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14115

3 Hours / 100 Marks **Seat No.** | | | | | | | | |

Instructions : (1) All Questions are *compulsory*.

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

Marks

1. Attempt any TEN of the following : **20**

(a) Define : Repeatability & Reproducibility.

(b) Define : (i) Point accuracy (ii) Resolution.

(c) List preliminary steps for periodic calibration of instrument.

(d) State any two factors on which precision of instrument depends.

(e) List any four undesirable characteristics of instrument.

(f) Define : (i) Settling time (ii) Tolerance.

(g) Compare active and passive transducers. (any two points)

(h) Give any two advantages of LVDT.

(i) Compare primary and secondary transducer. (any two points)

(j) Seebeck effect and Peltier effect.

(k) State any two characteristics of ideal OP-Amp.

(l) Define : (i) slew rate (ii) CMMR.

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2. Attempt any FOUR of the following : 16

(a) Draw block diagram of instrumentation system. State function of each block.

(b) Describe dynamic response of second order system. State example of second order instrument.

(c) Distinguish between RTD and thermistor.

(d) State types of Bourdon tubes. Describe 'C' type bourdon tube.

(e) Describe instrumentation amplifier in three OP-Amp configuration. State its applications.

(f) Draw circuit diagram of Op-amp as integrator with inverting configuration state its output equation.

3. Attempt any FOUR of the following : 16

(a) Describe the ramp response of first order system in brief.

(b) Explain why LVDT gives a residual output at null position. State its two applications.

(c) Define Gauge factor. Describe bonded metal foil strain gauge.

(d) Describe use of Op-amp as current to voltage converter.

(e) Suggest suitable transducers for following measurement as,

(i) Low gauge or vacuum pressure in furnace drafts.

(ii) Water flow in river, streams.

(iii) Level measurement of corrosive materials.

(iv) Speed on any type surface as rotating, vibrating.

(f) Describe the operation of turbine flowmeter.

4. Attempt any FOUR of the following : 16

(a) Describe the operation of electromagnetic flowmeter.

(b) What is Hall effect ? State its applicability in parameter measurement.

(c) State advantages of active filter over passive filter. Hence draw frequency response of major active filters.

(d) Draw generalized block diagram of data acquisition system.

(e) Describe instrumentation system for force measurement using load cell.

(f) Describe logarithmic conversion applicable with advantage to DAS.

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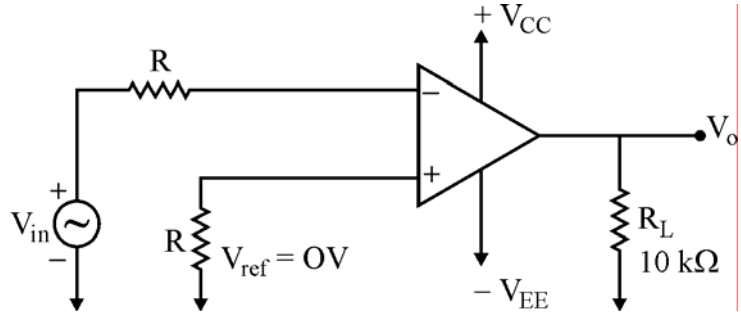
5. Attempt any FOUR of the following : 16

(a) Describe the construction of torque cell with a neat diagram.

(b) Describe the operation of AC analog tachometer.

(c) Identify the application of Op–amp shown in following circuit diagram. Hence draw its typical input–output waveforms.



(d) Differentiate between single channel and multi-channel DAS.

(e) Describe measurement of rotary motion using optical encoder.

(f) Describe operation of variable capacitance pressure transducer using diaphragm.

6. Attempt any FOUR of the following : 16

(a) Explain how liquid level is measured by resistive sensor.

(b) Discuss any four points to be considered while selecting a transducer for its intended applications.

(c) Describe ratio metric conversion in brief.

(d) Select suitable RTD with features for following temperature ranges as,

(i) – 240 ºC to + 649 ºC

(ii) – 196 ºC to + 538 ºC

(iii) – 212 ºC to + 316 ºC

(iv) – 73 ºC to + 204 ºC

(e) Explain use of LVDT as secondary transducer for pressure measurement.

(f) Explain the working of thermocouple for temperature measurement.

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