NODE ANALYSIS METHOD

CIRCUIT ANALYSIS METHOD

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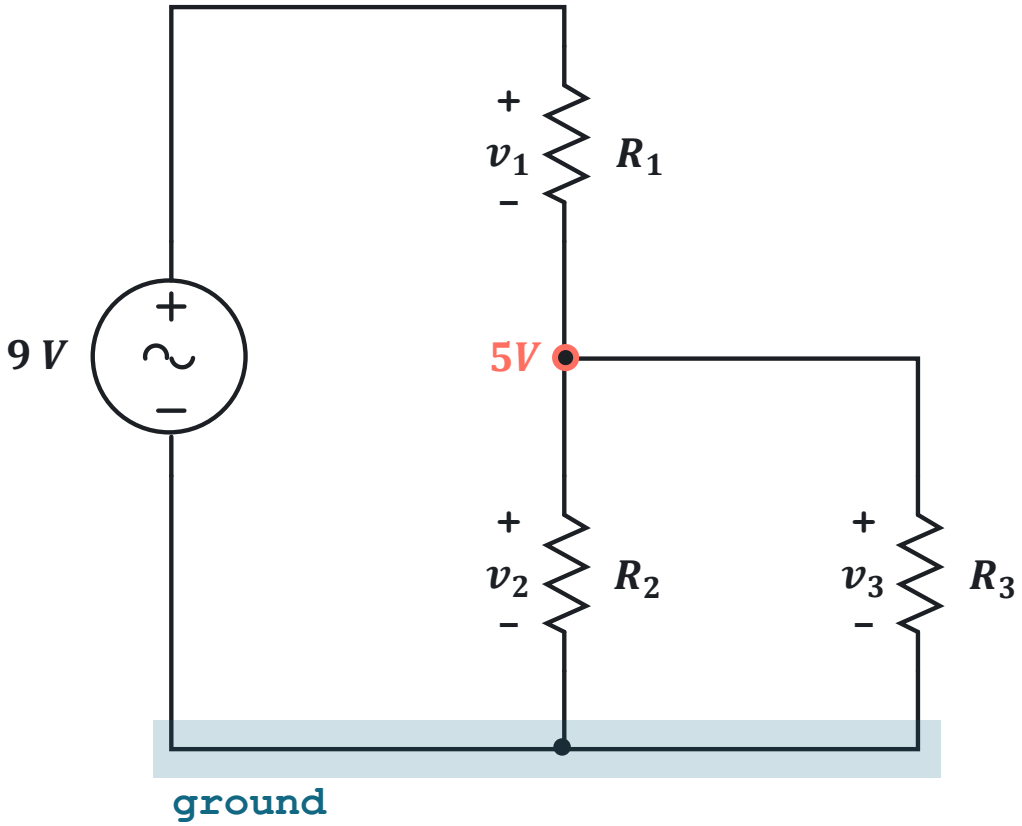
TOPIC OUTLINE

Node Voltage

Node Analysis Method

NODE ANALYSIS METHOD

NODE VOLTAGE



Node Voltage is the electrical potential difference between a given node and a reference node (ground) in a circuit.

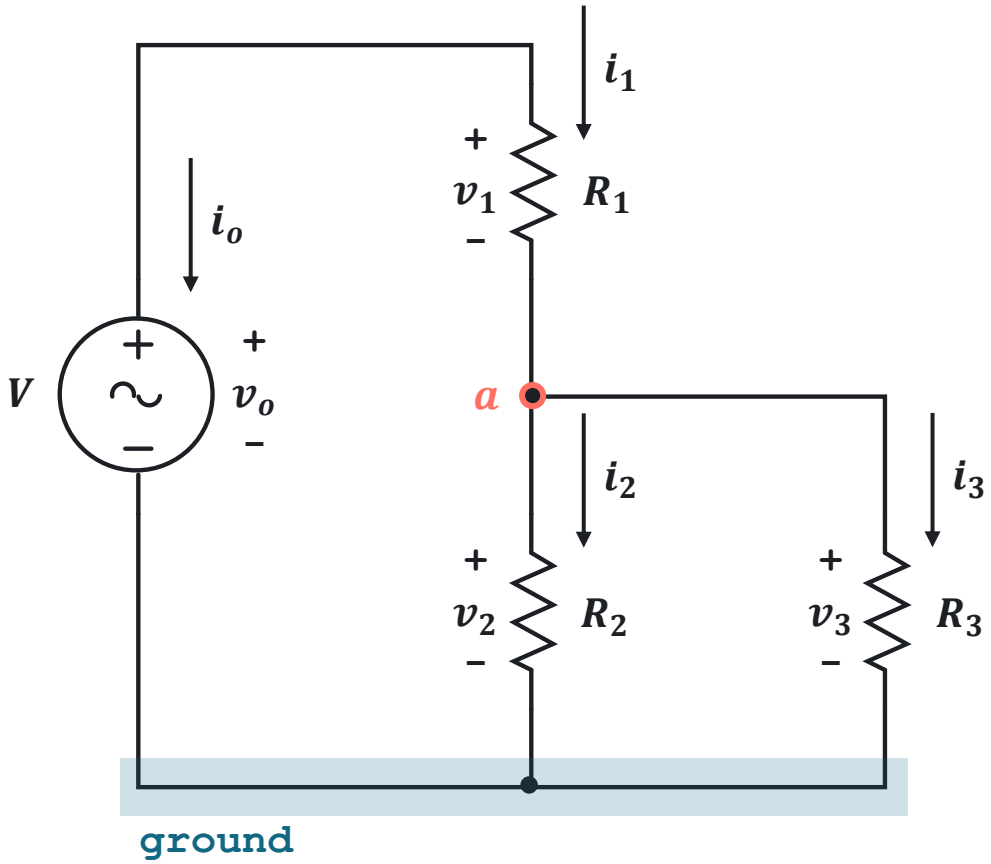
Example:

