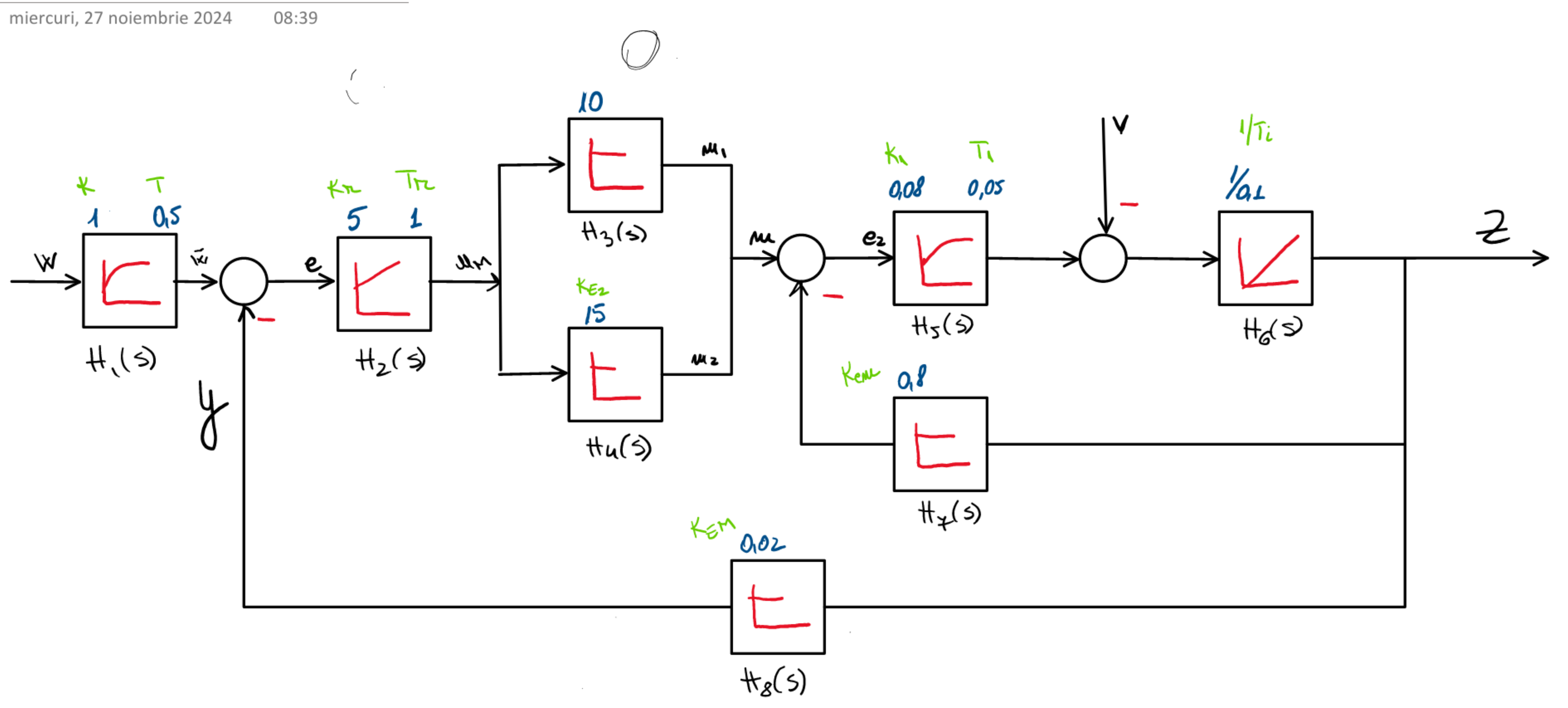
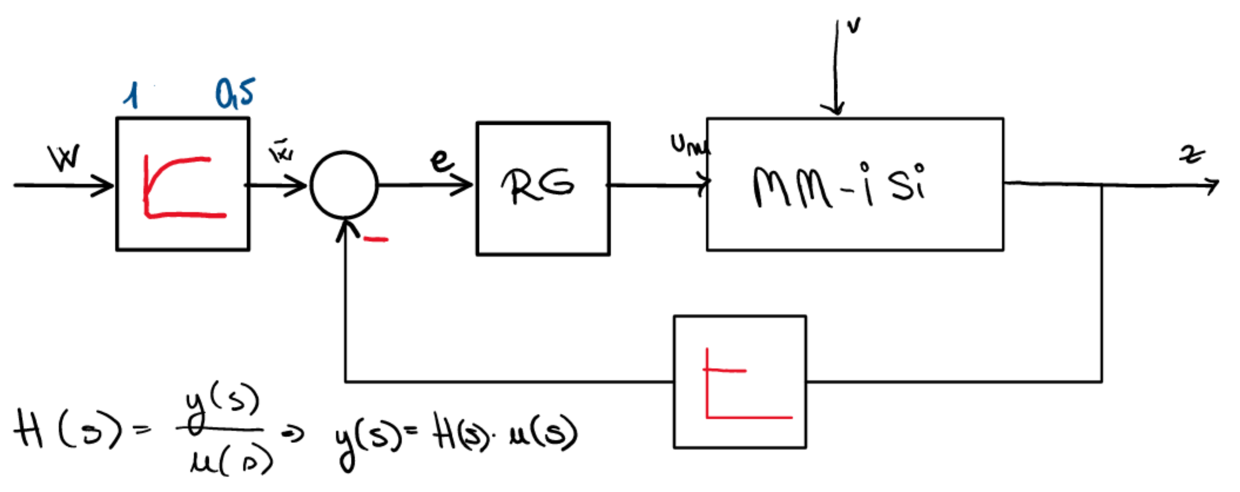
Lab s9

