034IN - FUNDAMENTALS OF AUTOMATIC CONTROL

EXERCISES

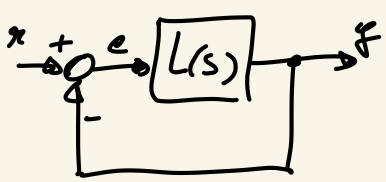
Root Loci Applications

Handwritten Notes

2025/05/15

$$L(s) = \rho \frac{s+1}{s(s-2)(s+4)} \qquad \rho \in \mathbb{R}$$

$m = 1$, $n = 3$

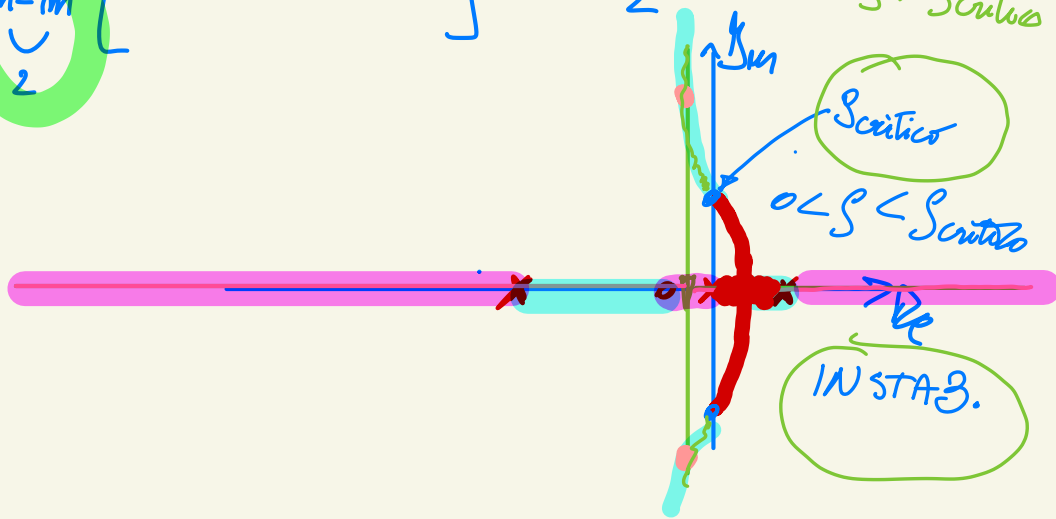


$$x_a = \frac{1}{n-m} \left[\sum^{-(-1)} +1 - 0 + 2 - 4 \right] = -\frac{1}{2}$$

$n - m = 2$

AS STAB.

$\rho > \rho_{critico}$



$$Re(p) \xrightarrow[\rho \to +\infty]{} -\frac{1}{2}$$

$$x_a = -\frac{1}{2} \longrightarrow \hat{x}_a = -3$$

$$L'(s) = \frac{s + z_a}{s + p_a} \cdot L(s) \qquad (-z_a)$$

$$\hat{x}_a = \frac{1}{2} \left[\sum^{+1} +1 + z_a - 2 - p_a \right] = -3$$

$+1,5$

$+1,5$

$-6 = -p_a$ $\quad \frac{s+1}{s+6}$ $\quad \frac{s+1,5}{s+6,5}$

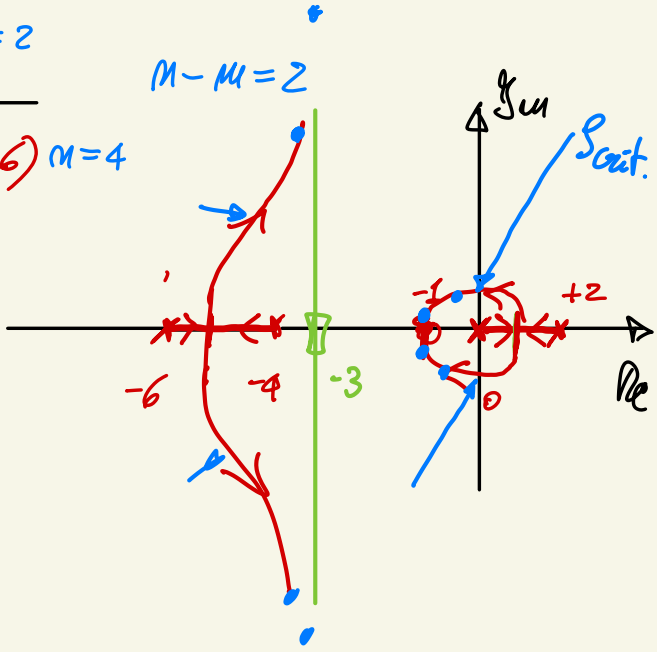
$-6 = -p_a + 0,5 \longrightarrow p_a = +6,5$

