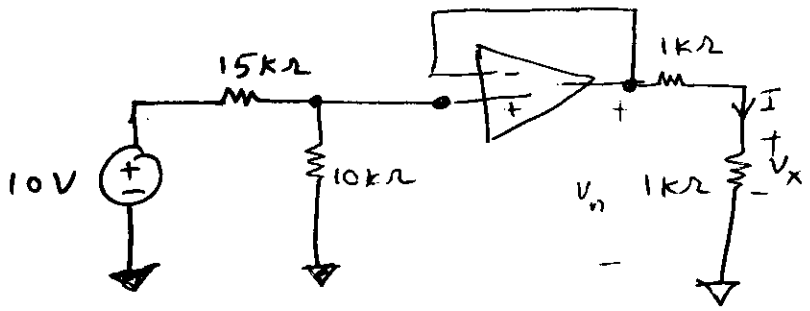
#7

Find V_x.



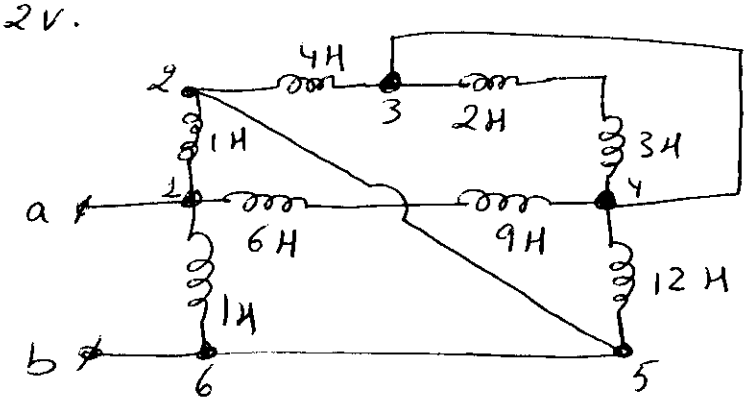
$V_p = V_n$

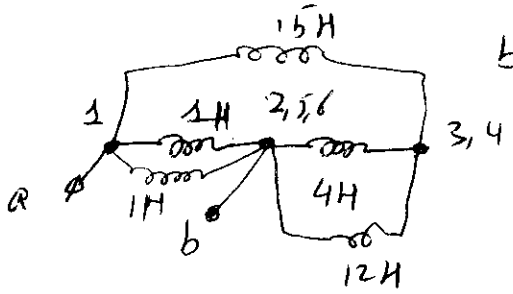
$V_p = \frac{10 \times 10k\Omega}{25k\Omega} = 4\ V.$

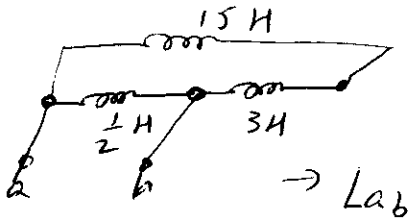
$V_n = 2\ k\Omega \times I$ So $2k\Omega \times I = 4V$ or $I = \frac{4}{2k\Omega} = 2\ mA.$

$V_x = 2mA \times 1k\Omega = 2V.$

#8 Find L_{eq}.





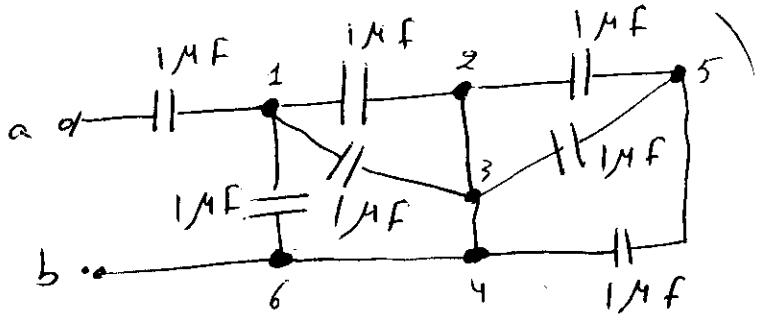


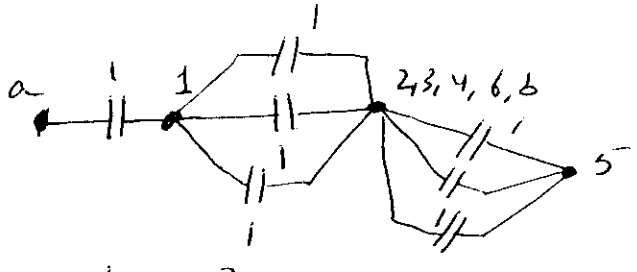
$\rightarrow L_{ab} = \frac{18 \times \frac{1}{2}}{18 + \frac{1}{2}} = \frac{9 \times 2}{37}$

