Total No. of printed pages = 6

END SEMESTER EXAMINATION-2020

Semester : 4th

Subject Code : CAI-403

INSTRUMENTATION AND PROCESS CONTROL

Full Marks – 70

Time – Three hours

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

Instructions :

1. Questions of 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.

[Turn over

(c) _____ is used to measure flow rate.

(d) The output variable of a bimetallic strip is _____.

(e) The resistance of a NTC 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 blow which no output can be detected in a measurement system is known as _____.

(i) Piezoelectric materials have the ability to develop _____ in response to an applied mechanical stress.

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

2. Write true or false : $1 \times 10 = 10$

(a) A measuring instrument need not have a calibration element.

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

(c) A precise instrument is also an accurate one.

(d) RTD is an active transducer.

(e) Speed of Response is a static characteristic of measuring instruments.

(f) LDR is mostly used for measurement of pressure.

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

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

(i) An Electric motor 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) LDR (iv) None of these

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

(i) Accuracy (ii) Precision

(iii) Resolution (iv) All of these

(c) Strain gauge is a/an _____ transducer.

(i) Resistive (ii) Capacitive

(iii) Inductive (iv) None of these

(d) The output of Thermocouple is _____.

(i) Current

(ii) Voltage

(iii) Displacement

(iv) Change in resistance

2

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

(i) Tissue (ii) Enzyme

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

PART – B

Marks – 45

4. (a) What is a transducer ? Name some desirable characteristics of a transducer. 3

   (b) Differentiate between :

   (i) Null type and Deflection type instruments and (ii) Self-generating and Power-operated type instruments. 6

5. (a) What do you mean by Standard and Calibration ? Briefly explain the different types. 5

   (b) Define the terms : Resolution, Static sensitivity, Drift and Dynamic error. 4

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

   (b) Differentiate between NTC and PTC type of thermistors. 4

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

8. Explain the working of ultrasonic device for level measurement. 9

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 diagarm of an automatic control system and briefly explain the functions of each block. 9