

Ex/SC/INSC/PG/CORE/TH/MI 103/2024

M. Sc. (INSTRUMENTATION) SCIENCE EXAMINATION, 2024

(1st Year, 1st Semester)

SENSORS TRANSDUCERS AND MEASUREMENTS

PAPER : PG/CORE/TH/MI 103

Time : 4 Hours

Full Marks : 80

(Use separate answer sheet for Part-I and Part-II)

PART—I (40 Marks)

*Answer **any four** 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
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 Diaphragm gauge. Is a Bourdon gauge a sensor or an actuator of a transducer? 6+4=10
5. What are common light sensors? What are LDR, LED and Photodiode? 4+6=10

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6. Describe a typical photomultiplier tube (PMT). Name some common coating materials used for obtaining secondary electron emission in PMT. 6+4=10
7. Discuss in detail of LVDT in displacement sensor applications. 5+5=10

PART—II(40 Marks)

Answer question No.1 and *any three* questions from the rest :

1. Answer *all* questions. 1×10=10
- (i) What are the main functional elements in measurement system?
- (ii) Define static error.
- (iii) Define sensitivity.
- (iv) What is environmental error?
- (v) Write names of main parts of an acro.
- (vi) What is the purpose of time base generator in oscilloscope?
- (vii) What is dual trace CRO?
- (viii) What is band width of an oscilloscope?
- (ix) What are the steps to be followed for measurement of voltage by a multimeter?
- (x) Define duty cycle.

(3)

2. Explain the working of Digital frequency measurement. A digital frequency meter has a time base derived from 1 MHz: clock. The clock is divided by decade counters to allow different frequency ranges. What is the displayed frequency when a 1:431 kHz: signal is applied if the time base frequency is divided by: five decade counters. 10
3. Explain difference between LED and LCD and their use as display devices. Mention its advantages and disadvantages. 10
4. Describe the working of Anderson's Bridge for measurement of self-inductance coil. Derive the equations for balance. Calculate the value of inductive reactance of the coil at a particular frequency. 10
5. Sketch labelled equivalent circuit diagram of a practical ammeter and voltmeter. What is function of probe? Discuss an oscilloscope probes. 10
6. Write short notes on the following : 5×2=10
- (a) Digital Storage Oscilloscopes
- (b) Digital vs Analog meters in teaching laboratory.

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