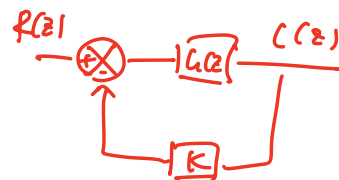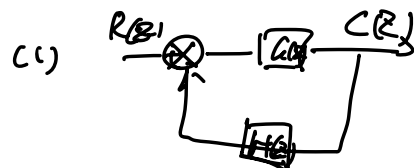Example 4.8

Q : k range?   Wd = ?

Solution

from (4-3) $\dfrac{C(z)}{R(z)} = \dfrac{G(z)}{1+G(z)H(z)}$

1) 推导闭环 $G(z) = \dfrac{C(z)}{R(z) - C(z)H(z)}$

$GR - GCH = C$

$GR = (GH+1)C$

$\dfrac{C(z)}{R(z)} = \dfrac{G(z)}{1+G(z)H(z)}$

C(s)

why H=1 ?

Gz   Hz=1

from (1) $\dfrac{C(z)}{R(z)} = \dfrac{G(z)}{1+G(z)H(z)} = \dfrac{\dfrac{k(0.3679z + 0.2642)}{(z-0.3679)(z-1)}}{1+\dfrac{k(0.3679z+0.2642)}{(z-0.3679)(z-1)}}$

$= \dfrac{k(0.3679z + 0.2642)}{(z-0.3679)(z-1) + k(0.3679z+0.2642)}$

$= \dfrac{k(0.3679z + 0.2642)}{z^2 + a_1 z + a_2}$

$a_1 = -1.3679 + 0.3679k$

$a_2 = 0.3679 + 0.2642k$

2nd order

$|a_2| = |0.3679 + 0.2642k| < 1 = \alpha_0$ (1)

$P(1) = 1 - 1.3679 + 0.3679k + 0.3679 + 0.2642k > 0$ (2)

$P(-1) = 1 + 1.3679 - 0.3679k + 0.3679 + 0.2642k > 0$ (3)

from (1) $-5.1755 < k < 2.3925$

from (2) $k > 0$

from (3) $0.1037k < 2.7358$

$k < 26.3819$

So $0 < k < 2.3925$

if $k = 2.3925$ $P(-1) = 0$ critically stable

$z^2 - 0.4877z + 1 = 0$
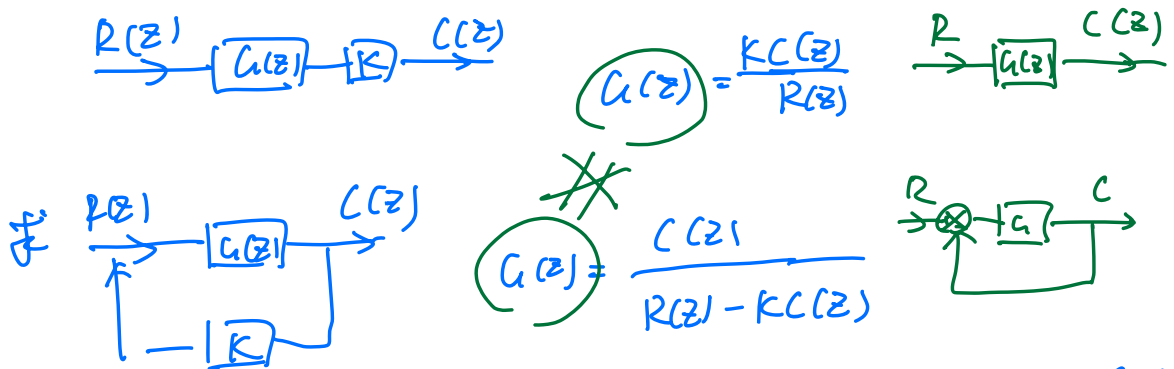
$z = 0.2439 \pm j \, 0.9698$

$T = 1$

$w_d =$

$z = e^{\frac{-2\pi \zeta}{\sqrt{1-\zeta^2}} \frac{w_d}{w_s}} + e^{j \, 2\pi \frac{w_d}{w_s}}$

$|z| =$

$\angle z = 2\pi \frac{w_d}{w_s} = w_d T$

$$w_d = \frac{1}{T} \angle Z = \angle 3 = \tan^{-1} \frac{0.9608}{0.2439}$$

$$= 1.3244 \, rad/ses$$

$$R(z) \rightarrow \boxed{G(z)} \rightarrow \boxed{K} \xrightarrow{C(z)}$$

$$\boxed{G(z)} = \frac{KC(z)}{R(3)}$$

$$R \rightarrow \boxed{G(3)} \xrightarrow{C(z)}$$

$$若 \quad R(z) \rightarrow \boxed{G(z)} \xrightarrow{C(z)}$$
$$\uparrow \quad \boxed{-K}$$

$$\boxed{G(z)} = \frac{C(z)}{R(z) - KC(z)}$$

$$R \rightarrow \otimes \rightarrow \boxed{G} \leftarrow C$$

$$C(z) = G(z)R(z) - K G(z) C(z)$$

$$[1 + K G(z)] C(z) = G(z) R(z)$$

$$\frac{C(z)}{R(z)} = \frac{G(z)}{1 + K G(z)}$$

$$G(z) = \frac{C(z)}{R(z)} \qquad G'(z) = \frac{C(z)}{R(z) - C(z)} = \frac{\frac{C(z)}{R(z)}}{1 - \frac{C(z)}{R(z)}}$$

$$\frac{G}{1-G} = \frac{C}{R-C} \qquad = \frac{G(z)}{1 - G(z)} \quad 认为 H(z) = 1$$

$$G(R - C) = C(1-G)$$
$$GR - GC = C - CG$$
$$\quad GR = C \qquad \frac{C}{R} = G$$