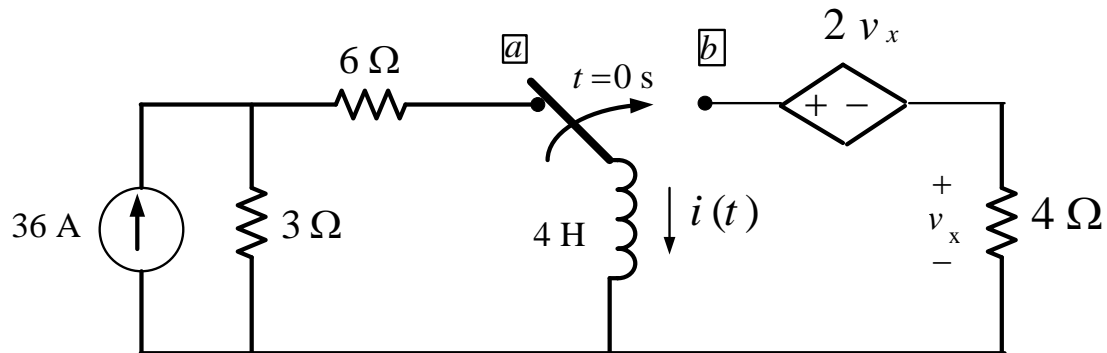


EE 202-02-Fall 2013(131)
QZ4

Sec	Ser	ID	Name	KEY
-----	-----	----	------	-----

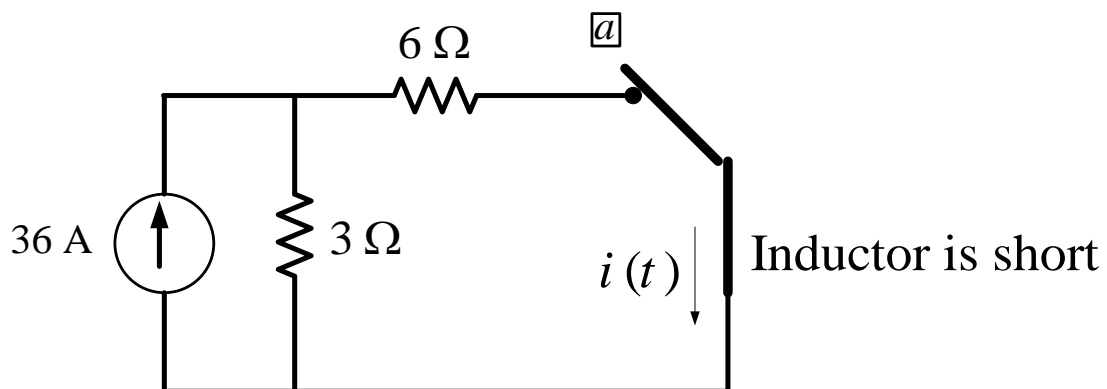


For the circuit shown above, the switch was in position **a** for a long time, then at time $t=0$ the switch move to position **b** . Find the current $i(t)$ for $t > 0$?

Solution

$$i(t) = i(0)e^{-\frac{t}{\tau}} \quad \tau = \frac{L}{R_{eq}}$$

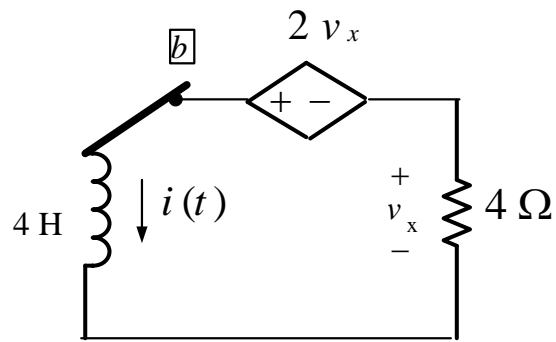
For $t < 0 \Rightarrow$ inductor is short



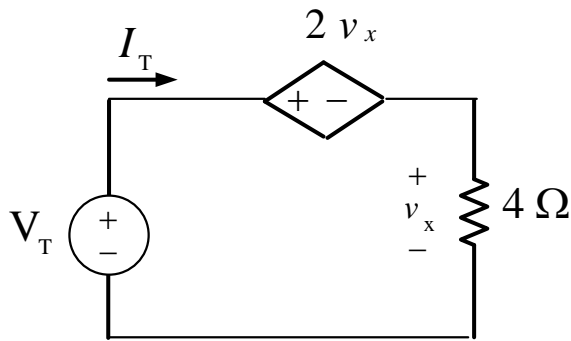
Current division

$$i(t) = \frac{3}{3+6}(36) = 12A \quad i(0^-) = 12A$$

For $t > 0$



$\tau = \frac{L}{R_{eq}}$ $L = 4 \text{ H}$. To find R_{eq} we apply a test voltage



