

5.8

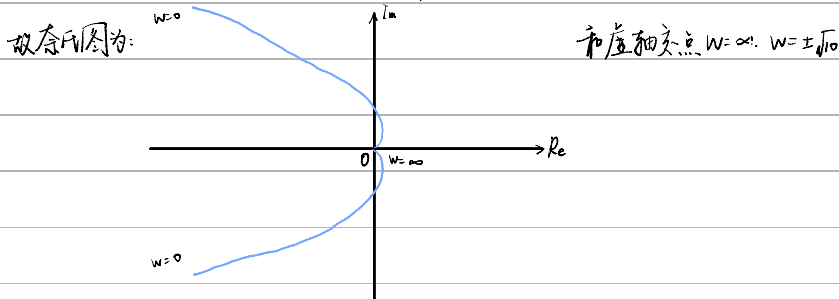
解: ①  $G(s) = \frac{10}{s^2(1+0.2s)(1+0.5s)}$   $G(j\omega) = \frac{10}{(j\omega)^2(1+0.2j\omega)(1+0.5j\omega)} = \frac{10}{- \omega^2(1+0.2j\omega)(1+0.5j\omega)}$

$P(j\omega) = \frac{10}{\omega^2(1+0.1\omega^2 + 0.49\omega^2)}$   $Q(j\omega) = \frac{10}{\omega(1+0.1\omega^2 + 0.49\omega^2)}$

$A(\omega) = \frac{10}{\omega^2(1+0.1\omega^2 + 0.49\omega^2)}$   $\varphi(\omega) = -180^\circ - \arctan 0.2\omega - \arctan 0.5\omega$

当  $\omega = 0$  时  $A(\omega) = \infty$   $\varphi(\omega) = -180^\circ$   $P(\omega) = \infty$   $Q(\omega) = \infty$

当  $\omega = \infty$  时  $A(\omega) = 0$   $\varphi(\omega) = -360^\circ$   $P(\omega) = 0$   $Q(\omega) = 0$



②  $G(s) = \frac{50}{s(s+5)(s-1)} = \frac{-10}{s(0.2s+1)(-s+1)}$   $G(j\omega) = \frac{-10}{j\omega(0.2j\omega+1)(1-j\omega)}$

$P(\omega) = \frac{-8}{1+1.04\omega^2+0.04\omega^4}$   $Q(\omega) = \frac{10+2\omega^2}{\omega(1+1.04\omega^2+0.04\omega^4)}$

$A(\omega) = \frac{10}{\omega(1+1.04\omega^2+0.04\omega^4)}$   $\varphi(\omega) = 180^\circ - 90^\circ - \arctan 0.2\omega - \arctan(-\omega) = 90^\circ - \arctan 0.2\omega + \arctan \omega$

当  $\omega \rightarrow 0$  时  $P(\omega) = -8$   $Q(\omega) = -\infty$   $A(\omega) = \infty$   $\varphi(\omega) = 90^\circ$

当  $\omega \rightarrow \infty$  时  $P(\omega) = 0$   $Q(\omega) = 0$   $A(\omega) = 0$   $\varphi(\omega) = 90^\circ$

和实轴交点:  $w = \infty$  和虚轴交点:  $w = \infty$  交点为  $(0,0)$

