

B.E. Third Semester (Electronics & Telecommunication) (New)
Instrumentation and Sensors : 3 ET 04

P. Pages : 2

Time : Three Hours



AU – 2515Add

Max. Marks : 80

- Notes :
1. Due credit will be given to neatness and adequate dimensions.
 2. Assume suitable data wherever necessary.
 3. Diagrams and chemical equations should be given wherever necessary.
 4. Illustrate your answer necessary with the help of neat sketches.
 5. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION – A

1. a) Define transducer and give its classification. 8
b) Explain the following static characteristics. 6
 - i) Sensitivity
 - ii) Resolution
 - iii) Dead Zone

OR

2. a) Explain the following types of errors. 6
 - i) Systematic errors
 - ii) Observational errors
b) A set of independent ten measurements were made to determine the weight of a lead shot. The weights in grams were : 1.570, 1.597, 1.591, 1.562, 1.577, 1.580, 1.564, 1.586, 1.550, 1.575. Determine the i) arithmetic mean, ii) average deviation, iii) standard deviation, iv) variance. 8
3. a) Explain liquid level measurement using gamma rays. 6
b) Explain the working of linear variable differential transformer (LVDT) for measurement of linear displacement. 7

OR

4. a) Explain ultrasonic method for liquid level measurement. 6
b) Explain capacitive method for measurement of liquid level and state its limitations. 7
5. a) A platinum resistance thermometer has a resistance of 150Ω at 0°C . What is the resistance when temperature is 200°C ? When thermometer has a resistance of 400Ω , what is the value of the temperature? The resistance temperature co-efficient of platinum is $0.0039/^\circ\text{C}$. 7
b) Describe optical pyrometer with neat labelled diagram. 6

OR

6. a) Compare the following temperature transducers. 6
- i) RTD ii) Thermistor
- iii) Thermocouple.
- b) A thermistor has a resistance of $3980\ \Omega$ at the ice point (0°C) and $794\ \Omega$ at 50°C . 7
- The resistance temperature relationship is given by $R_T = aR_0 \exp(b/T)$.
Calculate the constants a and b.

SECTION – B

7. a) Explain Hot Cathode ionization gauge on the basis of (i) diagram (ii) pressure range 8
(iii) advantages and disadvantages (iv) working.
- b) Describe electromagnetic flow meter for measurement of flow. 6

OR

8. a) Define the terms absolute and relative humidity. Explain the working of crystal hygrometer. 8
- b) Explain the working of ultrasonic flow transducer. 6
9. a) Derive an expression for gauge factor of a strain gauge. 7
- b) What are smart sensors? Explain with block diagram. 6

OR

10. a) A strain gauge is bonded to a beam 0.1 m long and has cross – sectional area 4cm^2 . Young's 7
modulus for steel is 207 N/m^2 . The strain gauge has an unstrained resistance of $240\ \Omega$ and
gauge factor of 2.2. When load is applied, the resistance of gauge changes by $0.013\ \Omega$.
Calculate the change in length of steel beam and amount of force applied to the beam.
- b) Explain temperature compensation and cancellation technique for strain gauges. 6
11. a) Explain the working of data acquisition system with suitable block diagram. 7
- b) Describe the following : 6
- i) Incremental Optical Encoder.
- ii) Absolute Optical Encoder.

OR

12. a) Define pH value of a solution. Explain pH cell for measurement of pH of a solution. 7
- b) What is normal blood pressure reading? Suggest and describe any transducer for 6
measurement of blood pressure.
