

10

$$(a) \frac{Y}{X} = \frac{\frac{4s+k}{s^2}}{1 + \left(\frac{4s+k}{s^2}\right)\left(\frac{1}{s+2}\right)} = \frac{(4s+k)(s+2)}{s^2(s+2) + 4s+k}$$

$$(b) s^3 + 2s^2 + 4s + k$$

(c)

$$\begin{array}{r|l} s^3 & 1 & 4 \\ s^2 & 2 & k \\ s & \frac{8-k}{2} & \\ s^0 & k & \end{array}$$

$$\left. \begin{array}{l} 8-k > 0 \\ k > 0 \end{array} \right\} \boxed{8 > k > 0}$$

$$(d) 8-k=0 \Rightarrow \boxed{k=8}$$

$$2s^2+k=0 \Rightarrow 2s^2+8=0 \Rightarrow s^2+4=0 \Rightarrow s \pm j2$$

$$\boxed{f = \frac{\omega}{2\pi}}$$

Test two

1. $G(s) = \frac{k(s+5)}{s(Ts+1)(2s+1)}$

(a) $\frac{Y}{X} = \frac{G}{1+G(s)} = \frac{k(s+5)}{s(Ts+1)(2s+1) + k(s+5)}$ 10

(b) $s^3(2T) + s^2(T+2) + s(k+1) + 5k$ 10

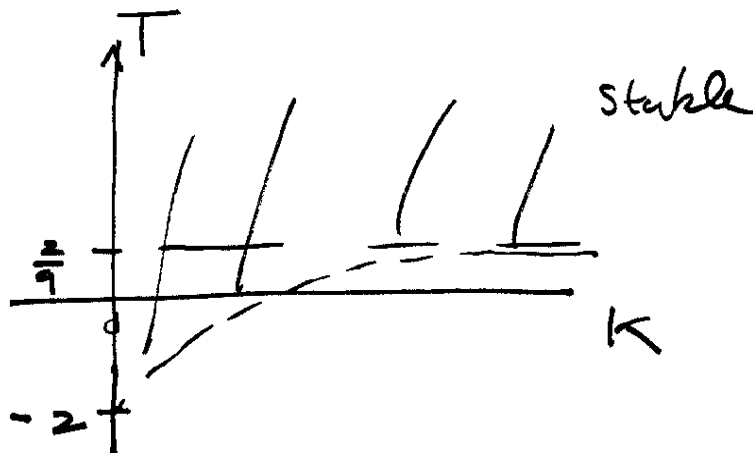
R-H

s^3	$2T$	$k+1$	
s^2	$T+2$	$5k$	
s^1	$\frac{(T+2)(k+1) - 2T(5k)}{T+2} = T(1-9k) + 2(k+1) > 0$		
s^0	$5k$		

$T(1-9k) + 2(k+1) > 0$ 5

$T > -\frac{2(k+1)}{(1-9k)} = \frac{2(k+1)}{9k-1}$

$5k > 0$ 5



B.S.6

$$G(s) = \frac{k}{s(s+1)(s+2)}$$

$$GH+1 = 0 \Rightarrow s(s+1)(s+2) + k = 0$$

$$(s^2+s)(s+2) + k = 0$$

$$s^3 + s^2 + 2s^2 + 2sk = 0 \Rightarrow s^3 + 3s^2 + 2sk = 0$$

s^3	1	2
s^2	3	k
s	$\frac{6-k}{3}$	
s^0	k	

$$6 - k > 0 \Rightarrow 6 > k$$

$$k > 0$$

$$0 < k < 6$$

B.S.7

$$s(s-1)(2s+3) + 10 = 0$$

$$(s^2-s)(2s+3) + 10 = 2s^3 - 2s^2 + 3s^2 - 3s + 10 = 0$$

$$2s^3 + s^2 - 3s + 10 = 0$$

unstable

s^3	2	-3
s^2	1	10
s^1	$\frac{-3-20}{1}$	
s^0	10	

$$2 \text{ roots in rhp}$$