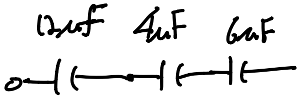
2017320114_최재원_HW03

Example

D3.1. Find the total capacitance of the network in Figure D3.1.



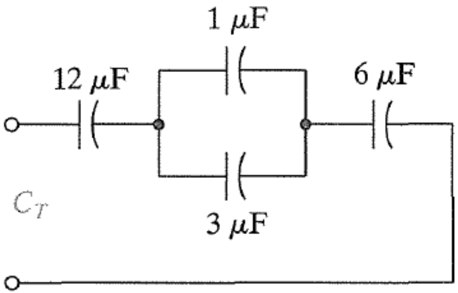


FIGURE D3.1

$$\frac{1}{12}+\frac{1}{4}+\frac{1}{6}=\frac{1}{2}$$

$$\frac{4}{12}+\frac{2}{12}$$

$$\boxed{2\mu F}$$

Example

D3.2. Find the total inductance in the network in Figure D3.2.

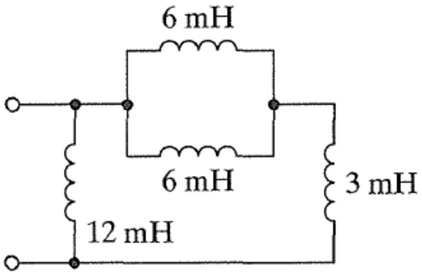
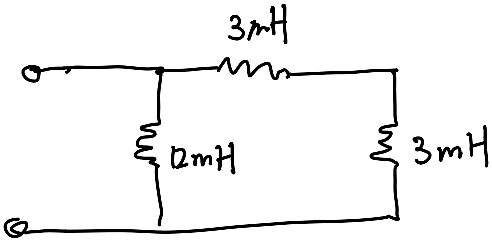
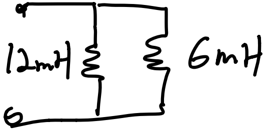


FIGURE D3.2

4mH





$$\frac{1}{12} + \frac{1}{6} = \frac{1}{4}$$

Example

D3.3. Find $i_o(t)$ and $v_o(t)$ for $t > 0$ in the network in Figure D3.3.

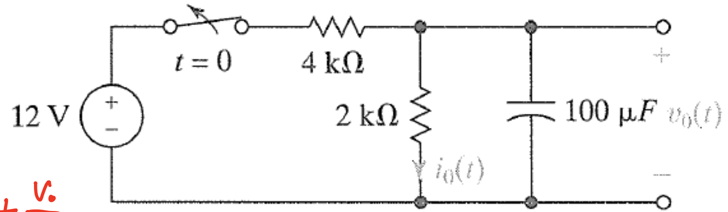
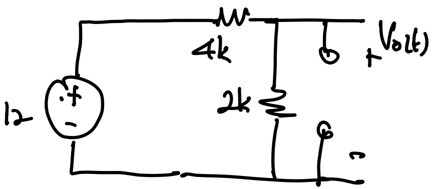


FIGURE D3.3



$\frac{2}{4+2} \times 12 = 4V. = K_2$

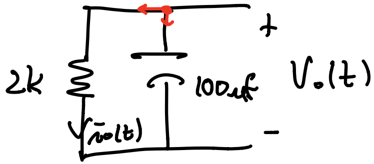
∴ $t > 0$ $V_o(t) = 4 \cdot e^{-t/0.2}$

$i_o(t) = 2e^{-t/0.2}$

$t > 0$

$C \cdot \frac{dV_o}{dt} + \frac{V_o}{R}$

KCL



$i_o(t) = \frac{V_o(t)}{2}$

① $V_o(t) = K_1 + K_2 e^{-t/T}$

② $T = R \cdot C = 0.2$

③ $V_o(t) = K_1 + K_2 e^{-t/0.2}$

④ $V_s = 0 = K_1$

$V_o(t) = K_2 e^{-t/0.2}$

K_2 $V_o(t=0)$

$\left(-\frac{R}{L}\right)t$

Example

$\frac{1}{6}+\frac{1}{3}$

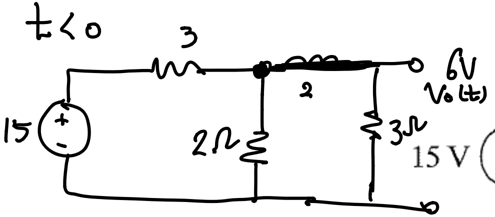
$\frac{2}{\cancel{3+2}} \times \frac{3}{-} = 6$

$V=6$

D3.4. Find $v_o(t)$ for $t > 0$ in the network in Figure D3.4.

$i_o(t)$ →

$t<0$



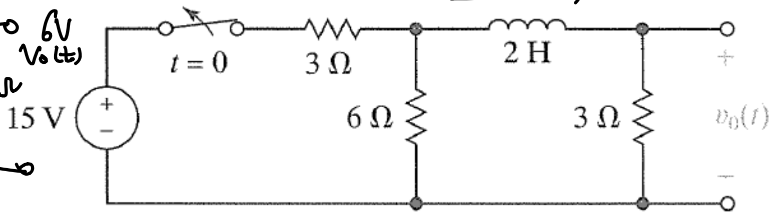
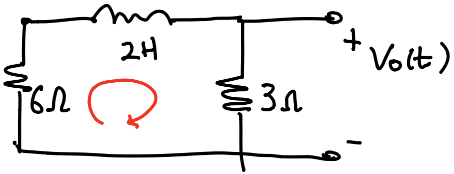


FIGURE D3.4

$V = I \cdot R$

$t>0$



$\frac{1}{6}+\frac{1}{3}=\frac{1}{2}$

$\frac{6V}{3}=2A$

$2e^{-4.5t} \times 3$

$=6e^{-4.5t}$

$\tau=\frac{L}{R}=\frac{2}{9}$

$i_o(t)=K_2e^{-4.5t}$

$i_o(t) = K_1 + K_2e^{-t/\tau}$

$K_1 = 0$

$i_o(t) = 2e^{-4.5t}$

Example

D3.7. A series *RLC* circuit consists of $R = 2\ \Omega$, $L = 1$ H, and a capacitor. Determine the type of response exhibited by the network if (a) $C = 1/2$ F, (b) $C = 1$ F, and (c) $C = 2$ F.

$$2\alpha = \frac{R}{L} = 2 = \alpha = 1$$

$$x(t) = i(t)$$

$$\omega_0^2 = \frac{1}{LC} =$$

(a) $\alpha = 1$ $\quad \alpha^2 = 1$ $\quad \alpha^2 - \omega_0^2 < 0$

$\omega_0^2 = 2$ $\quad \omega_0^2 = 2$ $\quad$ "underdamped"

$\omega_0 = \pm\sqrt{2}$

(b) $\alpha^2 = 1$ $\quad$ "critically damped"

$\omega_0^2 = 1$

(c) $\alpha^2 = 1$ $\quad$ "overdamped"

$\omega_0^2 = \frac{1}{2}$

Example

$I = V/R$

D3.9. The switch in the network in Figure D3.9 moves from position 1 to position 2 at $t = 0$. Find $v(t)$ for $t \geq 0$.

$2\alpha = \frac{1}{RC}$ $L = \frac{4}{3}$ $R = 1$

$\alpha = 2$

$\omega_0 = \sqrt{3}$

$-\frac{1}{4} \cdot (-k_1 e^{-t} - 3 \cdot k_2 \cdot e^{-3t})$

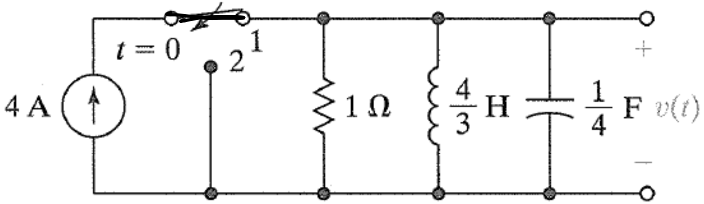


FIGURE D3.9

$v(t) = -8e^{-t} + 8e^{-3t}$ V

$$\frac{d^2 v(t)}{dt^2} + 4\frac{dv(t)}{dt} + 3v(t) = 0$$

$\rightarrow v(t) = k_1 e^{-t} + k_2 e^{-3t}$

$i(t) = \frac{3}{4}\left(-k_1 e^{-t} - \frac{1}{3}k_2 e^{-3t}\right) = -\frac{3}{4}k_1 e^{-t} - \frac{1}{4}k_2 e^{-3t}$

$V(0) = 0$

$i(0) = 4$

$k_1 = -8$

$K_2 = 8$