$L_{eq} = 0.486\ H$

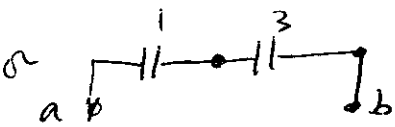
$= 0,486$

#11 $C_{eq} = ?$

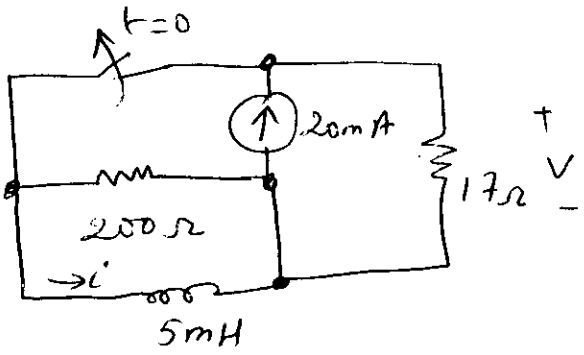




$C_{eq} = \frac{1 \times 3}{4} = \frac{3}{4}\ \mu F.$



11- find $i(0)$?



at $t=0^-$ L was a S.C

$i(0^-) = 20\,mA = i(0^+)$

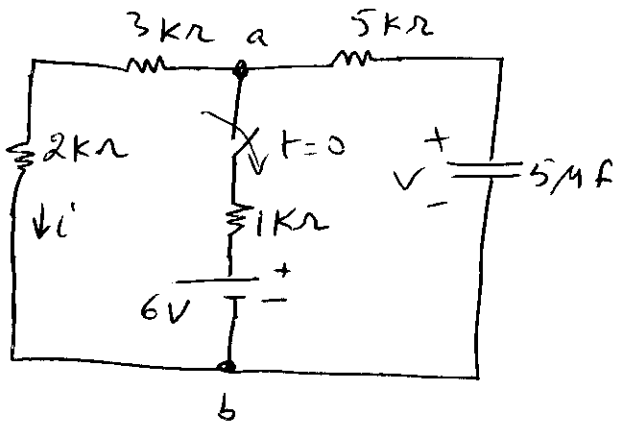
12- find $V(0^+)$ in the above CKT.

at $t=0^+$ $i_L(0^+) = 20\,mA$ but circulates through the 200Ω.

the 20mA current source circulates through the 17Ω.

Hence $V(0^+) = 20\,mA \times 17 = 0.34\,V$.

13- find $V(0^+)$.



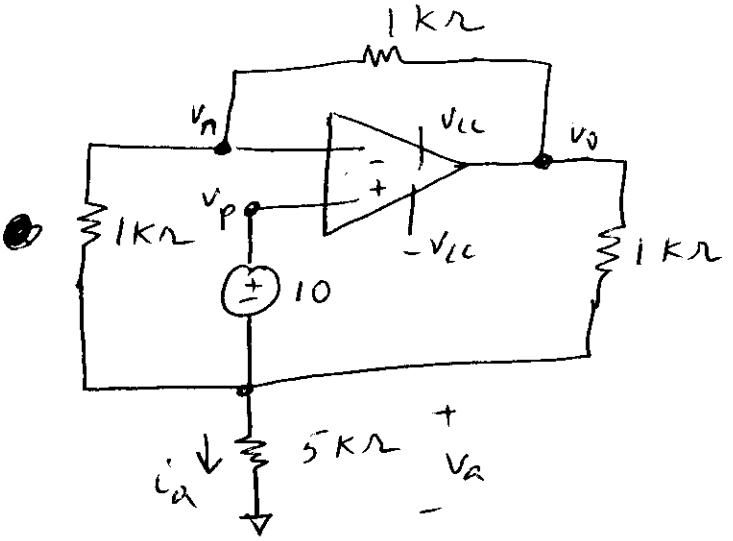
at $t=0^-$; C was O.C

$V = V_{ab}$

$i = \frac{6V}{6k\Omega} = 1\,mA$.

& $V_{ab} = 6 - 1k\Omega \times 1\,mA = 5\,V$.

2-, find i_a.



