

**University Diploma Program  
Electrical Engineering Technology**

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**EET 027, Experiment # 5**

**Thermocouple Voltage Measurement**

**Objectives:**

To examine the thermocouple voltage and find corresponding temperature under the following conditions:

1. To measure voltage of thermocouple without considering the intermediate thermocouple effect of measurement setup.
2. To measure voltage of thermocouple with ice-point reference junction and find corresponding voltage using the thermocouple table.
3. To measure voltage of thermocouple using ambient reference block and calculate the corrected voltage and then find the corresponding temperature.

**Apparatus:**

J type thermocouples  
4-1/2 digit DVM.  
Temperature Indicator.  
Ice point water  
Boiling water

**Theory:**

Theory as per attached sheets.

**Procedure:**

1. Setup the experiment as Figure 4 in theory sheets and measure voltage V.

$$V = \underline{\hspace{4cm}}$$

$$T = \underline{\hspace{4cm}}$$

2. Setup the experiment as Figure 6 and measure voltage V and calculate  $V_1$ . Find temperature corresponding to  $V_1$  from table.

$$V = V_1 - V_2$$

$$V = \alpha(T_1 - T_2)$$

where,

$$V_1 = \alpha t_1$$

$$V_2 = \alpha t_2$$

$$t(^{\circ}C) = T(^{\circ}K) + 273.15$$

$$V = \underline{\hspace{4cm}}$$

$$V_1 = \underline{\hspace{4cm}}$$

$$T = \underline{\hspace{4cm}}$$

$$T_1 = \underline{\hspace{4cm}}$$

3. Setup the experiment according to figure 12.
  - a. Note reference temperature, which will be ambient temperature from temperature indicator.
  - b. Measure V and find  $V_1$ .

$$V = V_1 - \alpha T_{REF}$$

- c. Find the temperature from table corresponding to V.

$$T_{REF} = \underline{\hspace{4cm}}$$

$$V = \underline{\hspace{4cm}}$$

$$V_1 = \underline{\hspace{4cm}}$$

$$T = \underline{\hspace{4cm}}$$

$$T_1 = \underline{\hspace{4cm}}$$

4. Compare voltage from setup 1, 2 and 3.

## **Conclusions:**

### **Explain:**

Which set up gives the correct temperature?

Which set up gives maximum error?