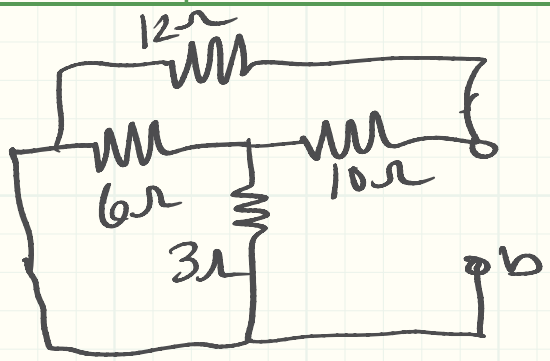
Req)



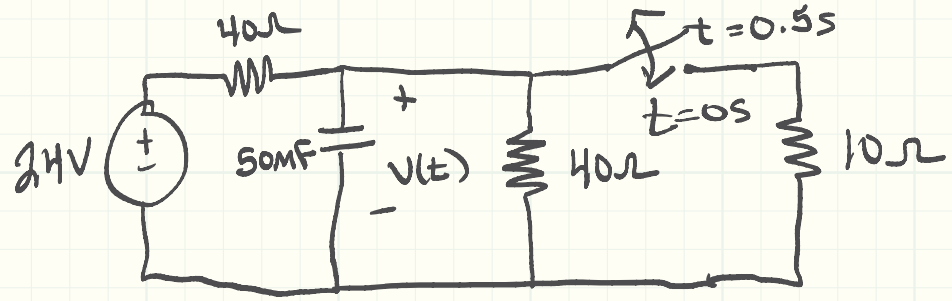
$$R_{eq} = [3 \| 6 + 10] \| 12 = [2 + 10] \| 12$$

$$= 6\,\Omega$$

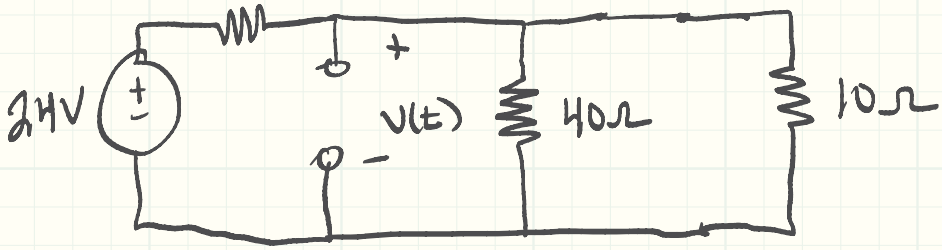
$$\tau = R_{eq} C = 6 * \frac{1}{24} = \frac{1}{4} \text{ sec}$$

$$\Rightarrow v(t) = 12 + [0 - 12] e^{-4t} \text{ V}$$

$$\boxed{v(t) = 12 - 12e^{-4t} \text{ V}}$$



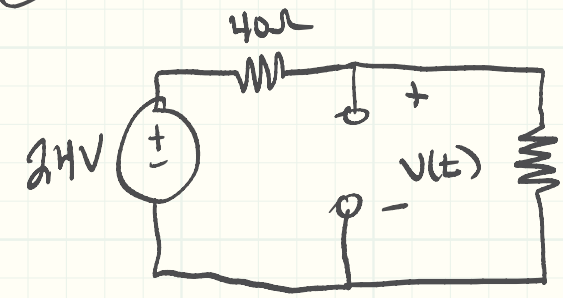
@ t < 0



$40 \| 10 = 8\Omega$

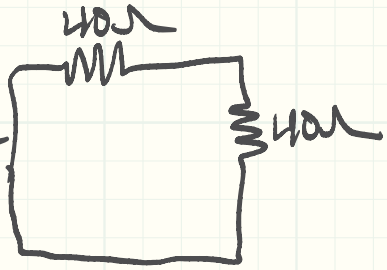
$$V(0) = \frac{8}{40+8} * 24 = 4V$$

@ t > 0 and t < 0.5 s



$$V(\infty) = \frac{40}{40+40} * 24 = 12V$$

Req



$40 \| 40 = 20\Omega$

$\tau = R_{eq} C = 20(50 \times 10^{-3})$

$\tau = 1$

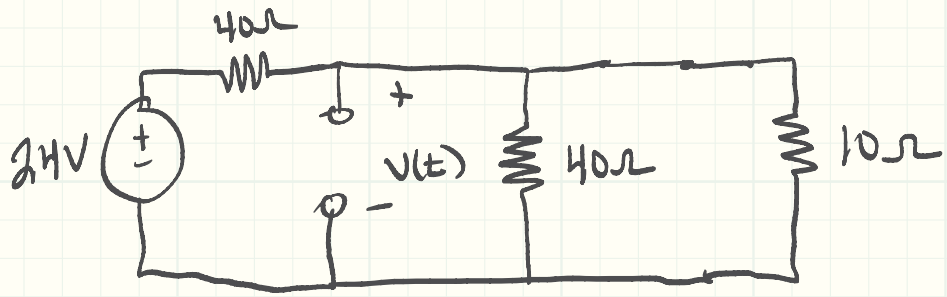
$$V(t) = V(\infty) + [V(0) - V(\infty)] e^{-\frac{t}{\tau}}$$

$$V(t) = 12 + [4 - 12] e^{-t}$$

$$V(t) = 12 - 8e^{-t}$$

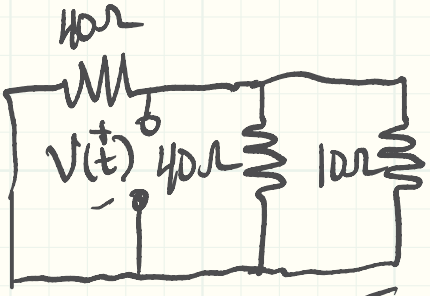
@ t > 0.5

$$V(0.5) = 12 - 8e^{-0.5} = 7.148V$$



$v(\infty) = 4V$ from earlier

Req



$R_{eq} = 40 \| 40 \| 10$

$R_{eq} = 6.67\Omega$

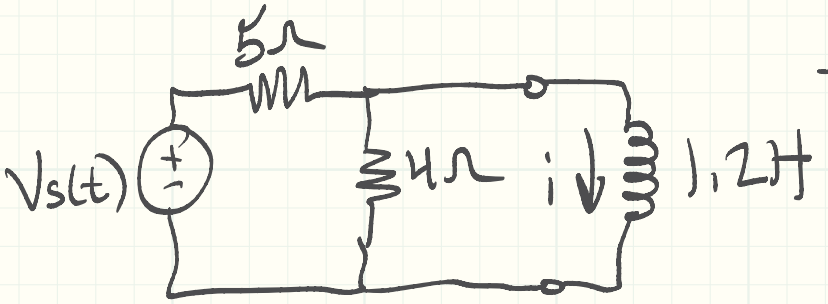
$\tau = 0.334$ sec

$$v(t) = v(\infty) + [v(0.5) - v(\infty)]\, e^{-3(t-0.5)}$$

$$v(t) = 4 + [7.148 - 4]\, e^{-3(t-0.5)}$$

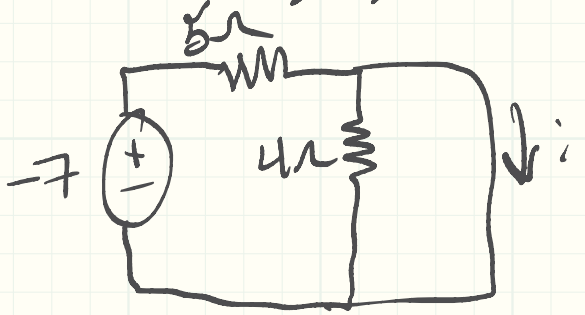
$$v(t) = 4 + 3.148\, e^{-3(t-0.5)}$$

$$v(t) = \begin{cases} 4\ V & t < 0 \\ 12 - 8e^{-t}\ V & 0 \le t \le 0.5 \\ 4 + 3.148\, e^{-3(t-0.5)}\ V & t \ge 0.5 \end{cases}$$



