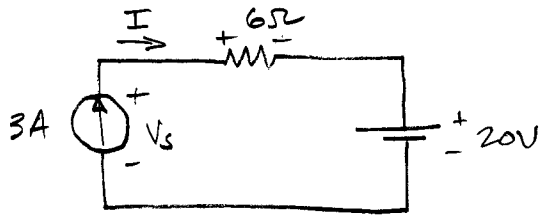
HW #10 Solutions EE301

Ch. 8 #1, 5, 9b, 10b, 11, 15

8.1)



$V_{6\Omega} = IR = (3A)(6\Omega) = 18V$

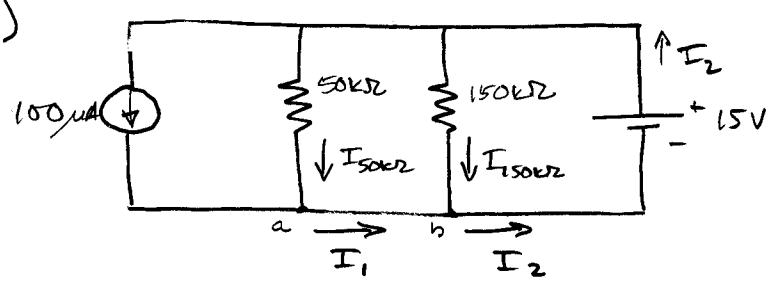
Using KVL, $\sum V = 0$

$V_s - V_{6\Omega} - 20V = 0$

$V_s - 18V - 20V = 0$

$\boxed{V_s = 38V}$

8.5)



Recognizing 15V potential exists across all parallel branches,

$$I_{50k\Omega} = \frac{E}{50k\Omega} = \frac{15V}{50k\Omega} = 300\mu A$$

Using KCL at node a,

$I_{50k\Omega} + 100\mu A = I_1$

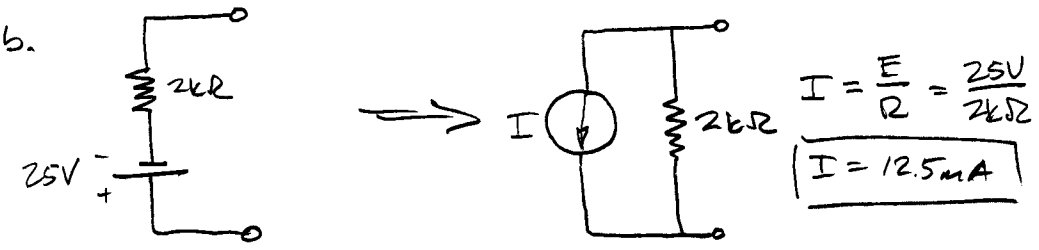
$I_1 = 100\mu A + 300\mu A = \boxed{400\mu A}$

Using KCL at node b,

$I_{150k\Omega} + I_1 = I_2$

$I_2 = 100\mu A + 400\mu A = \boxed{500\mu A}$

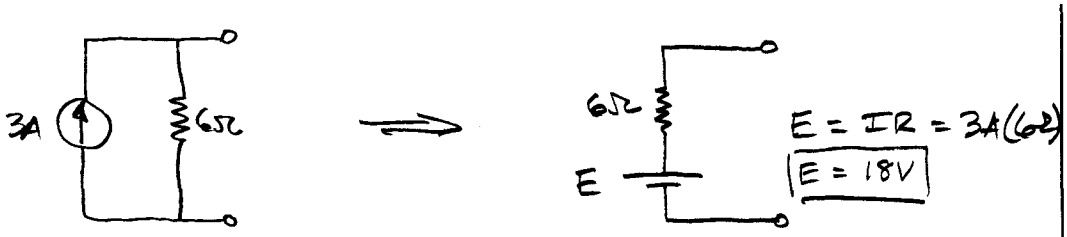
8.9) b.



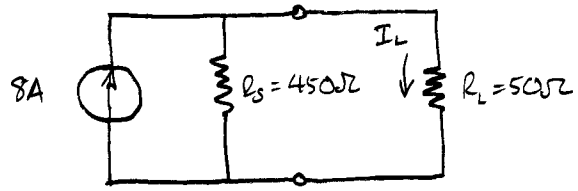
$$I = \frac{E}{R} = \frac{25V}{2k\Omega}$$

$\boxed{I = 12.5mA}$

8.10) b.



8.11)

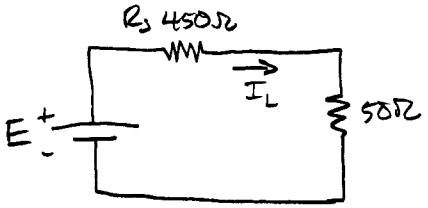


a) Solve for I_L using Current Divider Rule

$$I_L = \frac{R_S}{R_S + R_L} I_T \quad \text{for 2 parallel resistors}$$

$$I_L = \frac{450\Omega}{450\Omega + 50\Omega}(8A) = \boxed{7.2A}$$

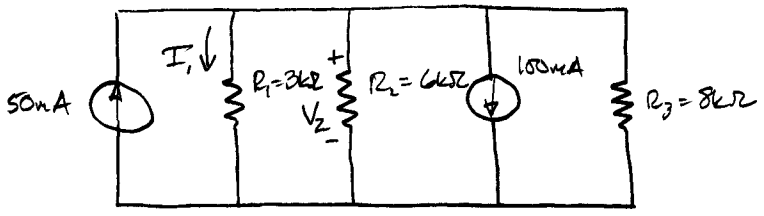
b) Convert current source into equivalent voltage source and solve for I_L.



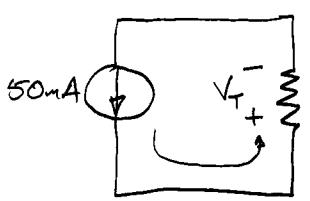
$E = IR_S = (8A)(450\Omega)$
$E = 3600V$

$$I_L = \frac{E}{R_T} = \frac{3600V}{450\Omega + 50\Omega} = \boxed{7.2A}$$

8.15)



Simplify circuit by combining current sources and parallel resistors.

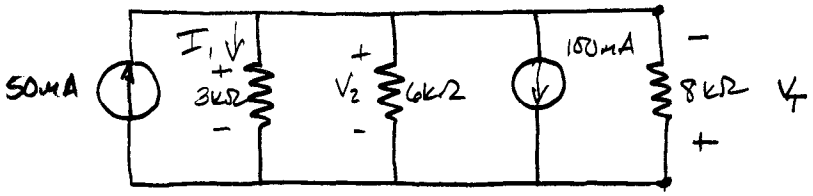


$$R_T = \frac{1}{\frac{1}{3k\Omega} + \frac{1}{6k\Omega} + \frac{1}{8k\Omega}} = 1.6k\Omega$$

8.15) Continued

We can determine $V_T = I_T R_T = (50mA)(1.6k\Omega) = 80V$

So, the voltage potential of the circuit is



Note the polarity of V_T is with the negative on top.

Since this is a parallel circuit, $V_2 = -V_T = \boxed{-80V.}$
The negative sign is due to the polarity convention assigned to V_2.

Use Ohm's Law to find I_1,

$$I_1 = \frac{-V_T}{3k\Omega} = \frac{-80V}{3k\Omega} = \boxed{-26.7mA}$$

Again, the negative current direction comes from the assigned direction for I_1.