

**Subject Name:** Basic Measurements and Instrumentation

**Time:** 3 Hrs.

**Full Marks:** 100

Attempt *question 1* and *any six* from remaining.

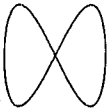
Group-A

1. Multiple choice questions.

1 × 10 = 10

- i) Example of an active transducer is
  - a) Strain Gauge
  - b) LVDT
  - c) RTD
  - d) Thermocouple
- ii) Strain gauge can be used to measure
  - a) Force
  - b) Pressure
  - c) Strain
  - d) All of the above
- iii) Which one of the following is a temperature sensor?
  - a) Bourdon Tube
  - b) Orifice plate
  - c) RTD
  - d) pH
- iv) Inductive proximity sensors can be effective only when the objects are of \_\_\_\_\_ materials.
  - a) Ferro magnetic
  - b) Non magnetic
  - c) Semiconductor
  - d) Insulating
- v) Pt<sub>500</sub> refers to RTD element with Platinum material and
  - a) 100 Ω resistance at 0°C
  - b) 500 Ω resistance at 0°C
  - c) 0 Ω resistance at 500°C
  - d) 0 Ω resistance at 100°C
- vi) The gauge factor of a metal strain gauge having poisson's ratio 1.8 is
  - a) 3.2
  - b) 4.6
  - c) 5
  - d) 6
- vii) Which of the following quantities can be measured using bellows?
  - a) Absolute pressure
  - b) Gauge pressure
  - c) Differential pressure
  - d) All of the mentioned

[ Turn over

- viii) Which of the following optical transducer is an active transducer?  
 a) Photo-emissive cell  
 b) Photo-diode  
 c) Photo-transistor  
 d) Photo-voltaic cell
- ix) CRO can't be used to measure  
 a) Frequency  
 b) Power  
 c) Phage  
 d) Voltage
- x) Hall Effect is clearly visible in \_\_\_\_\_.  
 a) Metals  
 b) Semiconductors  
 c) Super conductors  
 d) All of these
2. a) Draw generalised block diagram of a temperature measurement system. [CO3, K2, A1, S3]  
 b) Define sensitivity, span, accuracy, time constant and lag. [CO1, K1, A1, S1]  
**5+10=15**
3. a) A set of independent voltage measurements was taken by seven observers and recorded as 5.7V, 5.8V, 5.9V, 6V, 6.1V, 6.1V and 6.2V. Calculate (a) average deviation, (b) the standard deviation. [CO1, K4, A3, S2]  
 b) Using a suitable schematic design, describe the operation of a PMMC type instrument. [CO3, K2, A2, S1]  
 c) Draw the circuit of an AC bridge and write the expression for balance equations. [CO3, K2, A2, S2]  
**(4+2)+5+4=15**
4. a) Using necessary schematic diagram, describe the operation of an ammeter. [CO3, K2, A2, S1]  
 b) Draw the functional block diagram of CRO. [CO3, K4, A3, S4]  
 c) Determine the frequency ratio for the Lissajous pattern below.  
  
 [CO3, K4, A3, S4]  
**5+6+4=15**
5. a) Define gauge factor and find the expression of it. [CO4, K3, A3, S5]  
 b) Explain working of a capacitive level transducer. [CO4, K6, A4, S5]  
 c) Find the half bridge sensitivity of a strain measuring system. [CO4, K6, A4, S5]  
**(2+4)+4+5=15**

6. a) Draw the schematic diagram of LVDT and its demodulation characteristic. [CO4, K3, A4, S5]
- b) Define charge sensitivity, voltage sensitivity for piezoelectric sensor and establish their relationship. [CO4, K2, A1, S3]
- (3+3)+(2+2+5)=15**
7. a) Draw a neat sketch of bellow and capsule used to measure pressure. [CO4, K3, A3, S4]
- b) Draw the schematic of venturi meter and explain its working. [CO4, K1, A2, S1]
- c) What do you mean by NTC thermistor? Draw the measuring circuit for thermistor used in temperature measuring system. [CO4, K3, A3, S4]
- 4+5+(2+4)=15**
8. a) Draw the block diagram for feedback control system and explain each block. [CO4, K1, A2, S1]
- b) State 3 characteristics of AD590 temperature sensor [CO4, K1, A2, S1]
- c) Draw the schematic diagram for a dual beam spectroscope. [CO4, K2, A1, S3]
- (2+4)+3+6=15**
9. Write short notes on **any three**. **3 × 5 = 15**
- a) De Sauty Bridge. [CO3, K2, A1, S3]
- b) LCD display. [CO3, K2, A1, S3]
- c) Piezoelectric microphone. [CO3, K2, A1, S3]
- d) Thermopile. [CO3, K2, A1, S3]
- e) Load cell. [CO3, K2, A1, S3]