

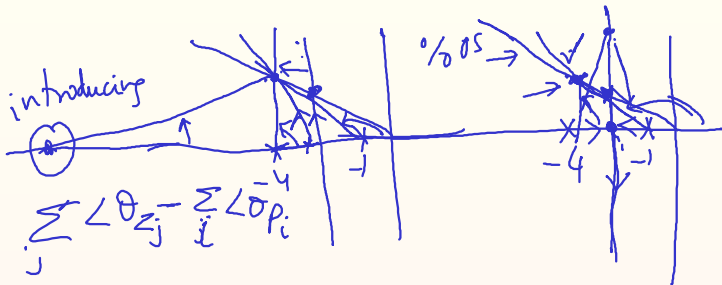
Control Systems, EE302

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Root locus - band
controller design
P-controllers
PD \rightarrow improving transient response
PI \rightarrow steady state error - type 0

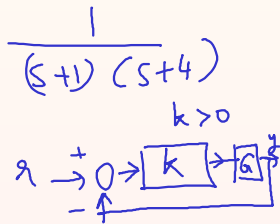


$s \in \mathbb{C}$ lies on the
root locus

\hat{IT}

$$\angle G(s) = (2k+1)180^\circ$$

$$G(s) = \frac{(s-z_1)(s-z_2)}{(s-p_1)(s-p_2)(s-p_3)}$$



design

- transient %OS

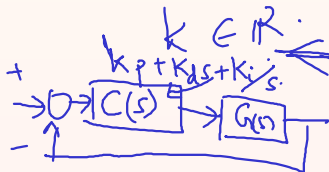
2% settling time

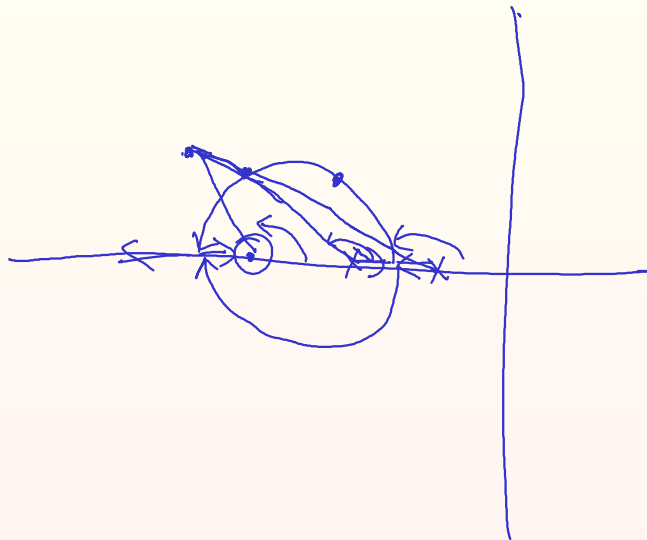


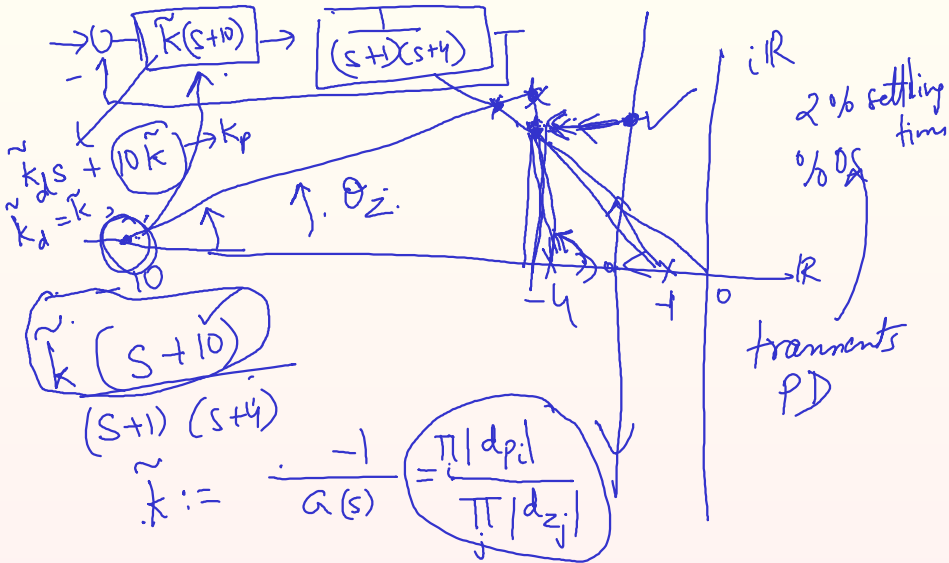
- steady state error

(low)
ideally 0

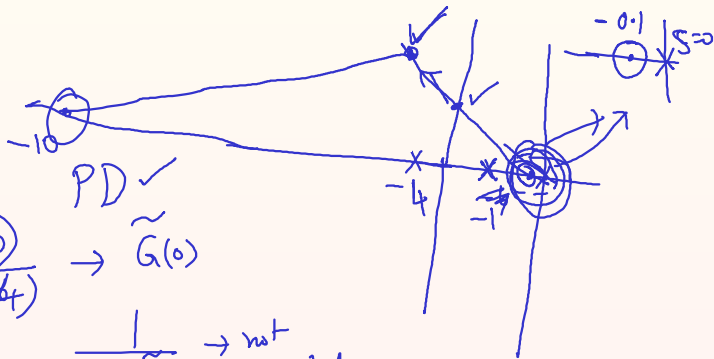
$$d(s) + k n(s)$$







PI controller for steady state error improvement.
type 0.



$$\frac{K(s+10)}{(s+1)(s+4)}$$

PD ✓
→ $\tilde{G}(s)$

$$\frac{1}{1 + \tilde{G}(s)} \rightarrow \text{not acceptable}$$

PD-controller → transient improv[~].

$$- k (s+z) \quad z > 0$$

decided by \angle criteria
then \tilde{k} is decided.

check S.S. error.

if not acceptable

increase system type from type 0 to type 1.



"quite close"
compared to the rest

$$G(s) \rightarrow \frac{1}{(s+1)(s+4)}$$

$$\frac{23(s+10)}{(s+1)(s+4)} \rightarrow \tilde{G}(s)$$

or

$$\frac{1}{1 + \tilde{G}(0)} \text{ not small.}$$

$$(23s + 230) \left(1 + \frac{0.1}{s}\right)$$

$$23s + \underbrace{\left(\frac{230}{+2.3}\right)}_{K_p} + \frac{23}{s} \quad \underbrace{\quad}_{K_i}$$

$\uparrow K_d$



$$\frac{(s+0.1)}{s}$$

