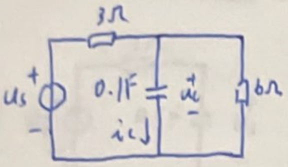
10-41 电容已充电至2V，$u_s=3\delta(t)V$，求u_c和i_c.



电容短路　$0^-\sim0^+$时

$$i_c=\frac{u_s}{3}=\delta(t)A.$$

$$u_c(0^+)-u_c(0^-)=\frac{1}{0.1}\int_{0^-}^{0^+}\delta(t)dt=10V$$

$\therefore u_c(0^+)=12V$，$u_c(\infty)=0$.

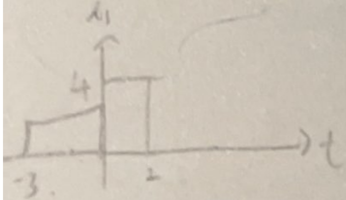
$\tau=0.1\times(3\parallel6)=0.2s.$

$\therefore u_c(t)=12e^{-5t}\varepsilon(t)+2\varepsilon(-t)V.$

$$i_c(t)=C\frac{du_c}{dt}=0.1(-60e^{-5t}\varepsilon(t)+12\delta(t)-2\delta(t))$$

$$=-6e^{-5t}\varepsilon(t)+\delta(t)A$$

10-48 $h(t)=\begin{cases}2e^{-t} & 0<t\le3\\ 0 & t>3.\end{cases}$　试求此电路由于输入$i_s=4[\varepsilon(t)-\varepsilon(t-2)]$所引起的零状态响应.



$0<t\le2$，$\int_0^t 4\times2e^{-(t-\tau)}d\tau$

$=8(1-e^{-t})$

$2<t\le3$，$\int_0^2 4\times2e^{-(t-\tau)}d\tau$

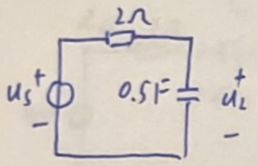
$=8(e^{2-t}-e^{-t})$

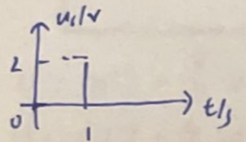
$3<t\le5$，$\int_{t-3}^2 4\times2e^{-(t-\tau)}d\tau$

$=8(e^{2-t}-e^{-3})$

$$i_{zs}=\begin{cases}8(1-e^{-t}), & 0<t\le2\\ 8(e^{2-t}-e^{-t}), & 2<t\le3\\ 8(e^{2-t}-e^{5-2t}), & 3<t\le5\\ 0, & t>5\end{cases}$$

10-50 电压源波形 $u_2(0^-)=0$. ,用卷积求 u_2.





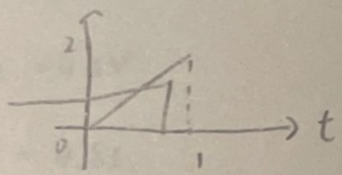
单位冲激响应 $0^- \sim 0^+$

$i_C = 0.5\delta(t)A$

$u_C(0^+) = \frac{1}{0.5}\int_{0^-}^{0^+} 0.5\,\delta(t)\,dt + u_C(0^-) = 1V$

$\tau = 2\times 0.5 = 1s$.

$h(t) = e^{-t}\varepsilon(t)$



$0<t\le 1$, $\int_0^t 2t\,e^{-(t-\tau)}d\tau$

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

$t>1$, $\int_0^1 2t\cdot e^{-(t-\tau)}d\tau$

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

$= 1.264t$

$$u_2 = \begin{cases} 0 & t\le 0 \\ 2t(1-e^{-t}), & 0<t\le 1 \\ 1.264t, & t>1 \end{cases}$$

10-51, 无初始储能. 当 $u_s = 10\varepsilon(t)$ V 时响应, $u_o = 6(1-e^{-10t})\varepsilon(t)$V. 求 $u_s = 5e^{-t}\varepsilon(t)$ V时 u_o

单位阶跃响应 $s(t) = 0.6(1-e^{-10t})\varepsilon(t)$.

单位冲激响应 $h(t) = s'(t) = 6e^{-10t}\varepsilon(t)$.

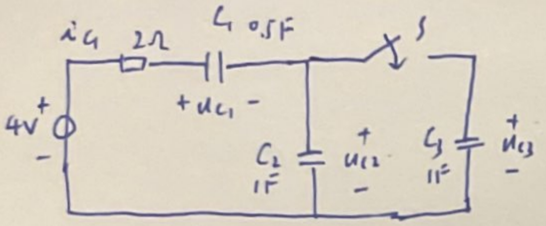
$\int_0^t 5e^{-\tau}\cdot 6e^{-10(t-\tau)}d\tau$

$= 30e^{-10t}\int_0^t e^{9\tau}d\tau$

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

$\therefore u_o = 3(e^{-t}-e^{-10t})\varepsilon(t)V$.

10-46 $u_{c3}(0^-)=0$, $t=0$ 时闭合开关 S，求 u_{c3} 和 i_{c1}



$u_{C1}(0^-)=\frac{8}{3}\,V$

$u_{C2}(0^-)=\frac{4}{3}\,V$

$0^-\sim0^+$ $\frac{8}{3}\times0.5=u\times1+u\times1 \Rightarrow u_3=\frac{2}{3}\,V$

$u_3(\infty)=\frac{0.5}{0.5+2}\times4=0.8V$

$\tau=(0.5\parallel2)\times2=0.8s$.

$u_{C3}(t)=(0.8-0.133e^{-1.25t})\varepsilon(t)\,V$

$u_1(\infty)=3.2V$

$u_1(0^+)=\frac{8}{3}V=u_1(0^-)$.

$u_{C1}(t)=(3.2-0.533e^{-1.25t})\varepsilon(t)+2.667\varepsilon(-t)V$.

$i_{C1}(t)=\frac{du_{C1}(t)}{dt}=0.333e^{-1.25t}\varepsilon(t)\,A$.