miercuri, 27 noiembrie 2024 08:39





$H(s) = \frac{y(s)}{u(s)} \Rightarrow y(s) = H(s)\cdot u(s)$

$m(s) = (10+15)\, u_M(s) \Rightarrow m(t) = 25\, u_M(t)$

$$\left.\begin{aligned} e_2(s) &= m(s) - y_1(s) = 25\, u_M(s) - y_1(s) \\ y_1(s) &= 0{,}8\, z(s) \end{aligned}\right\} \Rightarrow$$

$e_2(t) = 25\, u_M(t) - 0{,}8\, z(t)$

$e_2(s) = 25\, u_M(s) - 0{,}8\, z(s)$

identice pt. că nu avem s în fața lor

$n(s) = \frac{0{,}08}{1+0{,}05\, s}\cdot e_2(s)$

$\Rightarrow 0{,}05\, s\cdot n(s) + n(s) = 0{,}08\, e_2(s) \longrightarrow 0{,}05\, \dot{n}(t) = -n(t) + 0{,}08\, e_2(t)$

$\dot{n}(t) = -20\, n(t) + 1{,}6\, [25\, u_M(t) - 0{,}8\, z(t)]$

$\underline{\dot{n}(t) = -20\, n(t) + 40\, u_M(t) - 1{,}28\, z(t)}$

$e_1(s) = n(s) - v(s) \longrightarrow e_1(t) = n(t) - v(t)$

$z(s) = \frac{1}{0{,}1\cdot s}\cdot e_1(s) = \frac{10}{s}\cdot e_1(s) \longrightarrow s\cdot z(s) = 10\cdot e_1(s)$

$\dot{z}(t) = 10\cdot e_1(t) \Rightarrow \underline{\dot{z}(t) = 10\, n(t) - 10\, v(t)}$

$$\begin{bmatrix} \dot{n} \\ \dot{z} \end{bmatrix} = \begin{bmatrix} -20 & -1{,}28 \\ 10 & 0 \end{bmatrix} \begin{bmatrix} n \\ z \end{bmatrix} + \begin{bmatrix} 40 & 0 \\ 0 & -10 \end{bmatrix} \begin{bmatrix} u_M \\ v \end{bmatrix}$$

$z = [0 \quad 1] \begin{bmatrix} n \\ z \end{bmatrix}$

↳ nu vrem ieșirea $n \Rightarrow [0 \quad 1]$

②

$$\begin{cases} \dot{x}_1 = -2x_1 + 2x_2 + 40\, d \\ \dot{x}_2 = -0{,}5\, x_2 + 12{,}5\, u \end{cases}$$

$z = x_1$

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \underbrace{\begin{bmatrix} -2 & 2 \\ 0 & -0{,}5 \end{bmatrix}}_{A} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \underbrace{\begin{bmatrix} 0 & 40 \\ 12{,}5 & 0 \end{bmatrix}}_{B} \begin{bmatrix} u \\ d \end{bmatrix}$$