$$L'(s) = \frac{(s+1)(s+1)}{s(s-2)(s+4)(s+6)}$$

$m = 2$

$m = 4$

$n - m = 2$

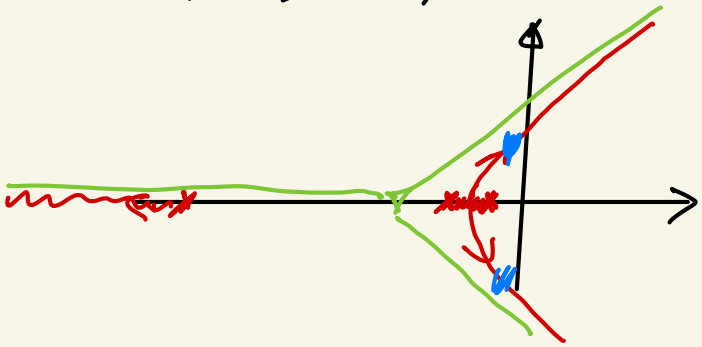


$$L(s) = \frac{g}{(s+1)(s+2)(s+10)}$$

$m = 0$

$m = 3$

$$x_a = \frac{1}{3}\left[-13\right] = -\frac{13}{3}$$



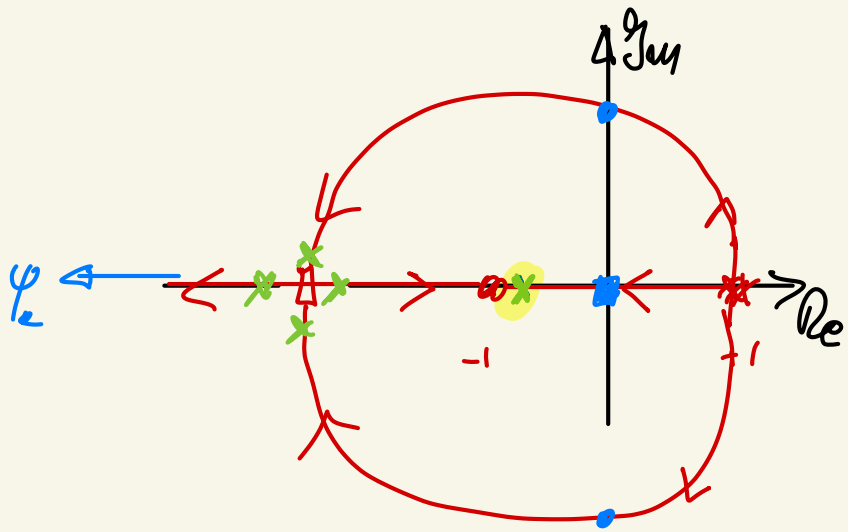
$$L(s) = \rho \frac{(s+1)^2}{(s-1)^3}$$

$m = 2$

$n - m = 1$

$m = 3$

$n - m = 1$

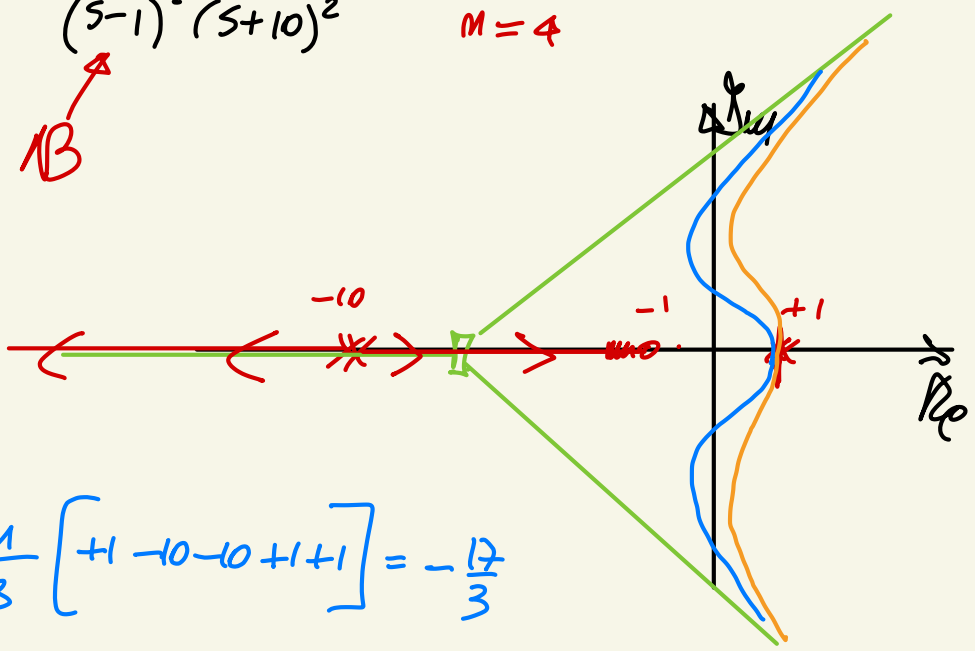


$$L(s) = \frac{s+1}{(s-1)^2(s+10)^2}$$

$m = 1$

$m = 4$

$n - m = 3$



