Total No. of printed pages = 5

CAI-403/PC&I/4th Sem/2017/N

PROCESS CONTROL AND INSTRUMENTATION

Full Marks – 70

Time – Three hours

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

PART – A

All the questions are compulsory.

1. State true or false : 5

   (a) LVDT is a secondary transducer.

   (b) Ammeter is a Null-type instrument.

   (c) Strain gauge is an inductive transducer.

   (d) All instruments that are precise are also accurate.

   (e) Dead Band is the largest change of the measure and to which the instrument does not respond.

[Turn over

2. Match the following : 1×5=5

Column A	Column B
(i) Thermistor	(a) Pressure measuring device
(ii) Thermocouple	(b) Positive temperature coefficient of resistance
(iii) Bourdon Gauge	(c) Negative temperature coefficient of resistance
(iv) RTD	(d) Active transducer
(v) LVDT	(e) Passive transducer

3. Answer in one or two words each : 1×10=10

(a) What is the standard equation of Thermistor ?

(b) What is the resistance of Pt-100 RTD at 0°C ?

(c) Specify the temperature range of Platinum RTD.

(d) Write the expression for gauge factor of strain gauge.

(e) Name the transducer element present in thermometer.

(f) Name one final control element.

(g) Name one element used for construction of Bourdon tube.

(h) Name one piezo electric material.

(i) Name one primary element in flow measurement.

(j) Name one signal conditioning element.

4. Fill up the blanks : $1 \times 5 = 5$

(a) The ratio of change of output to the change in input is the _____ of an instrument.

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

(c) The equation for relative limiting error is _____.

(d) _____ is an inverse transducer.

(e) The output of a bimetallic strip used for temperature measurement is _____.

PART – B

Answer any *three* questions. 15×3=45

1. (a) Describe the basic functional elements of instrumentation system with a block diagram. 5

   (b) Define the terms 'standard' and 'calibration' of an instrument. Explain briefly the various types of calibration processes. 2+4=6

   (c) Name and explain the different types of errors found in instruments. 4

2. (a) Explain the construction and working of LVDT for displacement measurement. 6

   (b) Differentiate between NTC and PTC type thermistors. 3

   (c) Explain the working principle of any one device for measurement of temperature. 6

3. (a) Explain the working of ultrasonic device for level measurement. 5

   (b) Draw the block diagram of closed loop control system and explain each of the elements. 5

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(c) Briefly explain the different types of basic flow measurement techniques. 5

4. Write short notes on any *three* : 5×3=15

(a) Evaporators

(b) Dryers

(c) Classification of transducers

(d) Static characteristics of instruments

(e) Biosensors.