1.

$R_{eq} = (6\|2) + 6$

$\quad = \dfrac{6 \times 2}{6+2} + 6 = 7.5\,k\Omega$

$I_{總} = \dfrac{6V}{7.5k\Omega} = 0.8\,mA$

$I_{01} = 0.8\,mA \times \dfrac{6}{2+6} = 0.6\,mA$

$(6\|2) + 3 = 4.5$

$\hat{i}_1 = 2mA \times \dfrac{3}{4.5+3} = 0.8\,mA$

$I_{02} = 0.8\,mA \times \dfrac{6}{6+2} = 0.6\,mA$

$\therefore I_0 = I_{01} + I_{02} = 0.6\,mA + 0.6\,mA$

$\qquad = \underline{\underline{1.2\,mA}}$ ※

2.
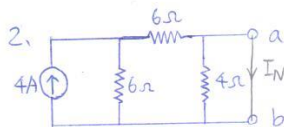
$R_N = (6+6)\|4 = \dfrac{12 \times 4}{12+4} = \underline{\underline{3\,\Omega}}$ ※

$I_N = 4A \times \dfrac{6}{6+6} = \underline{\underline{2\,A}}$ (∵ 4Ω 會短路)

3.
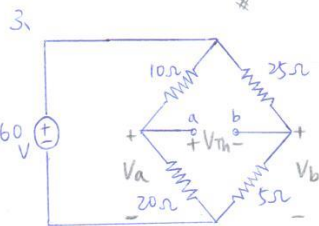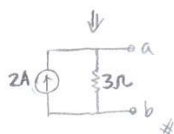
$R_{Th} = (10\|20) + (25\|5)$

$\quad = \dfrac{10 \times 20}{10+20} + \dfrac{25 \times 5}{25+5} = 10.833\,\Omega$

$V_{Th} = V_a - V_b$

$\quad = \dfrac{20}{10+20} \times 60 - \dfrac{5}{25+5} \times 60 = 40 - 10 = 30\,V$

$P_{max} = \dfrac{V_{Th}^2}{4R_{Th}} = \dfrac{30^2}{4 \times 10.833} = \underline{\underline{20.77\,W}}$ ※

4. $V_0 = -\left(\dfrac{50}{10} \times 2 + \dfrac{50}{20} \times V_2 + \dfrac{50}{50} \times (-1)\right) = -14$
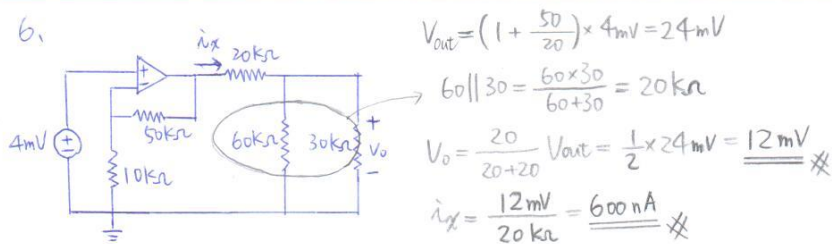
$\Longrightarrow 10 + 2.5V_2 - 1 = 14$

$\Longrightarrow \quad 2.5V_2 = 5 \quad \therefore V_2 = \underline{\underline{2\,V}}$ ※

5.

$V_0 = -\dfrac{80}{40} \times \left(-\dfrac{80}{20}\right) \times 0.2 - \dfrac{80}{20} \times 0.2$

$\quad = 3.2 - 0.8 = \underline{\underline{2.4\,V}}$ ※

6.

$$V_{out} = \left(1 + \frac{50}{20}\right) \times 4mV = 24\,mV$$

$$60 \| 30 = \frac{60 \times 30}{60 + 30} = 20\,k\Omega$$

$$V_0 = \frac{20}{20 + 20} V_{out} = \frac{1}{2} \times 24\,mV = \underline{\underline{12\,mV}} \; \#$$

$$i_x = \frac{12\,mV}{20\,k\Omega} = \underline{\underline{600\,nA}} \; \#$$

7. (a)

