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

$y(0_-)=y'(0_-)=1$, $f(t)=\varepsilon(t)$

$y_{zi}''(t)+4y_{zi}'(t)+3y_{zi}(t)=0$

$y_{zi}'(0_+)=y_{zi}'(0_-)=y'(0_-)=1$

$y_{zi}(0_+)=y_{zi}(0_-)=y(0_-)=1$

特征方程 $\lambda^2-4y+3=0$ $\lambda_1=-3,\ \lambda_2=-1$

$y_{zi}(t)=C_1e^{-3t}+C_2e^{-t}$, $t\geqslant0$

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

$C_1=-1,\ C_2=2$

零输入响应 $y_{zi}(t)=-e^{-3t}+2e^{-t}$, $t\geqslant0$

$y_{zs}''(t)+4y_{zs}'(t)+3y_{zs}(t)=\varepsilon(t)$

$y_{zs}(0_+)=y_{zs}(0_-)=0$ $y_{zs}'(0_+)=y_{zs}'(0_-)=0$

$y_{zsh}(t)=C_3e^{-3t}+C_4e^{-t}$, $t\geqslant0$

$y_{zsp}(t)=\frac{1}{3}$, $t\geqslant0$

$y_{zs}(t)=C_3e^{-3t}+C_4e^{-t}+\frac{1}{3}$, $t\geqslant0$

$C_3=\frac{1}{6}$, ~~式~~ $C_4=-\frac{1}{2}$

零状态响应 $y_{zs}(t)=\frac{1}{6}e^{-3t}-\frac{1}{2}e^{-t}+\frac{1}{3}$, $t\geqslant0$

全响应 $y(t)=y_{zi}(t)+y_{zs}(t)=-\frac{5}{6}e^{-3t}+\frac{3}{2}e^{-t}+\frac{1}{3}$, $t\geqslant0$

2.9 $u_R(t)=u_s(t)-u_c(t)$

$$\frac{u_R(t)}{R_1}=\frac{u_c(t)}{R_2}+C\frac{du_c}{dt}$$

联立得 $\frac{u_s(t)}{R_1}=\left(\frac{1}{R_2}+\frac{1}{R_1}\right)u_c(t)+Cu_c'(t)$

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

$2g'(t)+2g(t)=\varepsilon(t)$, $g(0_-)=0$, $g(0_+)=g(0_-)=0$

$$g(t)=Ce^{\cancel{2t}-t}+\frac{1}{2},\ t>0$$

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

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