Boise State University
Electrical Engineering Department

EE 210: Circuits I

Solution 1

For silicon, $\rho = 6.4x10^2\ \Omega$-m. $A = \pi r^2$. Hence,

$$R = \frac{\rho L}{A} = \frac{\rho L}{\pi r^2} \longrightarrow r^2 = \frac{\rho L}{\pi R} = \frac{6.4x10^2 x4x10^{-2}}{\pi x240} = 0.033953$$

r = **0.1843 m**

Solution 2

At A, $2 + 12 = i_1 \longrightarrow i_1 = \underline{14\ A}$

At B, $12 = i_2 + 14 \longrightarrow i_2 = \underline{-2\ A}$

At C, $14 = 4 + i_3 \longrightarrow i_3 = \underline{10\ A}$

Solution 3

$-V_1 + 1 + 5 = 0 \longrightarrow V_1 = \underline{6\ V}$
$-5 + 2 + V_2 = 0 \longrightarrow V_2 = \underline{3\ V}$

Solution 4

For loop 1, –12 + v +2 = 0, v = **10 V**

For loop 2, –2 + 8 + 3i_x =0, i_x = **–2 A**

Solution 5

Applying KVL around the entire outside loop we get,

–24 + v_1 + 10 + 12 = 0 or v_1 = **2V**

Applying KVL around the loop containing v_2, the 10-volt source, and the 12-volt source we get,

v_2 + 10 + 12 = 0 or v_2 = **–22V**

Applying KVL around the loop containing v_3 and the 10-volt source we get,

$$-v_3 + 10 = 0 \text{ or } v_3 = \underline{\mathbf{10V}}$$

Solution 6

Using voltage division,

$$V_o = \frac{4}{4+16}(16\text{V}) = \underline{6.4\text{ V}}$$

Solution 7

$$R_{eq} = 1 + 1//(1 + 1//2) = 1 + 1//(1+ 2/3) = 1+ 1//5/3 = \underline{\mathbf{1.625\ \Omega}}$$

Solution 8

$$R_{eq} = 3 + 2 // 4 // 1 = 3 + \frac{1}{1/2 + 1/4 + 1} = 3.5714$$

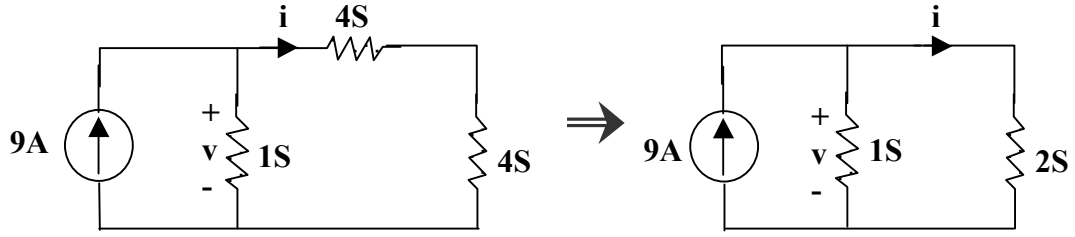
$$i_1 = \frac{40}{3.5714} = \underline{11.2\text{ A}}$$

$$v_1 = 0.5714 x i_1 = 6.4\text{V}, \quad i_2 = \frac{v_1}{4} = \underline{1.6\text{ A}}$$

$$i_4 = v_1/1 = \underline{6.4\text{ A}},\ i_5 = v_1/2 = \underline{3.2\text{ A}},\ i_3 = i_4 + i_5 = \underline{9.6\text{ A}}.$$

Solution 9

Combining the conductance leads to the equivalent circuit below



$$6S \| 3S = \frac{6x3}{9} = 2\text{S} \text{ and } 2\text{S} + 2\text{S} = 4\text{S}$$

Using current division,

$$i = \frac{1}{1+\frac{1}{2}}(9) = \underline{\mathbf{6\ A}},\ v = 3(1) = \underline{\mathbf{3\ V}}$$

Solution 10

Applying KVL,

$$-20 + 10 + 10I - 30 = 0, \quad I = 4$$

$$10 = RI \longrightarrow R = \frac{10}{I} = \underline{2.5\ \Omega}$$