

17414

14115

3 Hours / 100 Marks

Seat No.

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- 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.



P.T.O.

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.

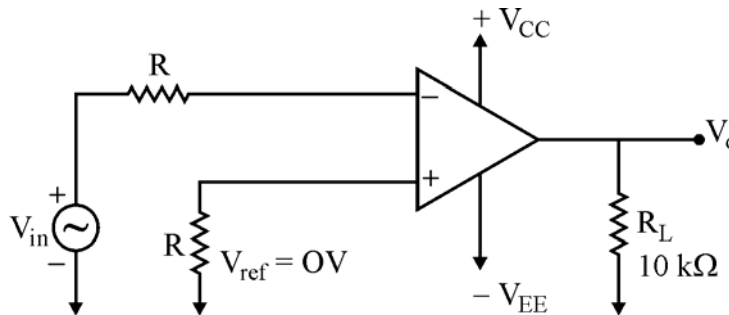
4. Attempt any FOUR of the following : 16

- (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.

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) $-240\text{ }^{\circ}\text{C}$ to $+649\text{ }^{\circ}\text{C}$
 - (ii) $-196\text{ }^{\circ}\text{C}$ to $+538\text{ }^{\circ}\text{C}$
 - (iii) $-212\text{ }^{\circ}\text{C}$ to $+316\text{ }^{\circ}\text{C}$
 - (iv) $-73\text{ }^{\circ}\text{C}$ to $+204\text{ }^{\circ}\text{C}$
- (e) Explain use of LVDT as secondary transducer for pressure measurement.
- (f) Explain the working of thermocouple for temperature measurement.

