Circuits Review

Series DC Circuits

$$R_T = R_1 + R_2 + R_3...$$

Power follows the same form

$$P_T = P_1 + P_2 + P_3...$$

Where

$$P = VI = I^2R = \frac{V^2}{R}$$

and we know that the current through resistors in series is the same. So if we sum R and solve for I we can the find the voltage drop across each resistor.

Kirchoff Voltage Law: The sum of voltage rises around a closed path will always equal the sum of the voltage drops.

Parallel DC Circuits

$$R_t = \frac{1}{1/R_1 + 1/R_2 + 1/R_3...}$$

In parallel circuits, the voltage drop across each is the same, but the current splits. Meaning $I_t = I_1 + I_2$.

Kirchoff's Current Law: The sum of currents entering a junction (or region) of a network must equal the sum of the currents leaving the same junction (or region).

Superposition Theorem

The current through, or voltage across, any element of a network is equal to the algebraic sum of the currents of voltages produced independently by each source.

When removing a voltage source from a network schematic, replace it with a direct connection (short circuit) of zero ohms. Any internal resistances associated with the source must remain in the network.

When removing a current source from a network schematic, replace it by an open circuit of infinite ohms. Any internal resistance associated with the source must remain in the network.

The Basic Elements of Phasors

Response of Basic R, L, and C Elements to a sinusoidal voltage or current

Resistor

Frequency gas no effect on the impedance

$$I_m = \frac{V_m}{R} V_m = I_m R$$

Inductor

At a frequency of 0 Hz, an inductor takes on the characteristics of a short circuit. At very high frequencies, the characteristics of an inductor approach those of an open circuit.

$$X_L = \omega L X_L = \frac{V_m}{I_m}$$

Capacitor

At or near 0 Hz, a capacitor takes on the characteristics of a short circuit. At very high frequencies, a capacitor takes on the characteristics of a sort circuit.

$$X_C = \frac{1}{\omega C} X_C = \frac{V_m}{I_m}$$