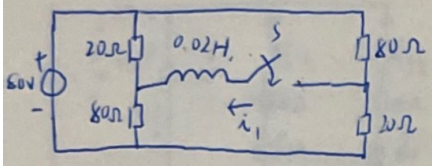
（科目：　　）清华大学数学作业纸

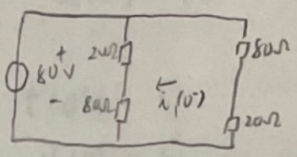
4120238

编号：H8.　　班级：　　姓名：　　第　　页

10-17. 求 $i_1(t)$ 零状态响应，画出其变化曲线

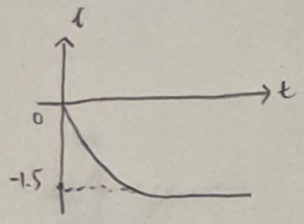


$t(0^-)$：

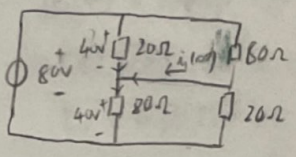


$i_1(0^-) = 0.$

$i_1(0^+) = i_1(0^-) = 0.$



$t(\infty)$：

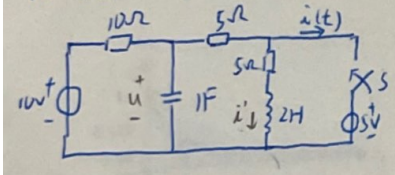


$i_1(\infty) = \frac{40}{80} - \frac{40}{20} = -1.5A.$

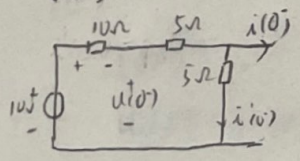
$\tau = \frac{L}{R} = \frac{0.02}{16+16} = 6.25\times10^{-4}$

零状态响应：$-1.5 - 1.5e^{-1600t}$ A.

10-28. 求 $i(t)$



$t(0^-)$：

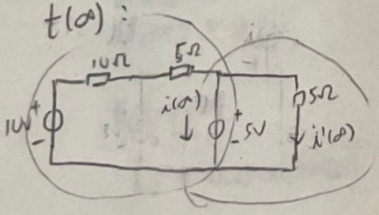


$i(0^-) = 0.$

$i'(0^-) = \frac{10}{10+5+5} = 0.5A.$

$u(0^-) = -10\times0.5+10 = 5V.$

$t(\infty)$：



$i_1(\infty) = \frac{10-5}{10+5} = 0.33A$

$i_2(\infty) = \frac{-5}{5} = -1A$

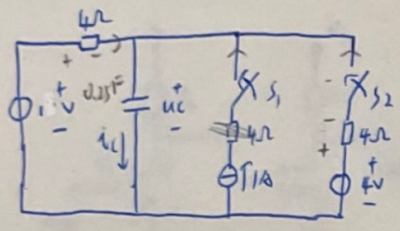
$\tau_1 = RC = (5\|10)\times1 = 3.33s.$

$\tau_2 = \frac{L}{R} = \frac{2}{5} = 0.4s.$

$i(t) = \left[0.33 + (0-0.33)e^{-0.3t}\right] + \left[(-1) + (-0.5-(-1))e^{-2.5t}\right.$

$i(t) = -0.66 - 0.33e^{-0.3t} + 0.5e^{-2.5t}$

10-35. 求u_c和i_c，画出变化曲线，$t=0$时闭合S_1，$t=1s$时闭合S_2



$t(0^-)$:

$u_c(0^-)=1V$，$i_c(0^-)=0$

$t(0^+)$:

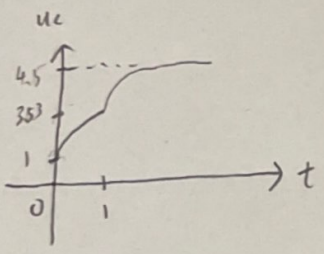
$u_c(0^+)=1V$，$i_c(0^+)=1A$.（相等）

$u_c(\infty)=1\times4+1=5V$，$i_c(\infty)=0$

$0<t<1s$时.

$\tau_1=4\times0.25=1s$.

$u_c(t)=5-4e^{-t}$，$i_c(t)=e^{-t}$

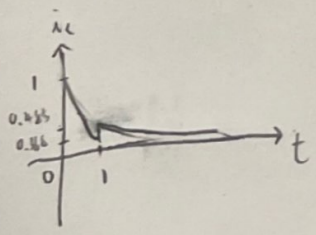


$t(1^-)$:

$u_c(1^-)=5-4e^{-1}=3.53V$.，$i_c(1^-)=e^{-1}=0.368A$

$t(1^+)$:

$u_c(1^+)=3.53V$.，$i_c(1^+)=\frac{1-3.53}{4}+1+\frac{4-3.53}{4}=0.485A$.



节点法

$u_c(\infty)=4.5V$　　$i_c(\infty)=0$.

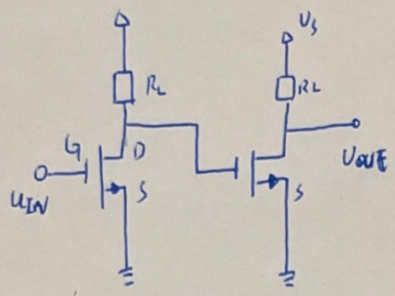
$t>1s$时

$\tau_2=0.25\times(4//4)=0.5$

$u_c(t)=4.5+(4.5-3.53)e^{-2(t-1)}=4.5-0.97e^{-2(t-1)}$

$i_c(t)=0.485e^{-2(t-1)}$

$$u_c(t)=\begin{cases}5-4e^{-t} & (0<t<1)\\ 4.5-0.97e^{-2(t-1)} & (t>1)\end{cases}\qquad i_c(t)=\begin{cases}e^{-t} & (0<t<1)\\ 0.485e^{-2(t-1)} & (t>1)\end{cases}$$



① $t=0.5\mu s$:

$u_1(0.5^+) = u_1(0.5^-) = 0.$

$u_1(\infty) = u_S = 5V.$

$\tau = 10\times10^{-12}\times10\times10^{3} = 10^{-7}s = 0.1\mu s.$

$u_1(t) = 5(1-e^{-10(t-0.5)})\ V.$

$1 = 5(1-e^{-10(t-0.5)})$

$t_1 = 0.0223\mu s.$

② $t=1\mu s$:

$u_1(1^+) = u_1(1^-) = 5V$

$u_1(\infty) = 0.$

$\tau_2 = (R_L // R_{on})C_{GS} = 10^{-9}s.$

$u_1(t) = 5e^{-10^3(t-1)}$

$1 = 5e^{-10^3(t-1)}$

$t_2 = 0.0016\mu s.$