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Instructions –   (1) All Questions are *Compulsory*.

(2) Answer each next main Question on a new page.

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

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1.   **Attempt any <u>TEN</u> of the following:**   **20**

a) Explain hysteresis effect in instruments.

b) Explain repeatability and reproducibility of instruments.

c) Define range and span of instruments.

d) Define dead zone.

e) Explain need of calibration of any instrument.

f) Explain what is meant by dynamic error in instruments.

g) Define transducer.

Marks

   h) Define stress and strain.

   i) State name of instrument used for measurement of speed.

   j) Explain hall effect.

   k) Explain why filters are used in signal conditioning.

   l) Define CMRR in operational amplifiers.

2.   **Attempt any FOUR of the following:**   **16**

   a) Draw and explain general block diagram of instrumentation.

   b) Draw a response curve for step curve for second order system under overdamped, underdamped, critically damped condition.

   c) Explain working of thermistor. State any two applications of thermistor.

   d) Classify transducer. Write one sentence about each of them.

   e) State types of filters. Define each of them.

   f) Draw diagrams of each of following operational amplifier.

      i)   differentiator

      ii)   integrator

      iii) inverter

      iv) adder.

Marks

3. **Attempt any <u>FOUR</u> of the following:** **16**

   a) Explain each of following w.r.t. instruments settling time, linearity.

   b) Explain working of resistance strain gauge.

   c) Explain how rotary motion can be measured.

   d) Define each of following terms of operational amplifiers

      i) slew rate

      ii) input offset voltage

      iii) voltage gain

      iv) input capacitance.

   e) Select suitable transducer for each of following.

      i) humidity in substation

      ii) thickness of magnetic material

      iii) transformer winding temperature

      iv) oil level in transformer.

   f) Explain working of instrumentation system for temperature measurement by RTD.

4. **Attempt any <u>FOUR</u> of the following:** **16**

   a) Explain seeback effect.

   b) Explain working of LVDT.

   c) Draw a pin diagram IC LF398. Write function of each pin.

   d) Draw and explain block diagram of general Data Acquisition System.

   e) Explain how force is measured using load cell.

   f) Explain ratio metric conversion in DAS.

Marks

5. **Attempt any FOUR of the following:** 16

   a) Explain how pressure can be measured using Bourdon Tube.

   b) Explain electromagnetic flow meter.

   c) State any two applications of each of following.

      i)   Comparator

      ii) Zero crossing detector.

   d) Draw a block diagram of a practical analog to digital converter.

   e) Explain how pressure can be measured using diagram.

   f) Explain how flow can be measured using turbine flow meter.

6. **Attempt any FOUR of the following:** 16

   a) Explain how current can be measured using hall effect.

   b) Explain how transducer can be selected for application.

   c) Explain voltage to frequency converter method of analog to digital converter.

   d) Explain how level can be measured using capacitive method.

   e) Explain how speed can be measured using dc tachogenerator.

   f) Explain liquid level can be measured using resistive sensor.

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3 Hours / 100 Marks