$\frac{V_n - V_a}{1k} + \frac{V_n - V_o}{1k} = 0$

or $\boxed{2V_n - V_a = V_o}$ (1)

&: $\frac{V_a}{5k} + \frac{V_a - V_n}{1k} + \frac{V_a - V_o}{1k} = 0$

$V_a\left[\frac{1}{5k} + \frac{2}{1k}\right] - \frac{V_n}{1k} = \frac{V_o}{1k}$

or $\boxed{V_a\left(\frac{11}{5}\right) - V_n = V_o}$ (2)

① & ② $\rightarrow 2V_n - V_a = V_a\frac{11}{5} - V_n$

$3V_n = \frac{16V_a}{5} \rightarrow V_n = \frac{16}{15}V_a.$

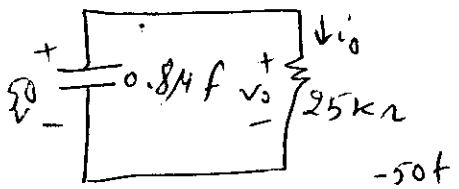
Also: $V_n = V_p = V_a + V_g = V_a + 10$

Hence $V_a + 10 = \frac{16}{15}V_a.$

or $\frac{V_a}{15} = 10 \rightarrow V_a = 150$

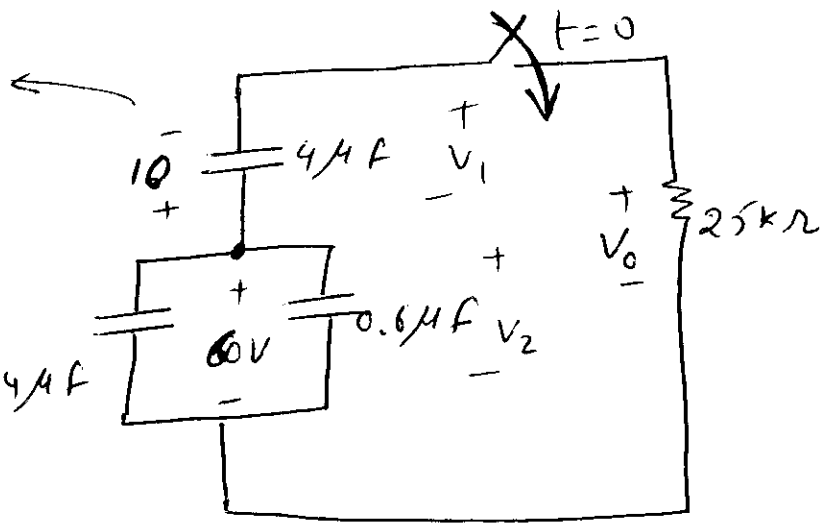
$i_a = \frac{150}{5} = 30\ A.$

#3 (a) $V_o(t)$? $t \geq 0$.



$\tau = RC = 0.8\times10^{-6}\times25\times10^{3}$
$= 50\ s$

$V_o(t) = 50e^{-50t}\ V,\ t \geq 0.$



#4 in problem 8, find $V_1(t)$ = ?

$i_o = \frac{V_o(t)}{25k} = \frac{50e^{-50t}}{25{,}000} = 2e^{-50t}\ mA,$

$V_1(t) = \frac{-1}{C}\int_0^t i\,dt - 10$

$= \frac{-1}{4\times10^{-6}}\int_0^t \frac{2e^{-50t}}{\times10^{-3}}dt - 10$

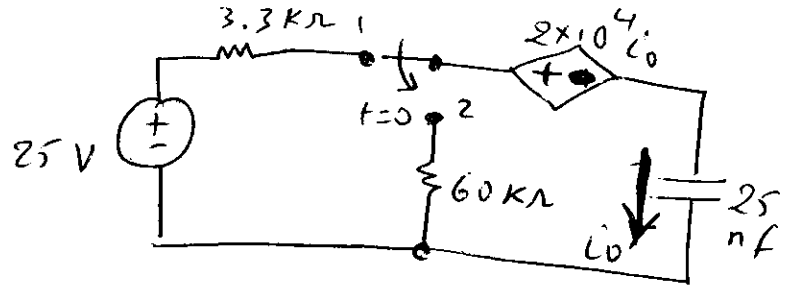
$= \frac{-1}{4\times10^{-6}} \times 2\times10^{-3}\frac{1}{-50}e^{-50t} - 10$

$= \frac{+10^{6}\times10^{-3}}{2\times50}\left(e^{-50t}\right)_0^t - 10 = \frac{+10^{4}}{\times10^{-3}}\left(e^{-50t} - 1\right) - 10$

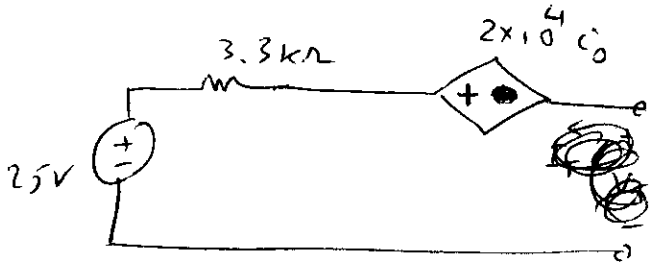
$= +10e^{-50t} - 20$

$= 10e^{-50t} - 20,\ t \geq 0$

9. $i_o(t) = ?$ $t \geq 0$.