(i)
$$i = C \cdot \frac{dv}{dt} = C \frac{d}{dt}(Ae^{-100t} + Be^{-600t})$$
$$= C(-100Ae^{-100t} - 600Be^{-600t})$$
$$= -100ACe^{-100t} - 600BCe^{-600t}$$

$t=0 \Rightarrow i = 2$

$\Rightarrow 2 = -100AC \cdot 1 - 600BC \cdot 1 \quad (C = 4\times10^{-3}F\text{代入})$

同÷(100C) $\Rightarrow 5 = -A - 6B$ —————①

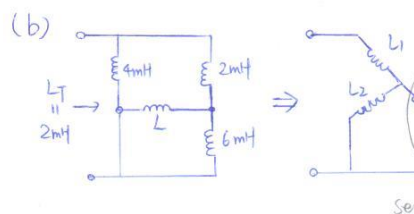又 $\because V(0^+) = V(0^-) \Rightarrow 50 = A + B$ —————②

利用①+② $\Rightarrow 55 = -5B \Rightarrow \underline{B = -11, A = 61}$ \\\\

(ii) $W = \frac{1}{2}CV^2 = \frac{1}{2} \times 4\times10^{-3} \times (50)^2 = \underline{\underline{5J}} \; \#$

(iii) from (i).
$$i = -100ACe^{-100t} - 600BCe^{-600t}$$
$$= -100 \times 61 \times (4\times10^{-3})e^{-100t} - 600 \times (-11) \times (4\times10^{-3})e^{-600t}$$
$$= \underline{-24.4\,e^{-100t} + 26.4\,e^{-600t}} \; (A) \; \#$$

(b)

$1°$ $\quad L_1 = \frac{8}{6+L}, \; L_2 = \frac{4L}{6+L}, \; L_3 = \frac{2L}{6+L}$
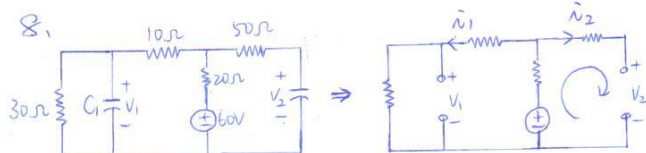
$2°$ $\quad [(L_3 + 6) \| L_2] + L_1 = L_T = 2$

$\Rightarrow \left[\left(\frac{2L}{6+L} + 6\right) \| \frac{4L}{6+L}\right] + \frac{8}{6+L} = 2$

$\Rightarrow \left(\frac{36+8L}{6+L} \| \frac{4L}{6+L}\right) + \frac{8}{6+L} = 2$

$\Rightarrow \dfrac{\frac{36+8L}{6+L} \times \frac{4L}{6+L}}{\frac{36+8L}{6+L} + \frac{4L}{6+L}} + \frac{8}{6+L} = 2$
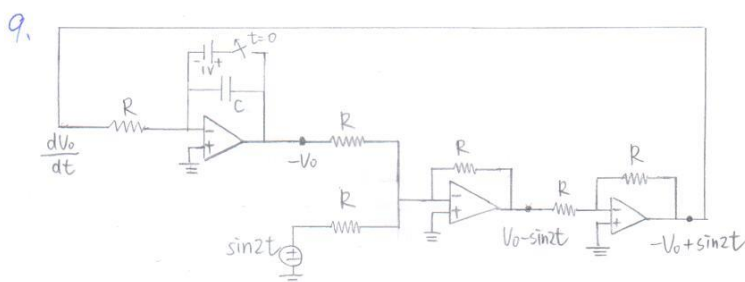
$\Rightarrow \dfrac{144L + 32L^2 + 8(36+12L)}{(6+L)(32+12L)} = 2$

$8L^2 + 24L - 144 = 0, \; \underline{L = 3mH} \; \#$

8.

$i_2 = 0, \; i_1 = \frac{60}{30+10+20} = 1A$

$V_1 = 30 i_1 = \underline{30V} \; \#, \quad V_2 = 60 - 20 i_1 = \underline{40V} \; \#$

9.

$$\frac{dV_0}{dt} + V_0 = \sin 2t, \; t \ge 0$$

$$V_0(0) = 1$$

$$\Rightarrow \frac{dV_0}{dt} = \sin 2t - V_0$$