

Answer on Question #61197-Engineering-Electrical Engineering

How do you solve nodal analysis in which you're asked to find power dissipated in each resistor.

The resistors are labeled with S (which is power from my understanding) but that would change the formula for the nodal analysis which is v/r right? So how do I solve it?

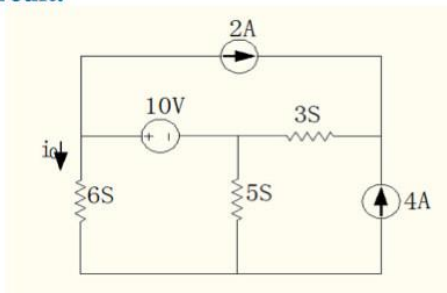
Answer

The resistors are labeled with their conductance:

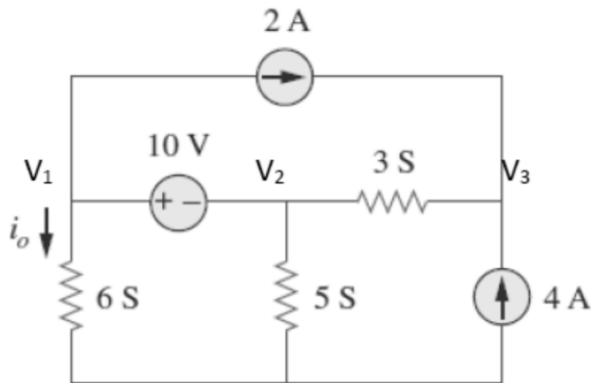
$$G = \frac{1}{R}$$

I give you an example of such problem.

3.15 Apply nodal analysis to find i_o and the power dissipated in each resistor in the circuit.



Solution



Nodes 1 and 2 form a supernode so that $v_1 = v_2 + 10$ (1)

At the supernode, $2 + 6v_1 + 5v_2 = 3(v_3 - v_2) \rightarrow 2 + 6v_1 + 8v_2 = 3v_3$ (2)

At node 3, $2 + 4 = 3(v_3 - v_2) \rightarrow v_3 = v_2 + 2$ (3)

Substituting (1) and (3) into (2),

$$2 + 6v_2 + 60 + 8v_2 = 3v_2 + 6 \rightarrow v_2 = -\frac{56}{11} = -5.1 \text{ V}$$

$$v_1 = v_2 + 10 = \frac{54}{11} = 4.9 \text{ V}$$

$$i_0 = 6v_1 = 29.45A$$

$$P_{65} = v_1^2 G = \left(\frac{54}{11}\right)^2 6 = 144.6W$$

$$P_{55} = v_2^2 G = \left(-\frac{56}{11}\right)^2 5 = 129.6W$$

$$P_{35} = (v_2 - v_3)^2 G = (2)^2 3 = 12W$$