

EXPERIMENT 2

LINEAR AND NONLINEAR RESISTIVE NETWORKS

OBJECTIVE: Some linear and nonlinear simple resistive elements such as resistor, light bulb, diode, thermistor and photoresistor will be examined as one port resistive elements.

PRELIMINARY WORK

CAUTION: ALL PLOTS MUST BE DRAWN ON GRAPH PAPER!

P1 Plot the I-V characteristics of the following circuits (Assume I as y-axis). Be careful the directions of the I and V. All diodes are assumed to be ideal.

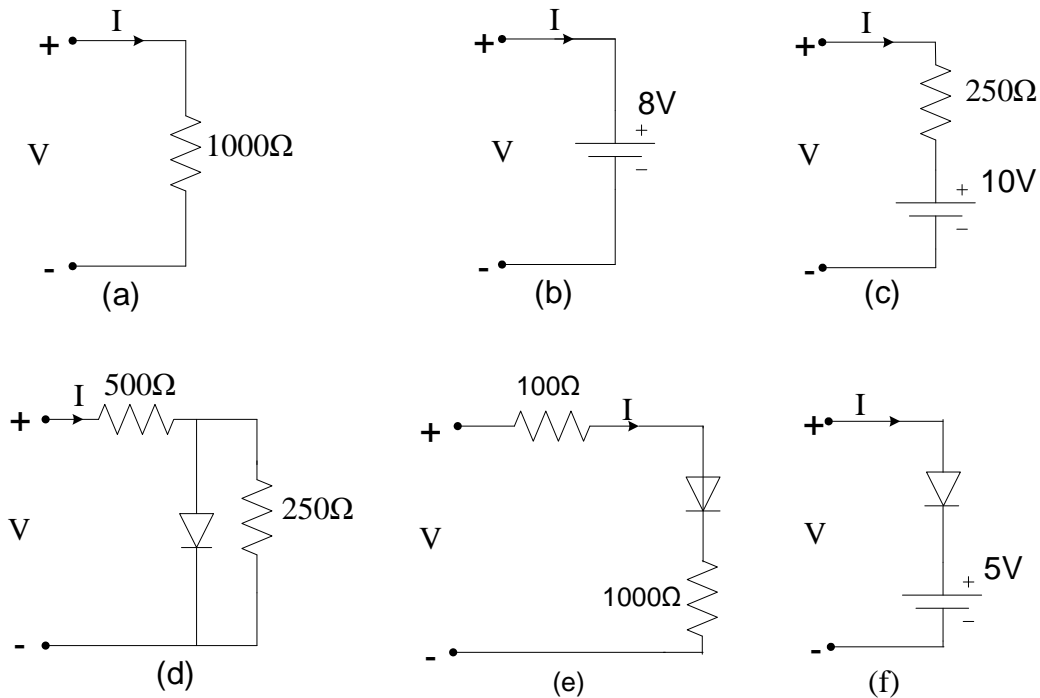


Figure 2.1

P2 Obtain and plot the I-V characteristics of $1k\Omega$ resistor by varying DC supply from $-10V$ to $10V$, in $2V$ steps.

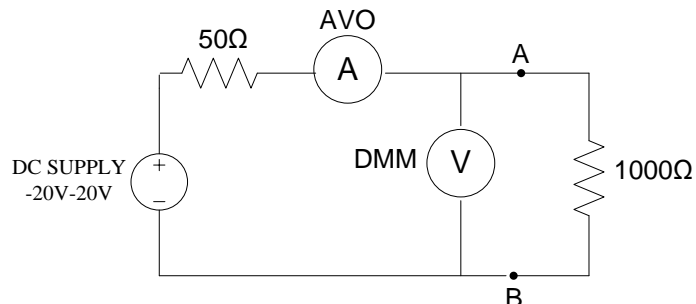


Figure 2.2

P3

a) Assume that the I-V characteristics of a nonlinear device (light bulb) is given as

$$v(i) = (1 - e^{-2i}) \text{ V}$$

Plot the I-V characteristic of the configuration given in Figure 2.3.a.

b) Draw the I-V characteristic of the series combination given in Figure 2.3.b.

