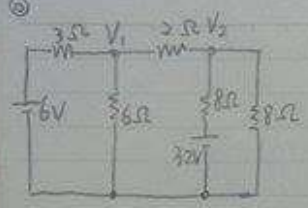
⑧



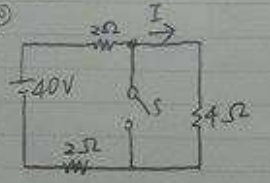
$$\begin{cases} \frac{V_1-6}{3}+\frac{V_1}{6}+\frac{V_1-V_2}{2}=0 \\ \frac{V_2-V_1}{2}+\frac{V_2-32}{8}+\frac{V_2}{8}=0 \end{cases}$$

$$\begin{cases} 2V_1-12+V_1+3V_1-3V_2=0 \\ 4V_2-4V_1+V_2-32+V_2=0 \end{cases}$$

$$\begin{cases} 6V_1-3V_2=12 \\ -4V_1+6V_2=32 \end{cases} \quad + \quad \begin{cases} 2V_1-V_2=4 \\ -2V_1+3V_2=16 \end{cases} \qquad 2V_2=20,\ V_2=10$$

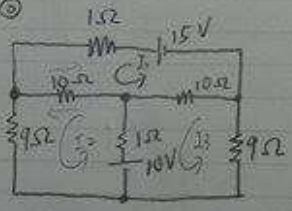
$$V_1=7\ V_\#$$

⑨



當S$_6$閉後
4Ω 短路
$I=0$

⑩



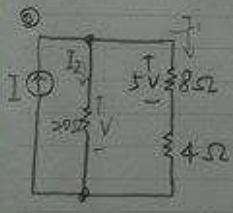
$$a_{11}I_1+a_{12}I_2+a_{13}I_3=15$$
$$a_{21}I_1+a_{22}I_2+a_{23}I_3=10$$
$$a_{31}I_1+a_{32}I_2+a_{33}I_3=-10$$

$$a_{11}+a_{22}+a_{33}=?$$

$$-15+I_1+10I_1+10I_1-10I_2-10I_3=0 \qquad 21I_1-10I_2-10I_3=+15$$
$$20I_2-10-I_3-10I_1=0 \qquad -10I_1+20I_2-I_3=+10$$
$$20I_3+10-I_2-10I_1=0 \qquad -10I_1-I_2+20I_3=-10$$

$$a_{11}+a_{22}+a_{33}=21+20+20=61_\#$$

⑪



$I=?$

$$I_1=\frac{V}{R}=\frac{5}{8} \qquad I_2=\frac{7.5}{20}=\frac{1.5}{4}$$

$$\frac{5}{8}\times 4=\frac{5}{2}$$

$$V_T=\frac{5}{2}+5=2.5+5=7.5$$

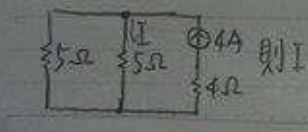
$$I=\frac{5}{8}+\frac{1.5}{4}$$

$$=\frac{5}{8}+\frac{3}{8}=\frac{8}{8}=1_\#$$

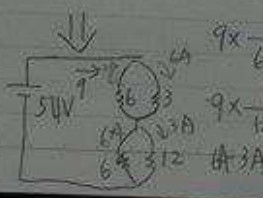
⑫

⑬

$$R_T=6//3+6//12$$
$$=2+4=6$$
$$I_T=\frac{54}{6}=9$$



則 $I=2A$

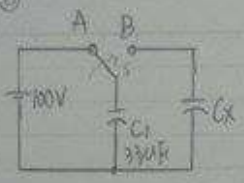


$$9\times\frac{6}{6+3}=6A$$

$$9\times\frac{6}{12+6}=3A$$

$$6A+3A=3A_\#$$

⑦



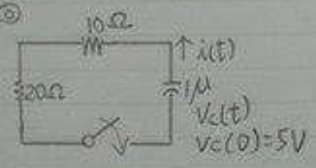
C_1 75V 達穩態，S→B

$Q=CV$

$(C_x+C_1)75V=100V\times C_1$

$75C_x=25C_1$，$C_x=1\mu$

⑧



(a) $\tau=RC=30\times10^{-6}=3\times10^{-5}$

$V_c(t)=V_{c0}\times e^{-\frac{t}{\tau}}$

$=5\times e^{-\frac{t}{3\times10^{-5}}}$

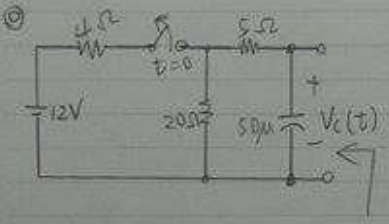
$i_c(t)=-C\frac{dv_c(t)}{dt}=\frac{10^5}{3}\times10^{-6}\times5e^{-10^5t/3}=\frac{1}{6}e^{-10^5t/3}$

(b) $t=3\times10^{-5}$

$V_c(3\times10^{-5})=5\times e^{-\frac{3\times10^{-5}}{3\times10^{-5}}}$

$=5\times e^{-1}$

⑨



$R_T=20+5=25$

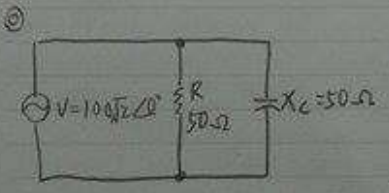
$\tau=RC=25\times50\times10^{-6}=1.25\times10^{-3}$

$V=\frac{20}{20+4}\times12=10V$

$V_c(t)=(10-0)\times e^{-\frac{t}{\tau}}$

$=10\times e^{-\frac{t}{1.25\times10^{-3}}}=10e^{-800t}$

⑩



$Z=\frac{R\cdot jC}{R+(jC)}=\frac{50\times50\angle-90}{50-j50}=\frac{2500\angle-90}{50\sqrt{2}\angle-45}$

$=\frac{50}{\sqrt{2}}\angle-45$

$I=\frac{V}{Z}=\frac{100\sqrt{2}\angle0^\circ}{\frac{50}{\sqrt{2}}\angle-45}=\frac{200\angle0^\circ}{50\angle-45}=4\angle45$

⑪ 純矽晶體，在室溫下載子濃度為 $P=n=1.45\times10^{10}$ 個/cm^3，$\mu_n=1500\ cm^2/V\cdot s$，$\mu_p=480\ cm^2/V\cdot s$，求導電率及 R

$\sigma=1.6\times10^{-19}\times1.45\times10^{10}\times(1500+480)=4.59\times10^{-6}\ S/cm$

$\rho=\frac{1}{\sigma}=\frac{1}{4.59\times10^{-6}}\approx2.2\times10^5\ \Omega\cdot cm$

⑫ $n_i=1.5\times10^{10}/cm^3$，原子密度為 $5\times10^{22}/cm^3$，若 10^9 個矽原子摻入1個施作(P)則電洞=?

$N_D=\frac{5\times10^{22}}{10^9}=5\times10^{13}$

$p=\frac{n_i^2}{N_D}=\frac{(1.5\times10^{10})^2}{5\times10^{13}}=4.5\times10^6$