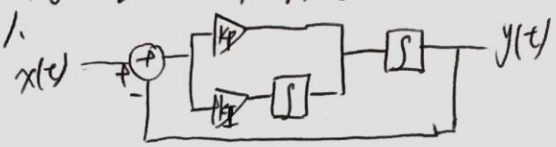
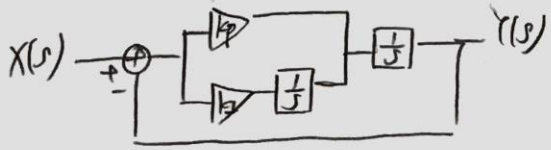
訂易HW8 10606115 劉世得

1.





$$Y(s)=\frac{1}{s}\left[k_p(X(s)-Y(s))+k_I\frac{1}{s}(X(s)-Y(s))\right]$$

$$sY(s)=k_p(X(s)-Y(s))+k_I\frac{1}{s}(X(s)-Y(s))$$

$$\frac{Y(s)}{X(s)}=\frac{k_ps+k_I}{s^2+k_ps+k_I}$$

① $k_p=3, k_I=2$

$$H(s)=\frac{3s+2}{s^2+3s+2}=\frac{3s+2}{(s+1)(s+2)}$$

$A(s+2)+B(s+1)=3s+2$

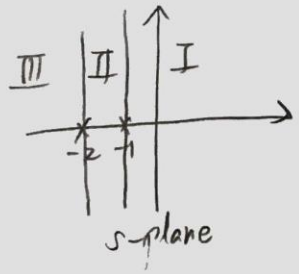
$A+B=3 \quad A=-1$

$2A+B=2 \quad B=4$

$$=\frac{A}{s+1}+\frac{B}{s+2}$$

$$=\frac{-1}{s+1}+\frac{4}{s+2}\ \#\ 2$$

②



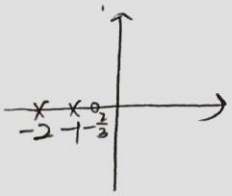
I $h(t)=-e^{-t}u(t)+4e^{-2t}u(t)$ causal

II $h(t)=e^{-t}u(-t)+4e^{-2t}u(t)$ non-causal

III $h(t)=e^{-t}u(-t)-4e^{-2t}u(t)$ anti-causal

③ pole-zero plot

$$H(s)=\frac{3s+2}{(s+1)(s+2)}$$



P1

④ Bode plot

$$H(f)=\frac{3s+2}{s^2+3s+2}\Big|_{s=j2\pi f}=\frac{j6\pi f+2}{-4\pi^2 f^2+j6\pi f+2}$$

