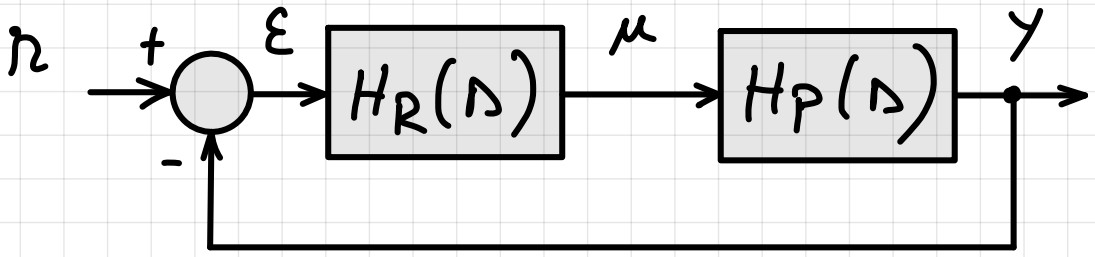
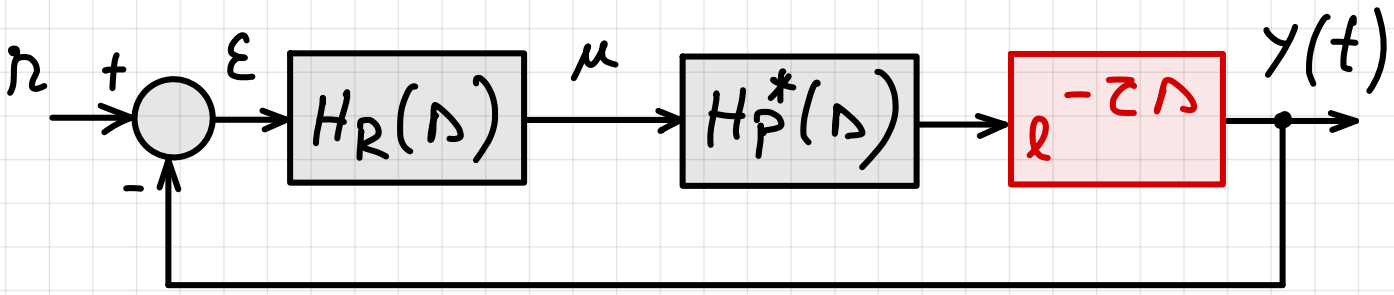
SRA cu Predictor Smith



$$H_P(s) = H_P^*(s) \cdot e^{-\tau s}$$

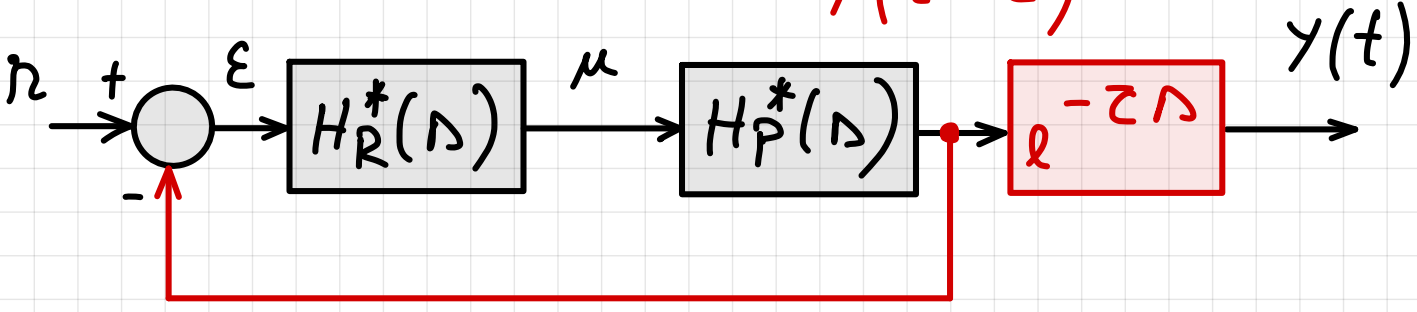
$H_P^*(s)$ → Fără timp mort



Încerc să scot afară timpul mort
(pe cale analitică - abstractizare, „artificiu teoretic")

„prezic viitorul"

$y(t+\tau)$



Construiesc o problemă echiv. pe care știu să o rezolv

În loc să proiectez H_R pt. H_P, proiectez H_R^* pt. H_P^*

Cum determin H_R pe baza lui H_R^* (întoarcerea la ph. inițială)

