

M.Sc.(Instrumentation Science) Examination 2017
2nd year 1st semester

Subject: Sensor & Transducer
Full marks:100

Paper: XII(T-302)
Time: 4 hours

Group: A

Answer any five questions:

1. What are broadly the parameters which are measured by measuring displacement? What are different types of displacement sensors? Describe the operations of capacitive sensors?
2+2+6
2. What are different types of inductive sensors ? Describe the operation of LVDT in details with suitable diagram.
3+7
3. What is Hall effect? What is Hall effect sensor ? Describe the operation of a rotary encoder.
2+2+2+4
4. What is a thermocouple? How does a Strain gauge function? What are different types of strain Gauges to measure pressure ? What is Gauge factor ?
2+3+2+3
5. What is thermocouple? How does a thermocouple function as a sensor ? What are the materials used to fabricate thermocouple ?
2+5+3
6. What is RTD? Write principle of operation of a RTD. Why platinum as a RTD is very popular. Draw schematic diagram of a commercial RTD with proper leveling. Explain about suitable wiring configuration for RTD measurement.
2+2+3+3

[Turn over

Group -B

(Attempt any five questions)

1. Discuss the following performance characteristics of a sensor:
(a) Linearity, (b) Selectivity, (c) Precision ,and (d)Resolution (10)
2. (a) What is a bath tub curve? What is its significance? Explain briefly. (b) For what purpose is Arrhenius model used in characterizing sensors? What is the model? Explain with analysis. (4+6)
3. How are frictional force due to stem movement of an actuator and thrust force due to high upstream pressure in the flow line taken consideration of in a pneumatic actuator? What do you mean by sizing and selection of a control Valve ? Explain. (3+7)
4. Define charge sensitivity and voltage sensitivity of a piezoelectric sensor/transducer. How are these related? Discuss and compare quartz and Barium Titanate as piezoelectric materials. How does sensing property develop in such materials? (4+3+3)
5. How do you define external and internal photoelectric effects? Which effect is used in designing photo-emissive cell ? Define amplification factor and sensitivity in a photomultiplier tube. What is a dynode? (2+3+4+1)
6. How can an optical fibre be used for measurement of temperature? Explain a typical system of temperature measurement with diagram and explain its limitations. Discuss fibre as a sensor or otherwise in your system. (3+6+1)
7. How does a solenoid valve function? Draw a simple diaphragm to explain its operation and append a relation to show the force or power it produces for actuation. (8+2)
8. Write notes on any two of the following :
(a) Relays, (b) control valve characteristics, (c) Fibre in liquid level measurement and (d) LDR. (5+5)