

(4)
Section—2

CO-2 (Answer *any two* questions)

5. Write the names of four different types of humidity sensors. What are the applications of humidity sensors? Explain, in detail, working principle of a resistive type of humidity sensor.
10
6. How do you measure the unknown inductance using Anderson Bridge? Explain with necessary diagram and derive the working formula of it.
10
7. (a) What is a flow sensor? Write on different types of flow sensors. Write on different applications of flow sensors.
(b) Draw functional block diagram of a function generator. Draw circuit diagram of a function generator using LM1458.
5+5
8. What is contact and non-contact types of level sensors? Write, in detail, working principle of four different types of level sensors and their applications.
10

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Ex/SC/INSC/PG/CORE/TH/MI103/2025

MASTER OF SCIENCE EXAMINATION, 2025

(1st Year, 1st Semester)

INSTRUMENTATION

PAPER : PG/CORE/TH/MI103

(Sensors, Transducers and Measurements)

Full Marks : 80

Time : Four Hours

The Answer Scripts must be written in your own hand writing in English language only.

Each part of the question is to be written in separate Answer Script.

PART—I (40 Marks)

Section—1

CO-1 (Answer *any three* questions)

1. What are sensor, actuator and transducer? What are the classifications of transducer?
6+4=10
2. Discuss Seebeck effect, Peltier effect and Thomson effect. What are the four common types of thermocouples used and range of temperature measurement?
6+4=10

(2)

3. What is RTD? What is pellistor? What is thermistor? Explain working principle of a thermistor and discuss the general classification of thermistor. 2+2+2+4=10
4. Describe Bourdon gauge and Diphragm gauge. Is a Bourdon gauge a sensor or an actuator or a transducer? 6+4=10
5. What are common light sensors? What are LDR, LED and Photodiode? 4+6=10
6. Discuss, in detail, LVDT in displacement sensor applications. 5+5=10

Section—2

CO-2 (Answer *any one* question)

1. Describe a typical photomultiplier tube (PMT). Name some common coating materials used for obtaining secondary electron emission in PMT. 6+4=10
2. Elucidate strain gauge as force sensor. Resistive strain gauge based on metallic and semiconducting materials : difference between them. What is gauge factor? 3+3+4=10
3. Describe ionization gauge for low pressure measurement. What are the basic differences between a common ionization gauge and Bayard-Alpert gauge? 5+5=10
4. Describe with diagram a typical radiation pyrometer. What are the common thermal detectors used in radiation pyrometers? 5+5=10

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(3)

PART—II (40 Marks)

Section—1

CO-1 (Answer *any two* questions)

1. (A) Define the following for a transducer : 5
 - (a) Reliability
 - (b) Sensitivity
 - (c) Response time
 - (d) Operating range(B) Distinguish between active and passive transducers. Explain the construction and working principle of a moving coil instrument. 5
2. Draw the functional block diagram of a measurement system. What are the types of transducer? What are primary and secondary transducers? List the factors responsible in selection of a transducer. 10
3. Find the value of shunt and multiplying power of an MC instrument which is extended to measure 20 A, if the meter has a full scale deflection at 1 mA and internal resistance of 5 ohm. 10
4. (a) Describe the block diagram representation of cathode ray oscilloscope in detail.
(b) Define the following characteristics of a pulse.
 - (i) Rise time
 - (ii) Fall time
 - (iii) Pulse repetition rate 10

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[Turn Over]