$$\text{KVL} \quad -V_T + 2v_x + v_x = 0 \text{ V} \Rightarrow V_T = 3v_x$$

$$v_x = 4I_T$$

$$\Rightarrow V_T = 3(4I_T) = 12I_T$$

$$\Rightarrow \frac{V_T}{I_T} = R_{eq} = 12 \Omega$$

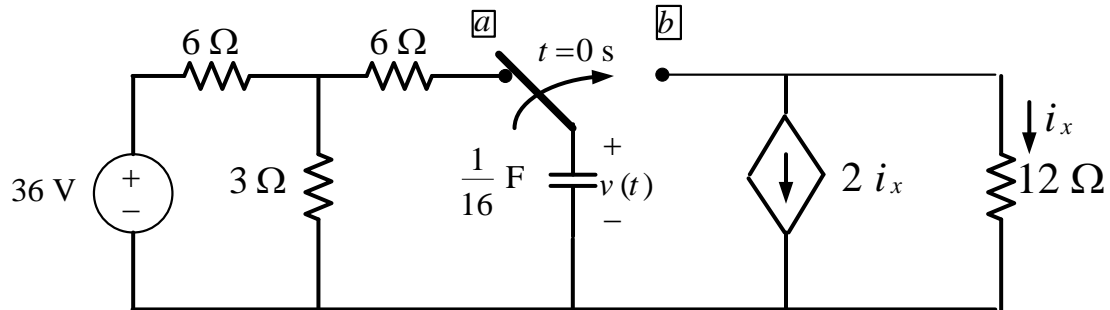
$$\Rightarrow \tau = \frac{L}{R_{eq}} = \frac{4}{12} = \frac{1}{3} \text{ s}$$

$$i(t) = i(0)e^{-\frac{t}{\tau}} = 12e^{-\frac{t}{(1/3)}} = 12e^{-3t}$$

$$\Rightarrow i(t) = \begin{cases} 12 & t < 0 \\ 12e^{-3t} & t > 0 \end{cases}$$

EE 202-06-Fall 2013(131)
QZ4

Sec	Ser	ID	Name	KEY
-----	-----	----	------	-----

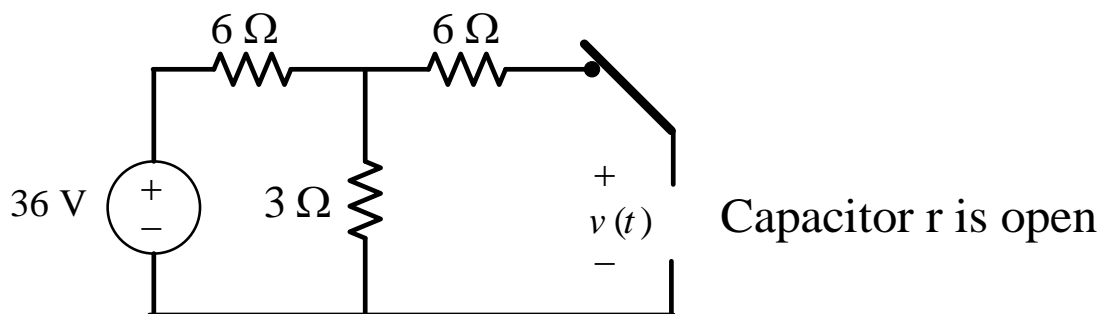


For the circuit shown above, the switch was in position **a** for a long time, then at time $t=0$ the switch move to position **b** . Find the voltage $v(t)$ for $t > 0$?

Solution

$$v(t) = v(0)e^{-\frac{t}{\tau}} \quad \tau = R_{eq}C$$

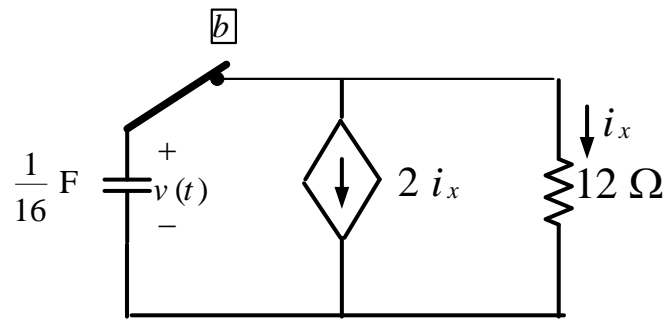
For $t < 0 \Rightarrow$ capacitor is open



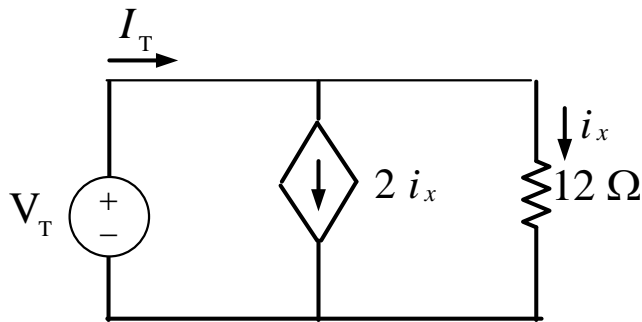
voltage division

$$v(t) = \frac{3}{3+6}(36) = 12A \quad v(0^-) = 12A$$

For $t > 0$



$\tau = R_{eq}C$ $C = \frac{1}{16} \text{ F}$. To find R_{eq} we apply a test voltage



KCL $I_T = 2i_x + i_x \Rightarrow I_T = 3i_x$

$$i_x = \frac{V_T}{12}$$

$$\Rightarrow I_T = 3\left(\frac{V_T}{12}\right) \Rightarrow \frac{V_T}{I_T} = R_{eq} = 4 \Omega$$

$$\Rightarrow \tau = R_{eq}C = 4\left(\frac{1}{16}\right) = \frac{1}{4} \text{ s}$$

$$\Rightarrow v(t) = v(0)e^{-\frac{t}{\tau}} = 12e^{-\frac{t}{(1/4)}} = 12e^{-4t}$$

$$\Rightarrow v(t) = \begin{cases} 12 & t < 0 \\ 12e^{-4t} & t > 0 \end{cases}$$