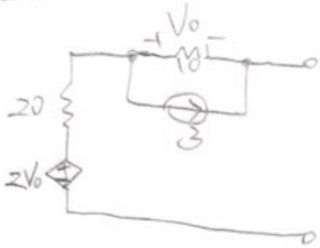
1.



求 V_{oc}

$V_0 = -3 \times 10 = -30\,(V)$

$V_{oc} = 2V_0 - V_0$

$= V_0 = -30\,(V)$

求 I_{sc}

$I_{sc} = \frac{V_0}{10} + 3$

$\frac{2V_0 - V_0}{20} = \frac{V_0}{10} + 3 \Rightarrow V_0 = -60$.

$\therefore I_{sc} = -3\ (A)$.

$\Rightarrow R_{th} = \frac{-30}{-3} = 10\,(\Omega)$.

$\therefore R_L = R_{th} = 10\,(\Omega)$ ※

$\Rightarrow P_{L(max)} = \frac{(-30)^2}{4 \times 10} = 22.5\,(W)$ ※

2.(a) $L_{eq} = 6\mu + (6\mu \,//\, 6\mu) = 9\mu(H)$, $R_{th} = 2k + 4k = 6k(\Omega)$, $\tau = \frac{9\mu}{6k} = \frac{3}{2}n$

$V_o(t) = i_{Leq}(t) \times 4k \times (-1) = -4k\, i_{Leq}(t)$

$\therefore i_{Leq}(0^+) = 1m\,(A) \downarrow$, $i_{Leq}(\infty) = 0\,(A)$

$\therefore V_o(t) = -4k\, i_{Leq}(t) = -4k[0 + (1-0)e^{-t/\frac{3}{2}n}] = -4e^{-\frac{2}{3}\times 10^9 t}\ (V)$ #

(b) $-1 = -4e^{-\frac{2}{3}\times 10^9 t} \Rightarrow t = 3\times 10^{-9} \ln 2\ (s)$ #

3 (a). $\omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{2.5\mu \times 20m}} = 2\sqrt{5}\times 10^3\,(rad/s)$ ※. $\alpha = \frac{1}{2RC} = 4\times 10^3$.

characteristic eq. $= s^2 + 2\alpha s + \omega_0^2 = 0 \Rightarrow s^2 + 8\times 10^3 s + 2\times 10^7 = 0$. #

(b) 令 $i_c(t) = C \cdot V_c'(t)$, $V_c(t) = V_{cs}(t) + V_{ch}(t)$

$V_{cs}(t) = V_c(\infty) = 0$, $\alpha = \frac{1}{2RC} = 4000$, $\omega_0 = \frac{1}{\sqrt{LC}} = 2000\sqrt{5}$

$s = -\alpha \pm \sqrt{\alpha^2 - \omega_0^2} = (-4 \pm j2)\times 10^3$

$\therefore V_{ch}(t) = e^{-4\times 10^3 t}[A\cos(2\times 10^3 t) + B\sin(2\times 10^3)t]$

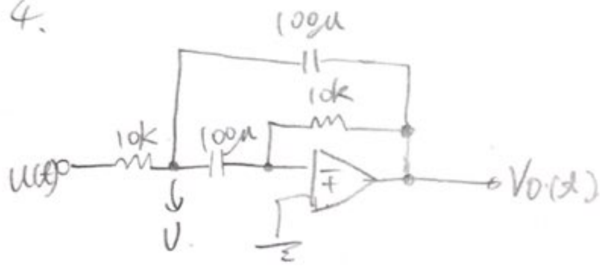
$V_c(0^+) = 0 = 0 + A \Rightarrow A = 0$

$i_c(0^+) = -2 = 2.5\mu \times (-4\times 10^3 A + 2\times 10^3 B) \Rightarrow B = -400$

$\therefore i_C(t) = 2.5\mu \times V_c'(t) = 4e^{-4\times 10^3 t}\sin(2\times 10^3 t) - 2e^{-4\times 10^3 t}\cos(2\times 10^3 t)\,(A)$

#

4.



$$\frac{0-V_0}{10k} = 100u\,(V-0)' \Rightarrow V' = -V_0$$

$$\frac{1-V}{10k} = 100u\,(V-0)' + 100u\,(V-V_0)'$$

$$\Rightarrow 1-V = V' + V' - V_0'$$

$$\Rightarrow 2V' + V - V_0' = 1$$

$$\Rightarrow V'' + 2V' + V = 1$$

$$V = V_s(t) + V_h(t)$$

$$V_s(t) = V(\infty) = 1$$

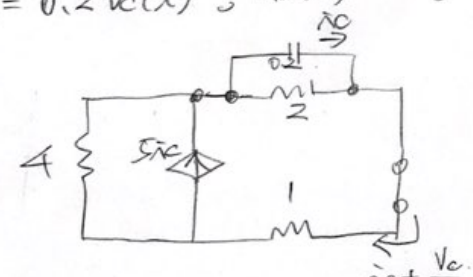
$$S = -1, -1 \Rightarrow V_h(t) = Ae^{-t} + Bte^{-t}$$

$$V(0^+) = 0 = 1 + A \Rightarrow A = -1$$

$$i(0^+) = 0 = 100u \cdot V' \Rightarrow 0 = e^{-t} + Be^{-t} \Rightarrow B = -1$$

$$\therefore V_0 = -V' = -te^{-t}\ (V)$$ ※

5. $i_c = 0.2 v_c'(t)$, $i_c(0^+) = 0$, $v_c(0^+) = 7 \times \frac{1}{1+1+4+2} \times 2 = \frac{7}{4}$



$$5i_c = \left(i_c + \frac{V_c}{2}\right) + \frac{V_c + i_c + \frac{V_c}{2}}{4}$$

$$\Rightarrow 40i_c = 8i_c + 4V_c + 2V_c + 2i_c + V_c$$

$$\Rightarrow 30i_c + 7V_c =$$

$$\Rightarrow V_c' - \frac{7}{6}V_c = 0$$

$$v_c = \frac{7}{4}e^{\frac{7}{6}t}\ (V)$$ ※