$$R_1: \dot{x}_1(t) = \frac{e(t)}{T_1} - \frac{x_1(t)}{T_2}$$ → input

MM isi:

$$u(t) = c_1\left[x_1(t) + e(t)\right]$$

stare ↓ output ↓ stări

$$\begin{bmatrix}\dot{x}_1\end{bmatrix} = \begin{bmatrix}\frac{1}{T_1} & -\frac{1}{T_2}\end{bmatrix}\begin{bmatrix}e(t)\\ x_1(t)\end{bmatrix}$$

$$\begin{bmatrix}u\end{bmatrix} = \begin{bmatrix}c_1\end{bmatrix}\begin{bmatrix}e(t)\\ x_1(t)\end{bmatrix}$$

$$s\,x_1(s) = \frac{e(s)}{T_1} - \frac{x_1(s)}{T_2}$$

$$u(s) = c_1\,x_1(s) + c_1\,e(s)$$

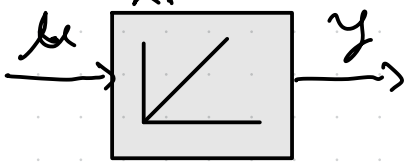
$$\left(s + \frac{1}{T_2}\right)x_1(s) = \frac{e(s)}{T_1}$$

$$e(s) = T_1\left(s + \frac{1}{T_2}\right)x_1(s)$$

$$u(s) = c_1\,x_1(s) + T_1\left(s + \frac{1}{T_2}\right)x_1(s)$$

$$u(s) = \left(c_1 + T_1 s + \frac{T_1}{T_2}\right)x_1(s)$$

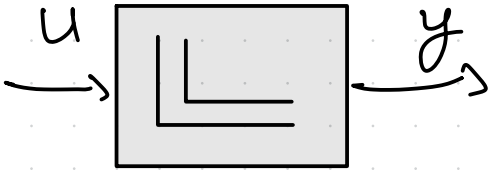
(1) I (ET-I, ET-PI)



$u_\infty = 0$

$y_\infty = ct$

(2) I (ET-IT1)

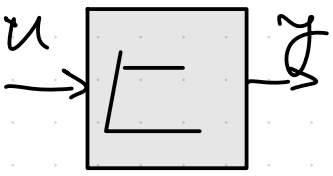


$u_\infty = ct$

$y_\infty = 0$

(3) P (ET-P, ET-PT1, ET-PDT1)

$$H(s) = \frac{k(1+sTd)}{1+sTf}$$



$y_\infty = k_p \cdot u_\infty \Rightarrow \lim_{s\to 0} sY(s) =$

$= \lim_{s\to 0} sH(s)U(s) - \lim_{s\to 0} sH(s)\frac{u_\infty}{s}$

$= H(0) \cdot u_\infty = k_p u_\infty$

! Statism natural / artificial

① $\gamma^e(y) = \left.\frac{y_\infty}{v_\infty}\right|_{w_\infty = 0}$ sau $\gamma_n(z) = \left.\frac{z_\infty}{v_\infty}\right|_{w'_\infty = 0}$

② $\gamma_n^e(y) = \frac{k_N(y)}{1+k_0}$ sau $\gamma_n^e(z) = \frac{k_N(z)}{1+k_0}$

(1) RG – PST$_1$ → scot în fct. de intrare

$e_\infty \neq 0$

$e_\infty = w_\infty - y_\infty \Rightarrow 7 - y_\infty$

$y_\infty = 7 - e_\infty$

$u_{c_\infty} = 2 \cdot e_\infty = 5,5746$

$u_{1_\infty} = 1 \cdot u_{c_\infty} = 2 e_\infty = 5,5746$

$n_\infty = 0,8\, u_1 = 1,6\, e_\infty = 4,4597$

$p_\infty = n_\infty - v_\infty = 1,6 e_\infty - 1,25 =$

$z_\infty = 1,25 \cdot p_\infty = 2 e_\infty - 1,5625$

$y_\infty = 1,05 \cdot z_\infty = 2,1 e_\infty - 1,6406$

$7 - e_\infty$

$\boxed{e_\infty = 2,7873}$

RG-PI $e_\infty = 0$ → scot în fct. de intrare

$e_\infty = w_\infty - y_\infty \rightarrow y_\infty = w_\infty = 7$

$u_{1\infty} = 1 \; c_\infty = \ldots$

$y_\infty = 1{,}05 \; z_\infty = 1{,}05 \; u_{c\infty} - 1{,}6 \; 4 \; 06 = 7$

Comp. integratoare → $\mathcal{G}_n = 0$

→ reg. cu comp I

II $k_0 = k_R \cdot k_{PC}$

$k_R = 2$

$(s = 0)$

$k_{PC} = 1 \cdot 0{,}8 \cdot 1{,}25 \cdot 1{,}05 = 1{,}05$

$u_c \rightarrow y$

→ $k_0 = 2{,}1$

$\mathcal{G}_n(y) = \dfrac{K_N(y)}{1 + k_0}$

$$K_N(y) = -1,25 \cdot 1,05 = -1,3125$$

$$K_N(z) = -1,25$$

$$\varphi_n(y) = \frac{-1,3125}{3,1} = -0,4234$$

$$\varphi_n(z) = \frac{-1,25}{3,1} = -0,4032$$