Total No. of printed pages = 6

END SEMESTER EXAMINATION – 2020

Semester : 6th

Subject Code : CAI-602

TRANSDUCER AND SIGNAL CONDITIONING

Full Marks – 70

Time – Three hours

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

Instructions :

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

PART – A

Marks – 25

1. Match the following : 1×9=9

(i) Level Measurement	1. Resistive Transducer
(ii) Strain Gauge	2. Capacitive Transducer

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(iii) Current Measurement.	3. Inductive Transducer
(iv) LVDT	4. Flow Measurements
(v) Hot Wire Anemometer	5. Temperature Measurement
(vi) Thermistor	6. Piezoelectric Transducer
(vii) Quartz	7. Vibration Measurement
(viii) Potentiometer	8. Load Cell
(ix) Seismic Transducer	9. Hall Effect Transducer

2. Write true or false : 1×9=9

(a) Strain Gauge is an active transducer.

(b) LVDT is an inverse transducer.

(c) Synchro is a variable capacitance transducer.

(d) Platinum is used in the construction of RTD.

(e) Techo generator is used for pressure measurement.

(f) An ideal OP AMP has infinite output impedance.

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(g) Terminal 3 of IC 741 OP AMP is known as inverting terminal.

(h) Carbon Microphones are resistive transducers.

(i) Piezoelectric transducers are used for speed measurement.

3. Fill in the blanks : 1×7=7

(a) The expression for gain in an OP AMP non-inverting amplifier is _____.

(b) Ultrasonic transducers are used for _____ measurements.

(c) _____ can be used as a secondary transducer.

(d) CMRR of an OP AMP is a ratio of _____ by _____.

(e) Gauge factor of an strain gauge is given by the expression _____.

(f) Shaft encoder is a _____ transducer.

(g) An ideal OP AMP has _____ open-loop gain.

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PART – B

Marks – 45

4. (a) Define resistive, capacitive and inductive transducer. Give examples in each case. 3

   (b) Describe the working principle of strain gauge and deduce the expression for gauge factor of a strain gauge. Also, name the types of strain gauges. 6

5. (a) Explain the three basic principles of working of inductive transducers. 6

   (b) Draw the diagram of potentiometric accelerometer and describe its working. 3

6. (a) Write one application of Synchro system with a neat diagram. 5

   (b) Deduce the expression for output voltage in a differential capacitive transducer. 4

7. (a) How Hall Effect transducer can be used for the measurement of current ? Explain with a diagram. 4

   (b) What are the properties of materials used for piezoelectric transducer ? Derive expression for voltage and charge sensitivities in piezoelectric transducers. 5

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8. (a) Describe in brief the working of the following detectors : 6

(i) Photoconductive detectors

(ii) Photovoltaic detectors

(iii) Photodiode detectors.

(b) Draw the diagram of Seismic Transducer and explain its working. 3

9. Write short notes on the following : 9

(i) Shaft Encoder

(ii) Ultrasonic Transducer.

10. (a) How an OP AMP can be used as a subtractor and an integrator ? Draw suitable circuit diagrams. 4

(b) Determine the expression for gain in an OP AMP non-inverting amplifier. Design an OP AMP amplifier with a gain of 100. 5

11. Draw the following signal conditioning circuits and write suitable mathematical expressions in each case : 9

(i) Linearization circuits using OP AMP

(ii) V to I converter

(iii) I to V converter.

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12. (a) Describe the working of successive approximation type A/D converter using a suitable diagram. 6

(b) Draw the diagram of a sample and hold circuit and explain its working. 3

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