$z = \underbrace{[1 \quad 0]}_{C} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$

$H_{zu}(s)\big|_{d=0} = \frac{z(s)}{u(s)}\Big|_{d=0} = ?$

$H_{zd}(s) = \frac{z(s)}{d(s)}\Big|_{u=0} = ?$

$H(s) = C(\underbrace{sI - A}_{M})^{-1}\cdot B = [H_{uz}(s) \quad H_{zd}(s)]$

$M^{-1} = \frac{1}{\det(M)}\cdot M^*$

$M = \begin{bmatrix} s+2 & -2 \\ 0 & s+0{,}5 \end{bmatrix} \qquad M^t = \begin{bmatrix} s+2 & 0 \\ -2 & s+0{,}5 \end{bmatrix} \Rightarrow M^* = \begin{bmatrix} s+0{,}5 & 2 \\ 0 & s+2 \end{bmatrix}$

$\det(M) = (s+2)(s+0{,}5) = 2(1+0{,}5s)\cdot 0{,}5(1+2s)$

$= (1+0{,}5s)(1+2s)$ ↳ le scriem în varianta asta pt. ca: $\frac{k}{1+sT}$

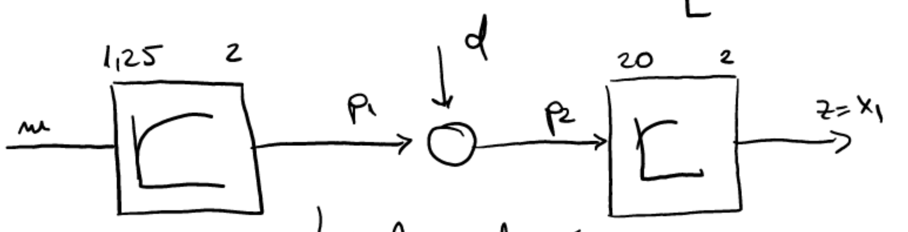
$M^{-1} = \frac{1}{(1+0{,}5s)(1+2s)}\cdot M^*$

$H(s) = \frac{1}{(1+0{,}5s)(1+2s)}\cdot [1 \quad 0] \begin{bmatrix} s+0{,}5 & 2 \\ 0 & s+2 \end{bmatrix} \begin{bmatrix} 0 & 40 \\ 12{,}5 & 0 \end{bmatrix}$

$= \frac{1}{(1+0{,}5s)(1+2s)}\cdot [s+0{,}5 \quad 2] \begin{bmatrix} 0 & 40 \\ 12{,}5 & 0 \end{bmatrix} = \Bigg[\underbrace{\frac{25}{(1+0{,}5s)(1+2s)}}_{H_{zu}(s)} \quad \underbrace{\frac{40\cdot 0{,}5\cdot (1+2s)}{(1+0{,}5s)(1+2s)}}_{H_{zd}(s)} \Bigg]$

$\frac{20}{1+0{,}5s} = \frac{40\cdot 0{,}5\cdot (1+2s)}{(1+0{,}5s)(1+2s)}$

$PT1 = \frac{k}{1+sT}$



↳ lipsește (x_2)

VERIF:

$x_2(s) = \frac{1{,}25}{1+2s}\cdot u(s) \Rightarrow 2s\, X(s) + x_2(s) = 1{,}25\, u(s)$

$\frac{25}{(1+0{,}5s)(1+2s)} = \frac{20}{(1+0{,}5s)}\cdot x$

X

$2\, \dot{x}_2(t) = -x_2(t) + 1{,}25\, u(t) \quad /:2$

$\dot{x}_2(t) = -0{,}5\, x_2(t) + 0{,}625\, u(t) \Rightarrow$ diferă de enunț !

$s\cdot X_2(s) = -0{,}5\, x_2(s) + 12{,}5\, u(s)$

$x_2(s)\,(s+0{,}5) = 12{,}5\, u(s)$

$x_2(s)\cdot 0{,}5\,(1+2s) = 12{,}5\, u(s) \Rightarrow x_2(s) = \frac{12{,}5}{0{,}5\,(1+2s)} = \frac{25}{(1+2s)} = \boxed{H_{x_2 u}(s) = \frac{x_2(s)}{u(s)} = \frac{25}{1+2s}}$