$t = 0^-$



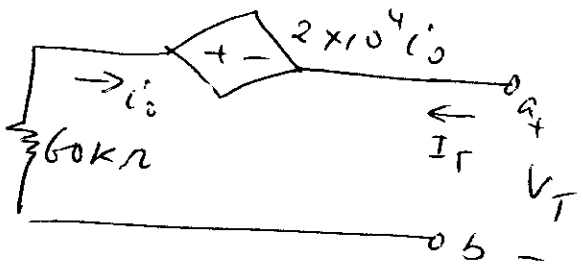
$\Rightarrow V_c(0^-) = 25\,V.$

by injection Method: after deactivating ±25V

$-V_T + 2\times10^4 i_o + 3.3k\,i_T + 25V = 0$

$\Rightarrow V_T = -2\times10^4 i_o -$

at $t = 0^+$



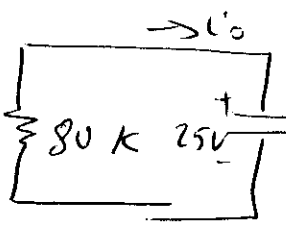
by injection Method:

$$V_T = -2\times10^4 i_o + 60\,000\, i_T$$

$$= 20\,000\, i_T + 60\,000\, i_T = 80,000\, i_T$$

$$\Rightarrow \frac{V_T}{I_T} = R_{thev} = 80,000 = 80\,k.$$

$\Rightarrow$



$\rightarrow V_o = 25\, e^{-\frac{t}{\tau}}$

$\tau = RC = 80K \times 25nF$

$= 2\,ms \cdot 8 \quad \frac{1}{\tau} = 500$

#10

$\Rightarrow V_o = 25\, e^{-500t}\, V, \quad t \geq 0^+$

$i_o = C\frac{dV}{dt} = 25\times10^{-9} \times 25 \times -500\, e^{-500t}$

$= -312.5\, e^{-500t}\, \mu A. \quad t \geq 0^+$

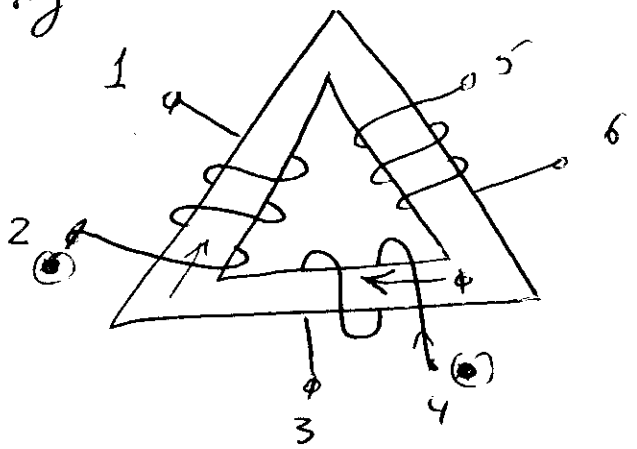
#5 dot locations that is wrong

4 & 2 ✓

4 & 1 ✗

1 & 3 ✓

3 & 6 ✓



#6. the current in a 2H inductor is:

$i = 25\ A \quad at \quad t \le 0$

$i = (B_1 \cos 5t + B_2 \sin 5t)\, e^{-1t}\ A, \quad t \ge 0$

find B_1 & B_2 if V across L is 100 V at $t = 0$

so $V_L(0) = 100\ V$.

@

$i(0^-) = i(0) = 25 = B_1 \cos 0 + 0 \rightarrow B_1 = 25$

& $v_L = L\frac{di}{dt} = 2\left(-5B_1 \sin 5t + 5B_2 \cos 5t\right) e^{-t}$

$- (2B_1 \cos 5t + 2B_2 \sin 5t)$

at $t = 0 \rightarrow v_L = 100 = 10B_2 - 2B_1$

$100 = 10B_2 - 50 \rightarrow$

$10B_2 = 150$

$B_2 = 15.$