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15116

3 Hours / 100 Marks

Seat No.

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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) Assume suitable data, if necessary.
- (5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination hall.

Marks

1. a) **Attempt any SIX of the following:** **12**
- (i) List any four different units of pressure.
- (ii) Draw the block diagram of instrumentation system and label it.
- (iii) State seebeck and peltier effect.
- (iv) List the types of orifice plates.
- (v) List two methods for measuring humidity.
- (vi) State the working principle of thermocouple.
- (vii) Classify the following flowmeters as variable head or variable area type:
- 1) Orifice plate
 - 2) Rotameter
 - 3) Venturi
 - 4) Pitot tube
- (vii) Define residual voltage in LVDT.

P.T.O.

b) Attempt any TWO of the following:

- (i) Describe the principle of operation of Doppler type ultrasonic flow meter for flow measurement with a neat labeled sketch.
- (ii) Describe how calibration of pressure measurement is done by using dead weight tester.
- (iii) Draw a neat setup diagram to measure level of a liquid in a tank using a float and potentiometer. Also identify the primary sensor and secondary transducer in this setup.

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

- a) Draw the input-output characteristics of LVDT. Why is it called as differential transformer?
- b) Why rotameter is called as a variable area flow meter? State the advantage of using a spherical float in rotameter.
- c) Compare RTD with thermistor with reference to:
 - (i) Working principle
 - (ii) Materials
 - (iii) Cost
 - (iv) Range of measurement
- d) List applications of (any four each)
 - (i) Ultrasonic level measurement
 - (ii) Float type level gauge
- e) Define:
 - (i) Gauge pressure
 - (ii) Vacuum pressure
- f) With the help of a neat labeled diagram describe the principle of operation of hair hygrometer.

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

- a) Write two examples of:
 - (i) Active transducer
 - (ii) Resistive transducer
 - (iii) Inductive transducer
 - (iv) Digital transducer
- b) Draw pressure measurement setup diagram using strain gauge and state its working principle.
- c) Draw the diagram of radar level measurement. Write one advantage and disadvantage of it.
- d) An electric resistance bulb is made up of platinum wire, its resistance at 0°C is 100 Ω. Determine the value at:
 - (i) - 100°C
 - (ii) + 250°C(Assume temperature co-efficient $\alpha = 0.385 \times 10^{-2}/^{\circ}\text{C}$)
- e) Define the terms:
 - (i) Absolute humidity
 - (ii) Relative humidity
- f) Calculate the output resistance of PT100 RTD for temperature values 30°C and 75°C.

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

- a) Compare Ultrasonic and Radar level measurement with respect to working principle and construction.
- b) Explain the principle of operation of piezoelectric transducer. Name two piezoelectric materials.
- c) List different thermocouples with:
 - (i) Type
 - (ii) Material
 - (iii) Range
 - (iv) Sensitivity

- d) State two advantages and two disadvantages of photoelectric pick up type speed measurement method.
- e) Describe the working principle of bimetallic thermometer. State its two merits and demerits.
- f) Sketch constructional diagram of inclined manometer. State its advantages and disadvantages.

5. Attempt any FOUR of the following: 16

- a) Draw labelled diagram of Electromagnetic flow meter.
- b) Mention different temperature scales and give conversion formulae.
- c) List any eight points for selection of transducer.
- d) With neat diagram, explain working of capacitance level measurement.
- e) Which are non contact type tachometers? Compare them on the basis of any two factors.
- f) Draw the constructional details of C type Bourdon tube and explain its working.

6. Attempt any FOUR of the following: 16

- a) List application of angular potentiometer and capacitive transducer.
 - b) Express the pressure of 260 mm Hg vacuum in absolute and gauge pressures.
 - c) Differentiate between ventury and orifice plate type of flow meters on the basis of pressure recovery, construction, application and cost.
 - d) Determine working principle of radiation level measurement with neat diagram.
 - e) What is thermistor? State types of thermistor. State any four advantages of thermistor.
 - f) Explain with neat diagram, diaphragm gauge pressure transducers. Write the range of pressure than can be measured by diaphragm gauge.
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