零输入

2.4(1) $y''(t)+4y'(t)+3y(t)=0$

$\lambda^2+4\lambda+3=0$

解得 $\lambda_1=-1$，$\lambda_2=-3$

$y_{zi}(t)=C_1e^{-3t}+C_2e^{-t}$

$y(0)=y_{zi}(0^-)=y_{zi}(0^+)=C_1+C_2=1$

$y'_{zi}(0)=y'_{zi}(0_-)=y'_{zi}(0_+)=-3C_1-C_2=1$

解得 $C_1=-1$，$C_2=2$

$\therefore y_{zi}(t)=-e^{-3t}+2e^{-t}$

零状态 $\because$ 无冲激

$\therefore y'_{zs}(0)=y'_{zs}(0_+)=y_{zs}(0^-)=0$

$y_{zs}(0)=y_{zs}(0^+)=y_{zs}(0^-)=0$

齐次解：$C_3e^{-3t}+C_4e^{-t}$

特解：$\frac{1}{3}$

代入原式 $\Rightarrow \begin{cases} C_3+C_4+\frac{1}{3}=0 \\ -3C_3-C_4=0 \end{cases} \Rightarrow \begin{cases} C_3=\frac{1}{6} \\ C_4=-\frac{1}{2} \end{cases}$

$\therefore y_{zs}(t)=\frac{1}{6}e^{-3t}-\frac{1}{2}e^{-t}+\frac{1}{3}$

$\therefore$ 全响应 $=y_{zi}(t)+y_{zs}(t)=-\frac{5}{6}e^{-3t}+\frac{3}{2}e^{-t}+\frac{1}{3}$

2.9 由KVL与KCL $\begin{cases} u_R(t) = u_s(t) - u_c(t) \\ \frac{u_R(t)}{R_1} = \frac{u_c(t)}{R_2} + C\frac{du_c}{dt} \end{cases}$

得 $\frac{u_s(t)}{R_1} = (\frac{1}{R_2} + \frac{1}{R_1})u_c(t) + Cu_c'(t)$

$2u_c'(t) + 2u_c(t) = u_s(t)$

$2g'(t) + 2g(t) = \varepsilon(t)$

$\because g(0_-) = 0$

又无冲激

$\therefore g(0_+) = g(0_-) = 0$

$\therefore g(t) = Ce^{-t} + \frac{1}{2}$

代入得 $g(t) = -\frac{1}{2}(e^{-t} - 1)\varepsilon(t)$

$\therefore h(t) = g'(t) = \frac{1}{2}e^{-t}\varepsilon(t)$