

## **7 LAB SESSION 7**

To measure the temperature in the oven using a thermistor temperature sensor

### **7.1 Learning Objective:**

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

- To use different parts of Oven Test Module including NTC thermistor and PTC temperature resistor

### **7.2 Apparatus**

In order to complete the demonstration, we need a number of pieces of equipment.

- Main module
- 5V DC power supply
- 5K $\Omega$  potentiometer
- NTC Thermistor • Heating Resistance
- Voltmeter.

### **7.3 Main Parts of Oven Test Module**

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

### **7.4 Related theory**

A thermistor is a type of negative coefficient resistor whose resistance is dependent on temperature, more so than in standard resistors. The word is a portmanteau of thermal and resistor. Thermistors are widely used as inrush current limiter, temperature sensors (Negative Temperature Coefficient or NTC type typically), self-resetting overcurrent protectors, and self-regulating heating elements (Positive Temperature Coefficient or PTC type typically).

Thermistors are of two opposite fundamental types:

- With NTC, resistance decreases as temperature rises to protect against inrush overvoltage conditions. Commonly installed in parallel as a current sink.
- With PTC, resistance increases as temperature rises to protect against overcurrent conditions. Commonly installed in series as a resettable fuse.

Thermistors differ from resistance temperature detectors (RTDs) in that the material used in a thermistor is generally a ceramic or polymer, while RTDs use pure metals. The temperature response is also different; RTDs are useful over larger temperature ranges,

while thermistors typically achieve a greater precision within a limited temperature range, typically  $-90\text{ }^{\circ}\text{C}$  to  $130\text{ }^{\circ}\text{C}$ .

### 7.5 Experimental procedure:

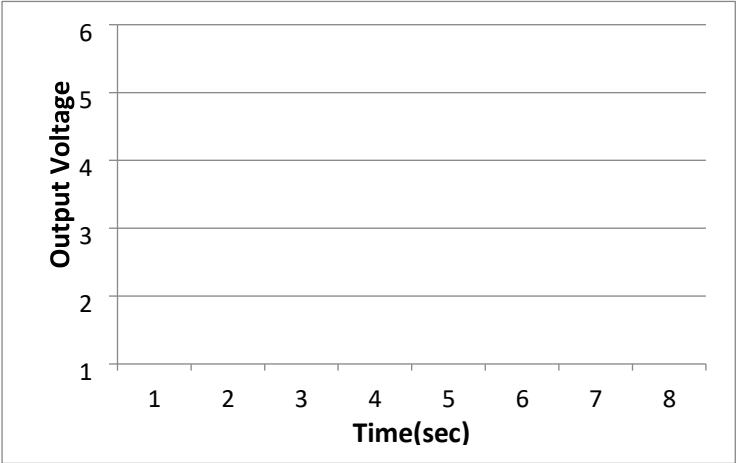
- 1) Set up the equipment and identify its components.
- 2) In this experiment we will be using a NTC thermistor as sensor element to measure the temperature inside the oven module, for it, the above circuit must be built.
- 3) In the above described circuit, the 5K potentiometer must be at its maximum path in order to get a 5K resistance in series with the thermistor, forming a voltage divisor that will vary the output voltage  $V_o$  according to the temperature detected by the thermistor.
- 4) Once the circuit is built and the potentiometer is adjusted the only thing left is to activate the oven heating resistance as described in previous practices and to supply the above described circuit using the main module.

### 7.6 Observations & Calculations

**Table7.1: Calculation of Temperature and Output Voltage**

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

**7.7 Graph**



*Figure 7-2 Characteristics of Thermistor.*

**7.7 Conclusion:**