

Physics Department

Physics 112

**Experiment #1**

**Linear and Non-Linear Circuit Components**

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Section:- 18

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1. abstract:

A.The aim of the experiment: Finding the resistance of a linear and non-linear component (carbon resistor, a diode, and a light bulb) from an I-V graph.

B.The method used: By taking several readings for I and V, and drawing I vs. V for every component.

c. The main results:

**Theory:**

*I-V characteristic* is the relation between the current passing through a circuit component and the voltage difference between its terminals. And when such a relation is plotted; components that have a straight line I-V characteristic are called linear components. And the slope of this representative graph is the value (1/resistance) of the component. And since linear components’ graphs are straight lines, then this value is a constant and so is the value of the resistance. However, most resistors used in laboratory are linear carbon resistors.

On the other hand, components that don’t posses straight line I-V characteristics are called non-linear components. And example is a diode; a device frequently used in electronic circuits to provide on way current paths.

The relation between the current (I) passing through a semi conducting diode and the potential difference (V) between its terminals is usually given by the equation:

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Where  is called the saturation current, K is a function of temperature only. Therefore a semiconducting diode has a variable resistance that depends on the value of the current passing through it.

Another example of a component that possesses non linear I-V characteristics is the light bulb, where the tungsten wire converts the electrical power to heat energy. As a result light is emitted. The resistivity and thus the resistance of the conducting material, depends on the temperature of that material according to



Where () is the resistance at temperature (), and  is the temperature coefficient of resistivity. And since the resistivity of the tungsten changes with temperature, then the resistance changes in a similar manner, causing the bulb to have non linear I-V characteristics.