Superposition, TEC and Maximum Power Transfer

Sayed Taher Zewari

ECE 280- 202

Lab No. 3

11/13/00

Superposition with Independent Sources

I. Introduction

The purpose of this part of the lab is to investigate the characteristics of a circuit using superposition principle.

II. Background Information

The Superposition Theorem is a rule that describes the behavior of currents and voltages in linear multibranch circuits. This rule states that when a circuit contains several voltage sources, the overall response of that circuit is equivalent to the sum of response of each individual source while the other sources in the circuit are killed. Superposition Theorem is true only in the case of linear circuits.

III. Materials Used

The following materials were used in this part of the lab: two resistors of 1 kΩ and one 4.7 kΩ resistor, DC voltage sources of 12 V, multimeters, banana to alligator wires, and the bread board on the Heathkit Trainer.

IV. Procedure

The following circuit was setup, figure 1.

1. The voltage V_{ab} across the resistor of 1 kΩ, in figure 1, was measured.
2. The voltage source at the right of the circuit (12 V) was killed (figure 2). Then the voltage (V_{ab1}) across then 1 kΩ resistor was measured again.
3. The voltage source at the left of the circuit (12 V) was killed (figure 3). Then the voltage (V_{ab2}) across the 1 kΩ resistor was measured again.
4. The voltages V_{ab1} and V_{ab2} were added to see if it would be equal to the overall response of the circuit V_{ab} with both sources present. That is if this equation is true: $V_{ab1} + V_{ab2} = V_{ab}$

V. Results

Voltage ($\mathbf{V_{ab1}}$) across 1 kΩ with right source killed (V)	Voltage ($\mathbf{V_{ab2}}$) across 1 kΩ with left source killed $\mathbf{V_{ab2}}$ (V)	Overall voltage ($\mathbf{V_{ab}}$) across 1 kΩ with both sources present (V)
5.44 V	-1.15 V	4.29 V

VI. Conclusion

The Superposition Theorem describes that the sum of responses of each individual sources in a linear circuit, while the other sources in the circuit are killed, is equal to the overall response of the circuit with both sources present. The above data supports this theorem. As we can see, the sum of individual responses $\mathbf{V_{ab1}}$ and $\mathbf{V_{ab1}}$ equal to the overall response of the circuit, $\mathbf{V_{ab}}$.