

5 LAB SESSION 5

To measure temperature inside the oven using a platinum resistance thermometer

5.1 Learning Objective:

At the end of this study, the student will be able to:

- To use different parts of Oven Test Module like platinum resistance thermometer and heating resistance.

5.2 Apparatus

In order to complete the demonstration, we need the following components.

- 5V DC power supply
- 5K Ω Potentiometer
- Platinum resistance (RTD)
- Heating resistance
- voltmeter

5.3 Main Parts of Oven Test Module

1. Oven
2. Thermocouple
3. RTD
4. Thermistor
5. Heating Resistance
6. Fan

5.4 Related theory

A platinum resistance thermometer (PRT) is a device which determines the temperature by measuring the electrical resistance of a piece of pure platinum wire. The piece of platinum wire is referred to as a temperature sensor. When manufactured carefully these devices offer an excellent combination of sensitivity, range and reproducibility.

The electrical resistance of many metals (e.g. copper, silver, aluminium, platinum) increases approximately linearly with absolute temperature and this feature makes them useful as temperature sensors. The resistance of a wire of the material is measured by passing a current (AC or DC) through it and measuring the voltage with a suitable bridge or voltmeter, and the reading is converted to temperature using a calibration equation.

The most reproducible type of sensor is made from platinum because it is a stable unreactive metal which can be drawn down to fine wires but is not too soft. Using very pure wires, thermometers can be made with closely similar resistance characteristics and achieve good reproducibility in use.

5.5 Experimental procedure:

- 1) Set up the equipment and identify its components.
- 2) To carry out this practice it is necessary to build the above circuit.
- 3) With this circuit we obtain a V_o voltage proportional to the temperature value inside the BS-5 oven.
- 4) RTD resistance varies with the temperature variation in BS-5 oven. This produces a V_o output voltage variation.
- 5) The excitation voltage is 5Vdc.
- 6) This platinum sensor has a high linearity even though it also has a low temperature rate.
- 7) 5K Ω potentiometer must be placed at its maximum path, this way we will obtain a 5K series resistance with platinum sensor forming a voltage divisor.

5.6 Observations & Calculations

Table5.1: Calculation of Temperature and Output Volts

Obs. n	Temperature (In terms of ON time of heater)	Output (mV)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

5.7 Graph

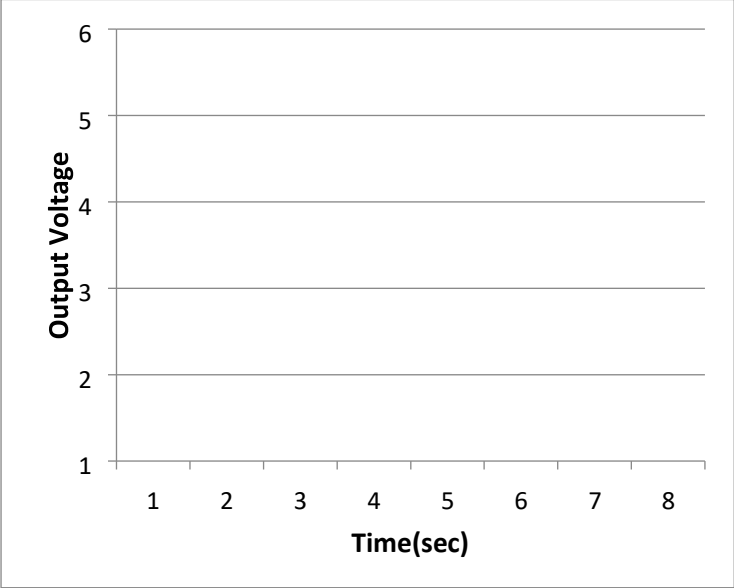


Figure 5-2 Characteristics of RTD

5.8 Specimen Calculation

N.A

5.9 Statistical Analysis

N.A

5.10 Conclusion: