Total No. of printed pages = 6



**END SEMESTER EXAMINATION – 2019**

Semester : 4th

Subject Code : CAI-403

# INSTRUMENTATION AND PROCESS CONTROL

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

**Instructions :**

1. *All* questions on PART – A are compulsory.
2. Answer any *five* questions from PART – B.

## PART – A

Marks – 25

1. Fill in the blanks : 1×10=10

   (a) The transducer element of a Bourdon Gauge is ———.

   (b) A thermocouple works on the principle of ——— effect.

   (c) Orifice plate is used to measure ———.

[Turn over

(d) The output variable of a strain gauge is ———.

(e) The resistance of a PTC type thermistor is ——— proportional to temperature.

(f) The most widely used metal for construction of RTD is ———.

(g) Pascal is a unit of ———.

(h) The minimum value of input below which no output can be detected in a measurement system is known as ———.

(i) ——— materials have the ability to develop electric charge in response to an applied mechanical stress.

(j) ——— is a device that converts light energy into electrical energy.

2. Write true or false : 1×10=10

(a) A measuring instrument need not have a data presentation element.

(b) The output of a transducer should preferably be mechanical in nature.

(c) A precise instrument is not necessarily an accurate one.





(d) LDR is an active transducer.

(e) Drift is a static characteristic of measuring instruments.

(f) Bourdon Gauge is mostly used for measurement of pressure.

(g) Hair hygrometer is used for measurement of humidity.

(h) An open loop control system is faster than a closed loop system.

(i) Conveyer is an example of a final control element.

(j) NTC type thermistors are made of conductors.

3. Choose the correct answer : 1×5=5

(a) Which of the following is an active transducer ?

(i) LVDT

(ii) RTD

(iii) Strain gauge

(iv) Thermocouple

(b) Which of the following is a dynamic characteristic of a measurement system ?

(i) Accuracy

(ii) Speed of response

(iii) Resolution

(iv) Precision

(c) LVDT is a/an —— transducer.

(i) Resistive (ii) Capacitive

(iii) Inductive (iv) None of these

(d) The output of Bi-metallic strip is ——.

(i) Current

(ii) Voltage

(iii) Displacement

(iv) Change in resistance

(e) —— can be used as sensitive element in biosensors.

(i) Tissue (ii) Enzymes

(iii) Nucleic Acids (iv) All of these.





## PART – B

Marks – 45

4. (a) What is a transducer ? Name some desirable characteristics of a transducer. 4

(b) Differentiate between Contacting and Non-contacting type of instruments with example. 3

(c) Why is it necessary to calibrate a measuring instrument ? 2

5. (a) Discuss the different types of errors found in measuring instruments. 5

(b) Define the terms : Resolution, Hysteresis, Linearity and Dynamic error. 4

6. (a) Briefly explain the working of a capacitive transducer. 5

(b) What is Gauge Factor ? 2

(c) Name any two Opto-electrical transducers. 2

7. Explain the construction and working of LVDT with the help of a suitable diagram. 9

8. (a) Name any four techniques for level measurement. 4

(b) Briefly explain the working principle of RTD. 5

9. (a) Name the basic methods of drying and describe the principle of operation of each method. 6

(b) Name any three different types of dryers. 3

10. Draw the block diagram of an automatic control system and briefly explain the function of each block. 9