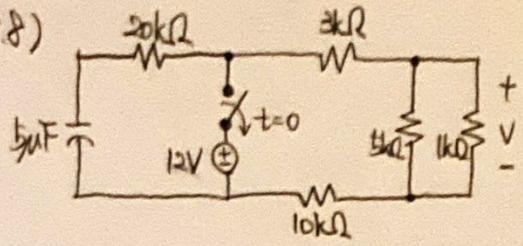
회로이론 I

국방정보공학과 2학년 20200732106 송민경

8.8)



(a) 회로 상수를 구하면,

$$\tau = RC = ((1000 \| 5000) + (3000 + 10000 + 20000))(5\times10^{-6})$$
$$= 169.15 \times 10^{-3} s$$

(b) capacitor의 초기 전압이 $V = 12V$ 이므로

1000Ω 저항의 초기 전압은 $V_o = \frac{V(1000\|5000)}{R} = \frac{12(1000\|5000)}{((1000\|5000)+33000)} = 0.2955V$

$t \geq 0$ 일 때, $V(t) = V_o e^{-t/\tau}$

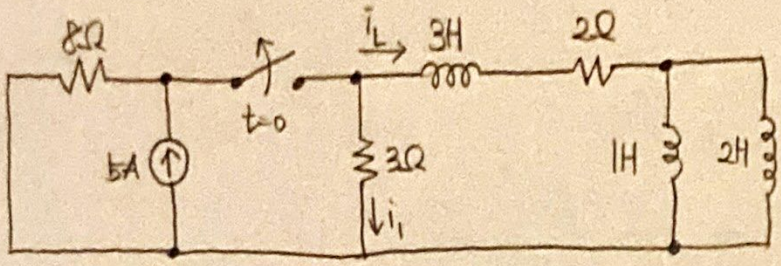
$$= 0.2955 e^{-t/169.15\times10^{-3}} V$$

(c) 스위치가 개방된 이후, 100ms 에서 전압은

$$V(t) = V(100ms) = 0.2955 e^{-100\times10^{-3}/169.15\times10^{-3}} = 0.1587V$$

$$\therefore w(100ms) = 0.5CV^2(100ms)$$
$$= 0.5(5\times10^{-6})(0.1587)^2 = 29.544mJ$$

8.29)



$$i_1(0^-) = \frac{5(2\|8)}{3+(2\|8)} = 1.714A$$

$$i_L(0^-) = \frac{5(3\|8)}{2+(3\|8)} = 2.61A$$

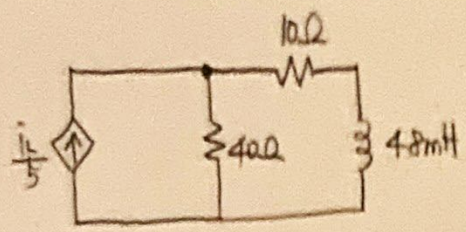
이 때, $L_{eq} = (1\|2)+2 = 3.667H$ 이므로

시상수는 $\tau = L_{eq}/R_{eq} = 3.667/(2+3) = 0.7333S$ 이다.

$t \geq 0$ 에서, $i_L(t) = I_0 e^{-t/\tau} = 2.61\, e^{-t/0.7333}\ A$

$$i_1(t) = -i_L(t) = -2.61 e^{-t/0.7333}\ A$$

8.39)



(a) $W_0 = 0.5LI_0^2$

$54\times10^{-9} = (0.5)(48\times10^{-3})I_0^2$

$\therefore I_0 = 1.5mA$

$\Rightarrow W(0^+) = 54nJ$

(b) $R_{eq} = 4\times40 = 160\Omega$

시상수는 $\tau = \frac{L}{R_{tot}} = \frac{48\times10^{-3}}{(40\|160)+10} = \frac{8}{7}ms$

$t>0$일 때 전류는 $i(t) = I_0e^{-t/\tau} = 1.5e^{-\frac{7000}{8}t}mA$

$\therefore i(1ms) = 1.5e^{-\frac{7000\times0.001}{8}} = 0.625mA$

$\Rightarrow w(1ms) = 0.5Li^2(1ms)$

$= 0.5(48\times10^{-3})(0.625\times10^{-3})^2 = 9.38nJ$

(c) $i(5ms) = 1.5e^{-\frac{7000\times0.005}{8}} = 0.0189mA$

$\Rightarrow w(5ms) = 0.5Li^2(5ms)$

$= 0.5(48\times10^{-3})(0.0189\times10^{-3})^2 = 8.55pJ$