$$x_a = \frac{1}{3}\left[+1-10-10+1+1\right] = -\frac{17}{3}$$

$$L'(s) = (s+\bar{z})\frac{(s+1)}{(s-1)^2(s+10)^2}$$

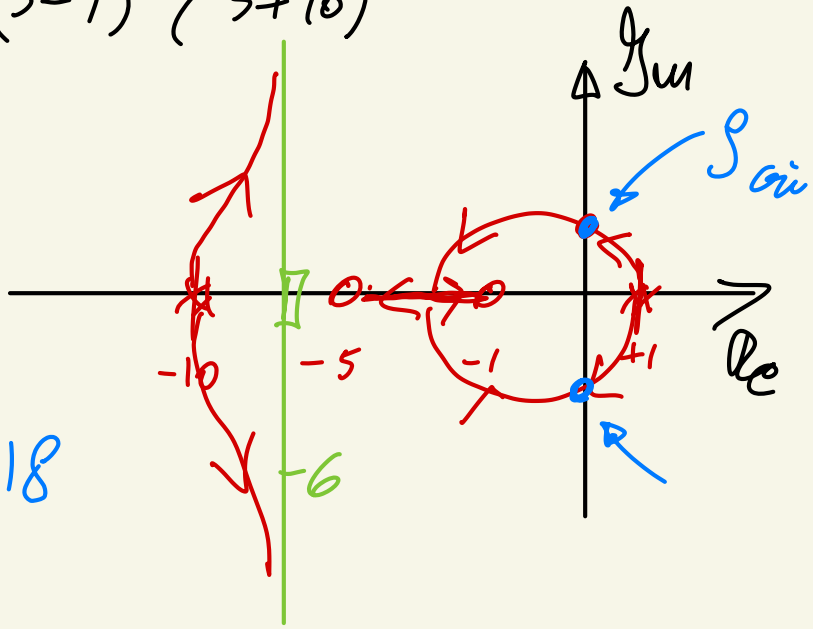
$n - m = 2$

$$\hat{x}_a = \frac{1}{2}\left[\overset{+1}{-(-1)} - (-\bar{z}) - 10 - 10 + 1 + 1\right] = -6$$

$$\frac{-17+\bar{z}}{2} = -6 \qquad \bar{z} = 5$$

$$L'(s) = \frac{(s+5)(s+1)}{(s-1)^2(s+10)^2}$$

$n - m = 2$



$\bar{s} = 718$

$$C(s) = (s+5) \cdot \frac{1}{1+\tau_p s} \qquad 0 < \tau_p \ll 1$$

$\tau_p = 0{,}004$