$$v_1 = 9\,V - 5V$$

$$v_2 = 5\,V - 0$$

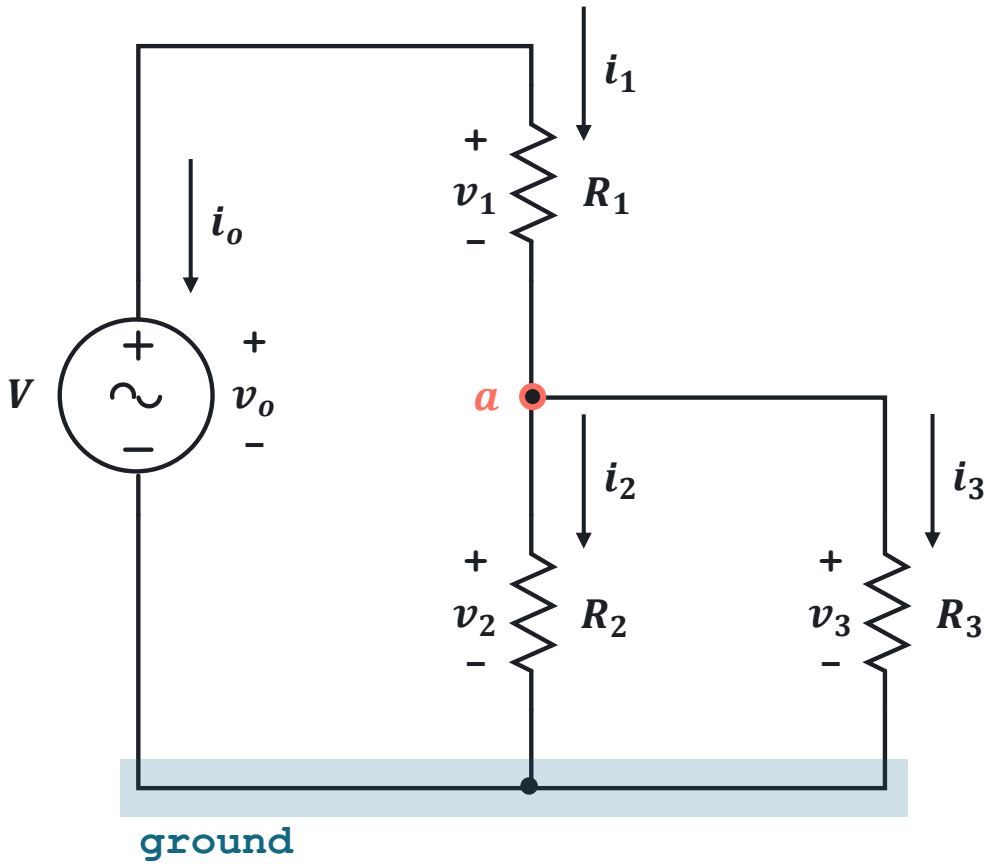
$$v_3 = 5V - 0$$

NODE ANALYSIS METHOD



The **node analysis method** is based on Kirchhoff's Current Law (KCL), which is implicitly applied to establish voltage-current relationships forming a system of equations to solved for the **unknown node voltages**.