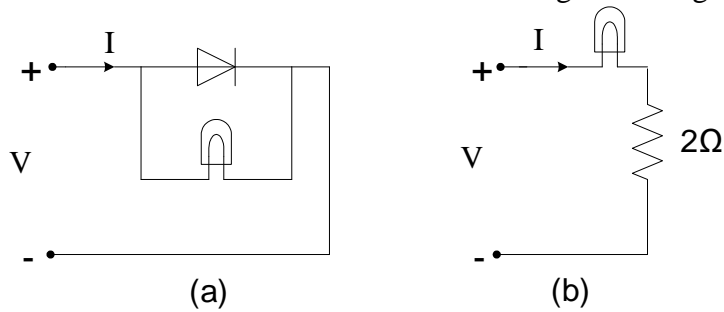


Figure 2.3

EQUIPMENTS

- Digital Multimeter (DMM)
- Avometer (AVO8)
- Power Supply
- Resistors
- Diode
- Light Bulb
- Thermistor
- Photoresistor

EXPERIMENTAL WORK

E1 Obtain and plot the I-V characteristics of 1kΩ resistor by varying DC supply from -10V to 10V, in 2V steps.

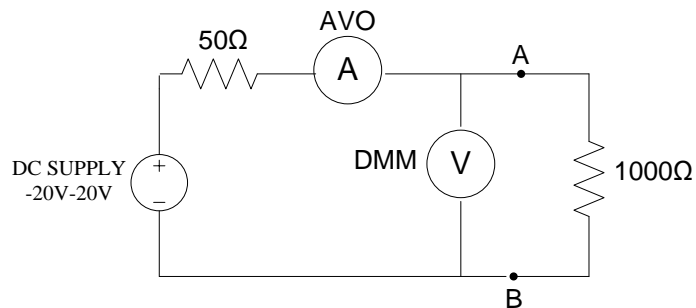


Figure 2.4

E2 Obtain the I-V characteristics of the light bulb by varying the DC supply from -20V to 20V in 4V steps.

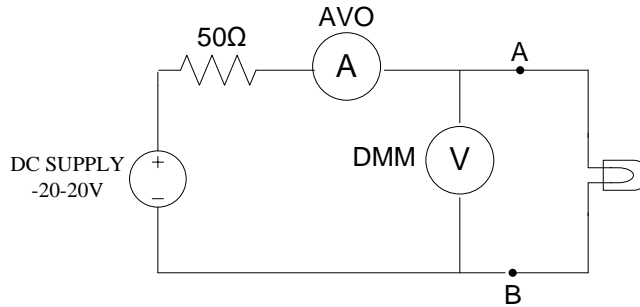


Figure 2.5

E3 Setup the circuit given in Figure 2.6a) change the supply voltage from -10V to 10V in 2V steps. Record the values of V and I. Plot the I-V characteristics of this element. Repeat the same procedure for the circuit in Figure 2.6 (b)

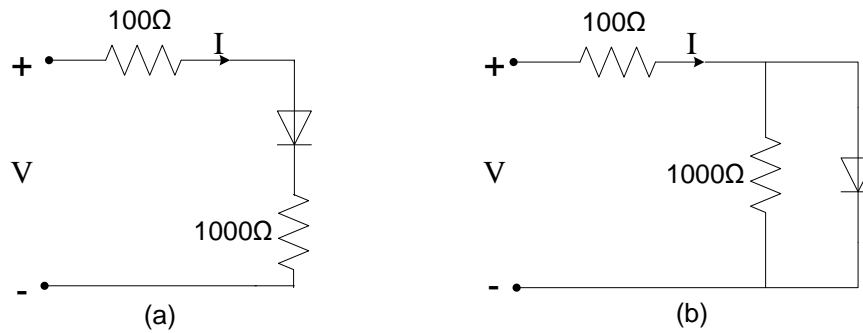


Figure 2.6

E4

- a) Measure the resistance of a thermistor under normal conditions, then take it close to the flame of a lighter; record the change in its resistance.
- b) Measure the resistance of a photoresistor under normal conditions, then cover it by hand; record the change in its resistance.

CONCLUSION

C1 Compare the I-V plots that you obtained in E1 and P2. Are there any differences between these two plots? Explain

C2 Are the I-V plots you obtained in E3 symmetric with respect to V-axis. Why?

C3 What can be the function of a diode in a circuit? Explain the function of the diode by considering experiment E3.

C4 Can you give examples of the usage areas of photoresistor and thermistor?