

Duration: 1 ½ Hr

Marks: 45

Note: (1) Q.1 is compulsory

(2) Attempt any two from remaining

(3) All Questions are of 15 marks.

Q.1 Attempt any five

[15M]

- Define the term Calibration. Write 2 points regarding its significance in measurements.
- Justify the statement: "Concept of Interference yields better results when employed as measuring Instrument"
- Fill in the gap: Full form of LVDT is Linear Variable _____ Transformer. It works on the principle of _____. It measures _____.
- Draw the diagram to measure Hall Voltage of a semiconductor slab. Clearly indicating width "w", thickness "t", current "I" passing through it and Applied Magnetic field Intensity B Tesla.
- Describe Seebeck effect .What is the approximate range of potential difference it generates?
- Assuming that atoms are perfect spheres of radius R, Write the expression of Surface to volume ratio. Also find the surface to Volume ratio if the atom is a perfect cube with edge "s"
- Write three points as the comparison for Accuracy and Precision.

Q.2 (a) In an experiment to find Resistance a student performed it for five times and the results are 38Ω, 51Ω, 46Ω, 79Ω, 57Ω. Find the standard Deviation. [5M]

(b) Apply the knowledge of monochromatic light in interference and explain its application to determine the flatness of the surface. [5M]

(c) Draw neat diagram and explain how LVDT works [5M]

Q.3 (a) Using a neat diagram, Derive the expression that measures Hall Voltage for a semiconductor under the magnetic field intensity B Tesla. [5M]

(b) Write the formula that can explain variation of Resistance with respect to temperature. Sketch the variation of Resistance with respect to temperature in case of material with (1) Positive temperature coefficient (2) Negative temperature coefficient [5M]

(c) Apply the knowledge of optical microscope to determine its limitation to study nano particles. Explain Transmission Electron Microscope (TEM) works in study of nano particles. [5M]

- Q.4 (a) A straight line is to be drawn using x and y coordinates as mentioned below. Using the concept of least square fit find the equation of straight line. [5M]

X	1	2	3	4	5	6	7	8	9
Y	4	7	8	11	12	15	17	21	20

- (b) Define (1) Transducer (2) Piezo electric effect. How Piezo electric Transducer works? Write at least three applications of Piezo electric Transducer. [5M]
- (c) What is heat? Write at least two points as the difference between heat and Temperature. Explain the use of Bimetallic thermometer for measurements of temperature. [5M]

- Q.5 (a) Explain why optical interferometry is one of the best concept for testing the flatness of a surface? [5M]

- (b) A sample of a n-type Silicon has a donor density of $10^{20} / \text{m}^3$. It is used in the Hall effect experiment. If the sample of width 4.5 mm is kept in a magnetic field of 0.55T with current density of 500 A/m^2 . Find Hall voltage developed. [5M]

- (c) Draw the neat diagram and explain how AFM works. [5M]