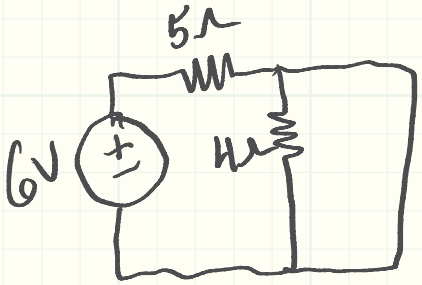
Given
$v_s(t) = -7 + 13u(t)$

for $t < 0$ $v_s(t) = -7$



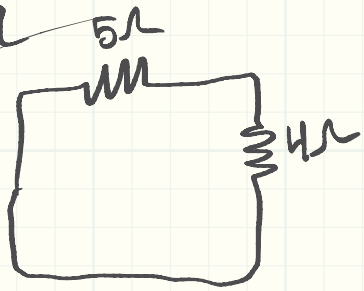
$$i(0) = \frac{-7}{5} = -1.4A$$

for $t > 0$ $v_s(t) = 6V$



$$i(\infty) = \frac{6}{5} = 1.2A$$

Req

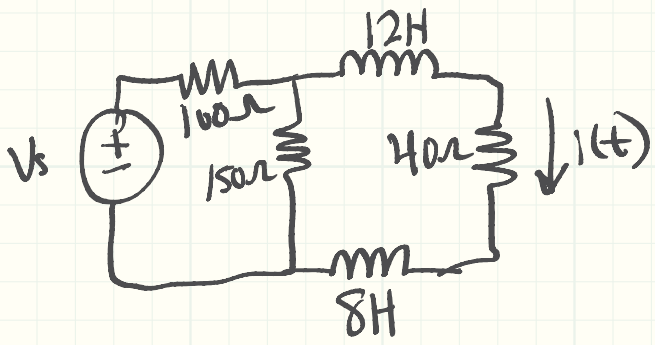


$5 \| 4 = 2.22\Omega$

$$\tau = \frac{L}{R} = \frac{1.2}{2.22} = 0.54 \text{ sec}$$

$$i_L = i(\infty) + [i(0) - i(\infty)]e^{-\frac{t}{\tau}} A$$

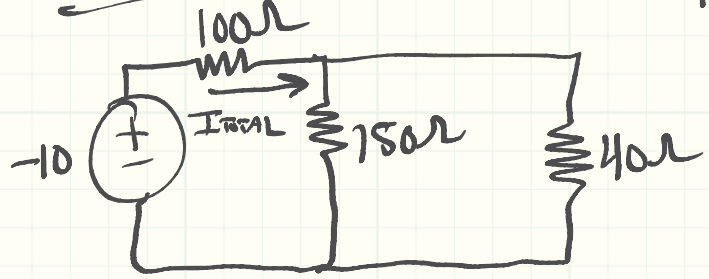
$$\boxed{i_L = 1.2 - 2.6e^{-1.85t} A}$$



Given

$V_s(t) = 25u(t) - 10V$

@t<0



$i_{TOTAL} = \frac{-10}{40 \| 150 + 100} = \frac{-10}{131.58}$

$i_{TOTAL} = -76mA$

$i(0) = \frac{150 * -76 \times 10^{-3}}{150 + 40}$

$i(0) = -60mA$

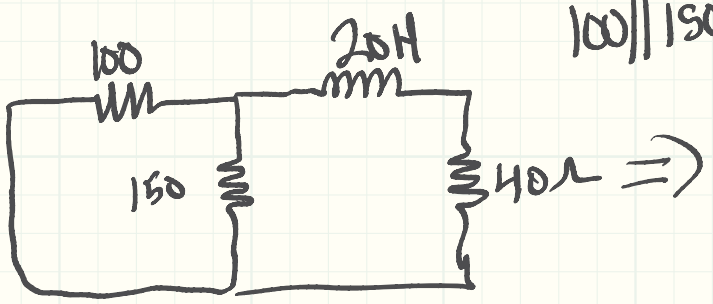
@t>0

Now $V_s = 15V$

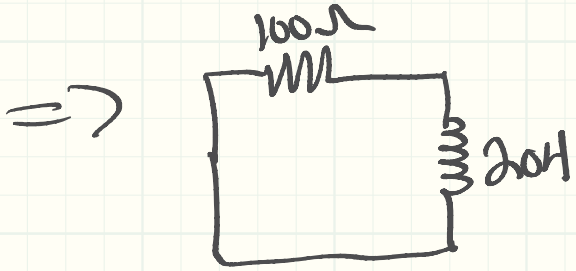
$i_{TOTAL} = \frac{15}{131.58} = 114mA$

$i(\infty) = \frac{150 * 114 \times 10^{-3}}{150 + 40} = 90mA$

Req) $L = 12 + 8 = 20H$



$100 \| 150 = 60\Omega$

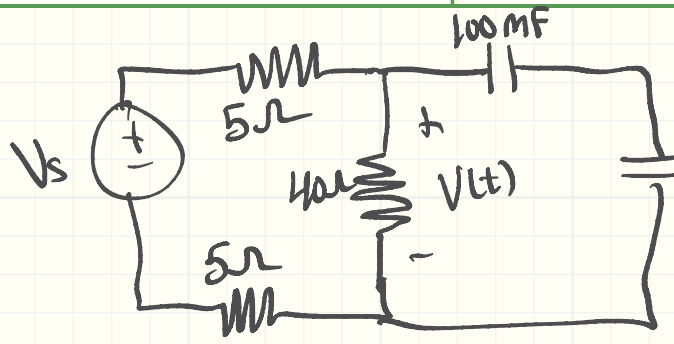


$R_{eq} = 100\Omega$

$\tau = \frac{L}{R} = \frac{20}{100} = \frac{1}{5}$

$i(t) = i(\infty) + [i(0) - i(\infty)]\, e^{-5t}\, A$

$\boxed{i(t) = 90 - 150e^{-5t}\, mA}$



Given

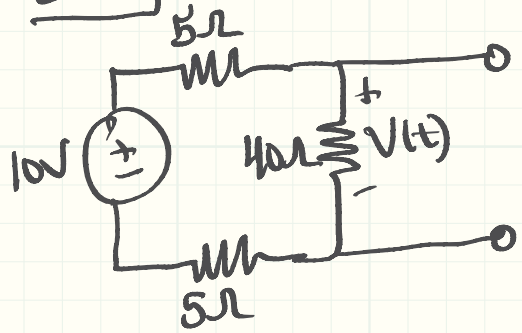
$V_s = 10 + 40u(t)$

Find $v(t)$

$C_{eq} = \left[\frac{1}{100m} + \frac{1}{150m}\right]^{-1}$

$= 60MF$

$t<0$



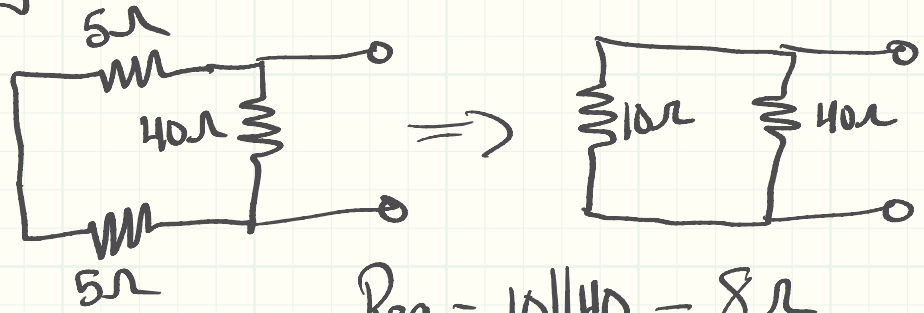
$v(0) = \frac{40}{40+5+5} * 10 = 8V$

@ $t>0$

$V_s = 50V$

$v(\infty) = \frac{40}{40+5+5} * 50 = 40V$

R_{eq}

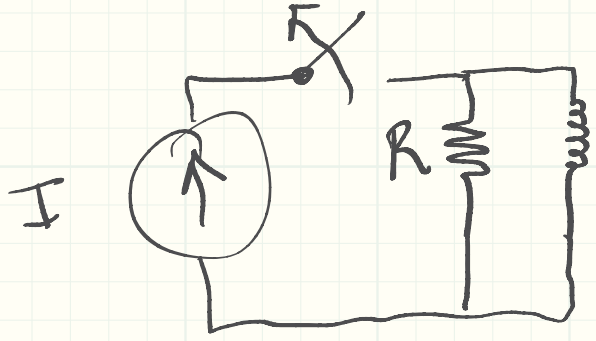


$R_{eq} = 10 \| 40 = 8\Omega$

$\tau = R_{eq} C_{eq} = 8 * 60 \times 10^{-3} = 0.48 sec$

$v(t) = v(\infty) + [v(0) - v(\infty)] e^{-2.083t}$

$$v(t) = 40 - 32e^{-2.083t} \; V$$



@ $t<0$ $\quad i_L = I_{max}$

@ $t>0$ $\quad i_L = 0$

$$i_L(t) = i_L(\infty) + [i(0) - i(\infty)]e^{-\frac{t}{\tau}}$$

$$i_L(t) = 0 + [I_{max} - 0]e^{-\frac{t}{\tau}}$$

$$\Rightarrow i_L(t) = I_{max}e^{-\frac{t}{\tau}}$$

$$\Rightarrow i_L(\tau) = I_{max}e^{-1} = \boxed{0.3678 I_{max}}$$