NODE ANALYSIS METHOD



KCL @a:

$$-i_1 + i_2 + i_3 = 0$$

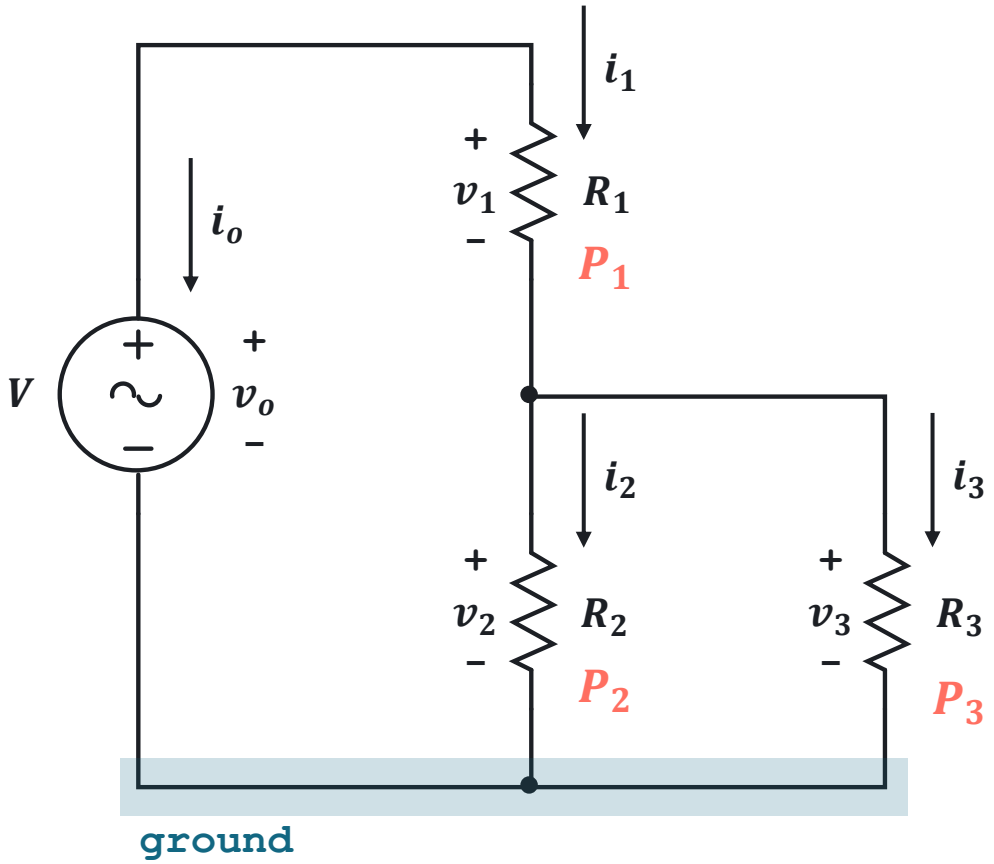
$$-\frac{v_1}{R_1} + \frac{v_2}{R_2} + \frac{v_3}{R_3} = 0$$

$$-\frac{v_o - v_a}{R_1} + \frac{v_a - 0}{R_2} + \frac{v_a - 0}{R_3} = 0$$

$$-v_o G_1 + v_a G_1 + v_a G_2 + v_a G_3 = 0$$

$$v_a(G_1 + G_2 + G_3) = v_o G_1$$

ELECTRICAL POWER



Electrical power refers to the rate at which electrical energy is transferred or converted per unit time.

Formulas:

$$P = vi$$

$$P = i^2R$$

$$P = \frac{v^2}{R}$$

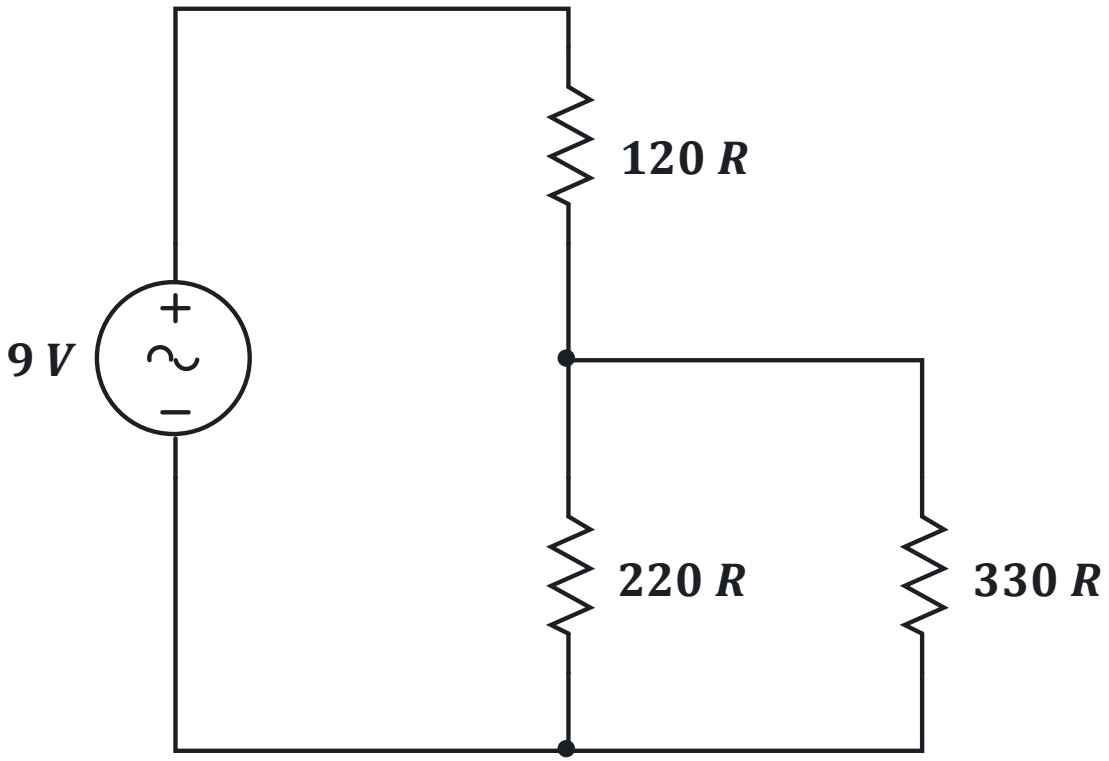
$$P_{total} = P_1 + P_2 + P_3 + \cdots P_n$$

unit: Watt (**W**)

EXERCISE

Determine the **current** flowing through each resistor, the **voltage** drop across each resistor, and the **total power** in the given circuit.

Solution:



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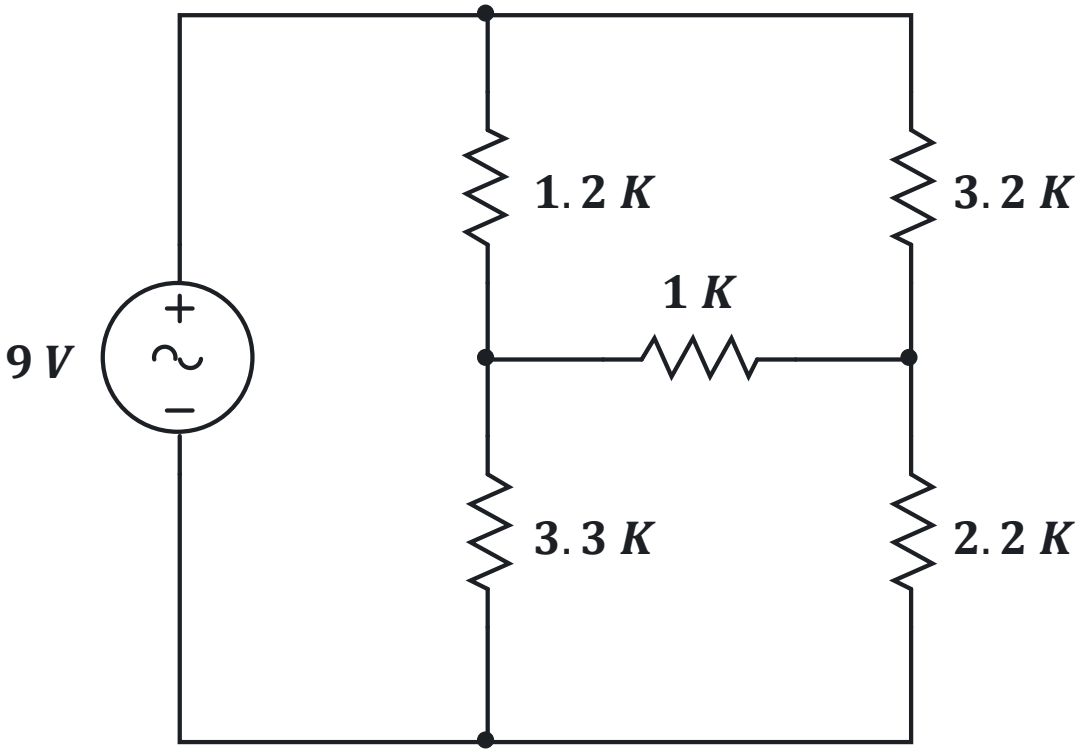

LABORATORY