip. (10 marks)
- (b) Describe and sketch the operating principles of the following flow sensors:- (15 marks)
- i. Ultrasonic
 - ii. Magnetic
 - iii. Orifice plate

QUESTION 6

- (a) Define the terms below :- (12 marks)
- i. Analog input and analog output
 - ii. Digital input and digital output
 - iii. Data conversion device (ADC and DAC)
 - iv. Telemetry
 - v. Multiplex
 - vi. Demultiplex
- (b) State **FIVE (5)** advantages of computer application in industrial control process. (5 marks)
- (c) State **FOUR (4)** devices for interface of pneumatic control process system to a computer and explain briefly. (8 marks)