$$H(f)=\frac{2+j6\pi f}{(2-4\pi^2 f^2)+j6\pi f}$$

$$|H(f)|=\frac{\sqrt{4+36\pi^2 f^2}}{\sqrt{(2-4\pi^2 f^2)^2+36\pi^2 f^2}}$$

$$\angle H(f)=\tan^{-1}(3\pi f)-\tan^{-1}\frac{6\pi f}{2-4\pi^2 f^2}$$

2. $K_p=2\zeta\omega_n$

$K_I=\omega_n^2$

$\omega_n=1$

$$H(s)=\frac{2\zeta s+1}{s^2+2\zeta s+1}$$

$$s^2+2\zeta s+1=0$$

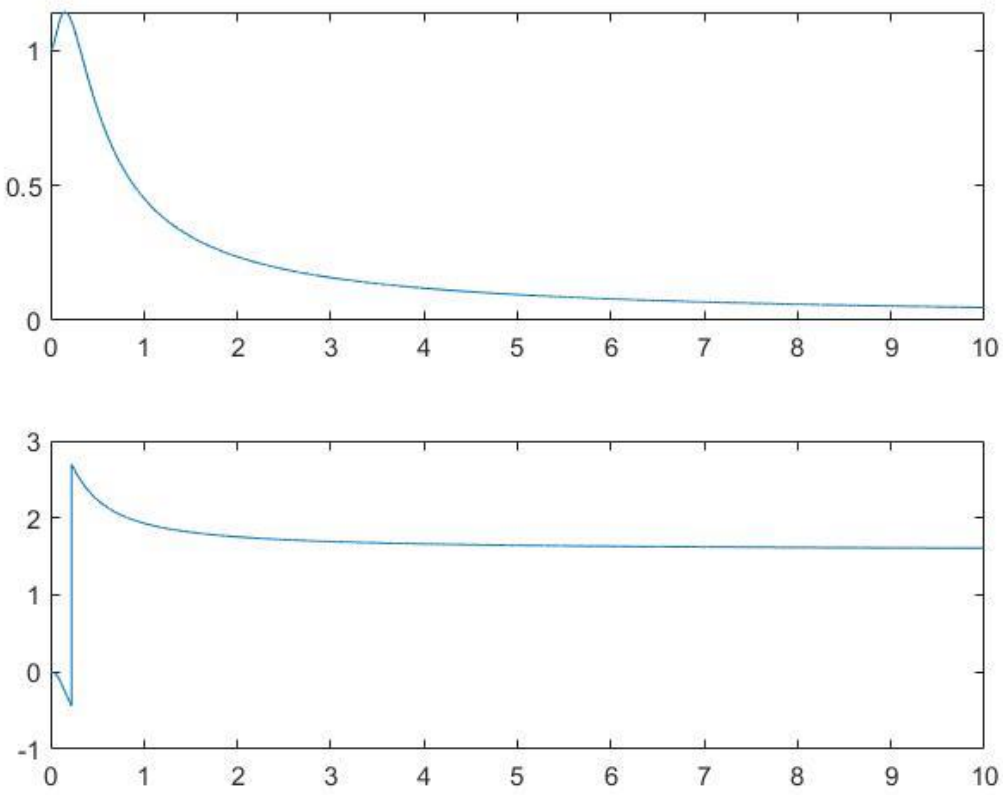
$$s=\frac{-2\zeta\pm\sqrt{4\zeta^2-4}}{2}$$

$$=-\zeta\pm\sqrt{\zeta^2-1}$$

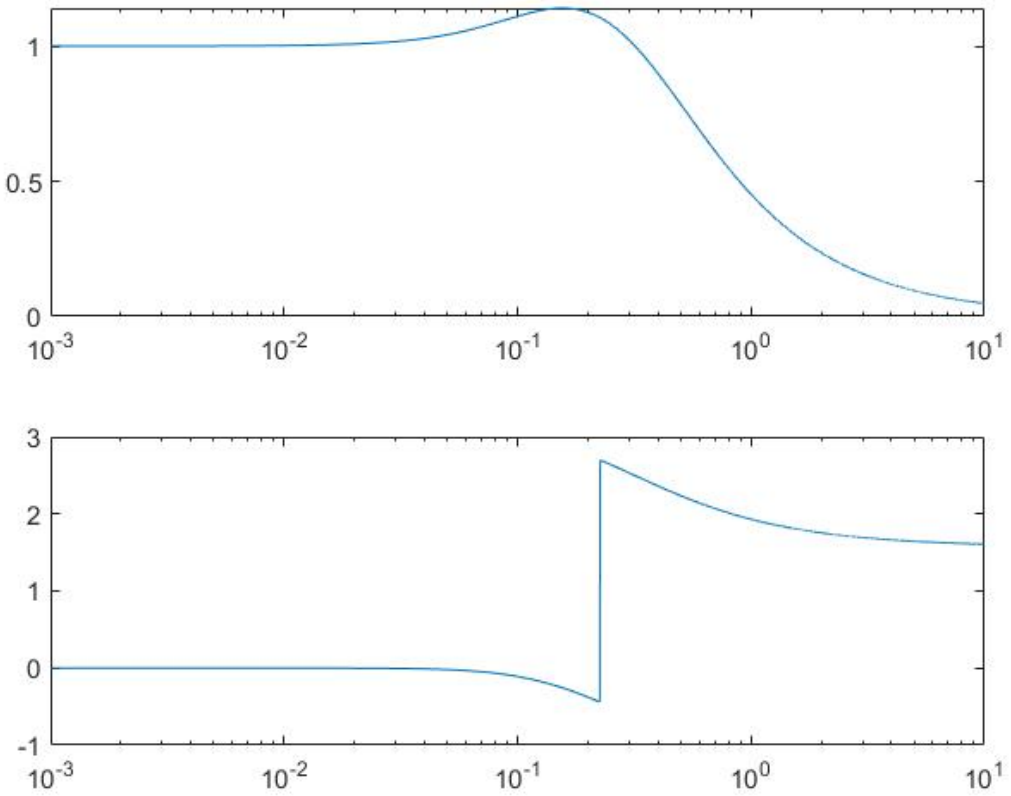
1(4) Bode Plot

上為|H(f)|

下為 phase(H(f))



同樣為 Bode Plot，但此圖 x 軸為 log
上為|H(f)|
下為 phase(H(f))



2. Root Locus

黑色 x 為 Zeta = -1 時

紅色 x 為 Zeta = 0 時

青色 x 為 Zeta = 1 時

綠色 x 為 Zeta = 10 時