Impun $H_0 \equiv H_0^*$

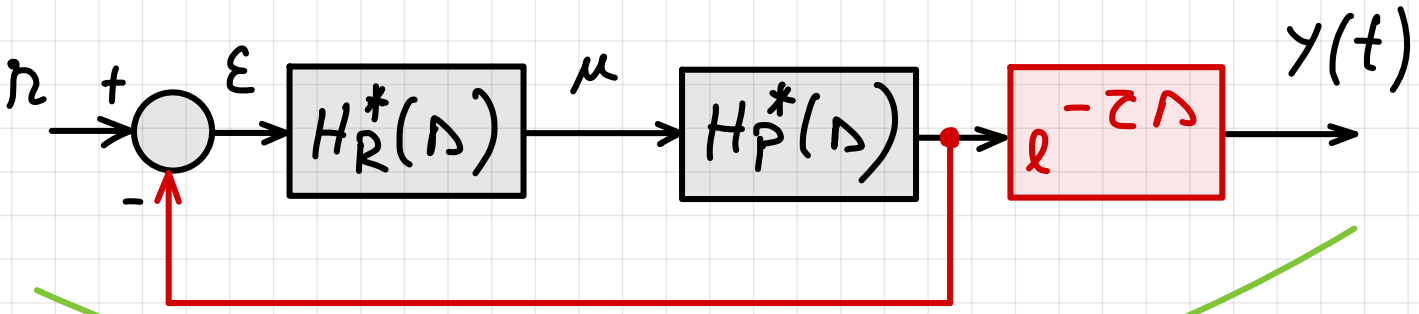
$$\Rightarrow H_R(\Lambda) = \frac{H_R^*}{1 + H_R^* \cdot H_P^* \left(1 - e^{-\tau\Lambda}\right)}$$

Pași

1) Calculez H_R^* pentru H_P^*
   - → crit. modulului
   - → met. poli-zerouri

2) Calculez H_R pe baza lui H_R^*

Obs. proiectare H_R^*



Performanțele din cerință ($r \to y$)

Perf. pentru care vrei proiecta H_R^*

Cum det. perf. de proiectare din perf. din cerință

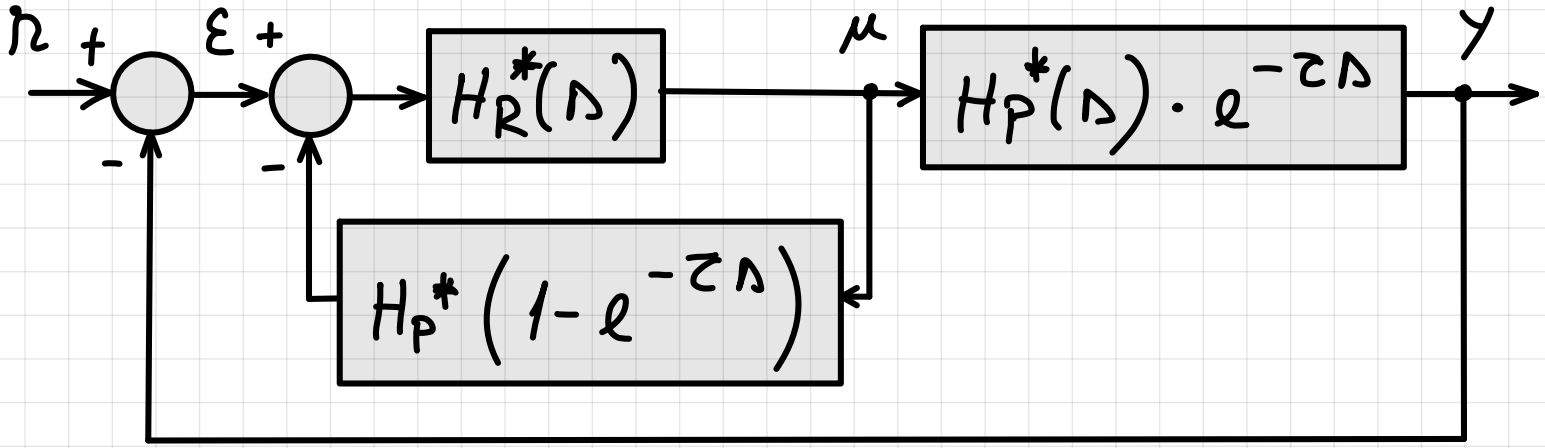
σ, ε_{ST} $\}$ → la fel

$t_t^* = t_t - \tau$

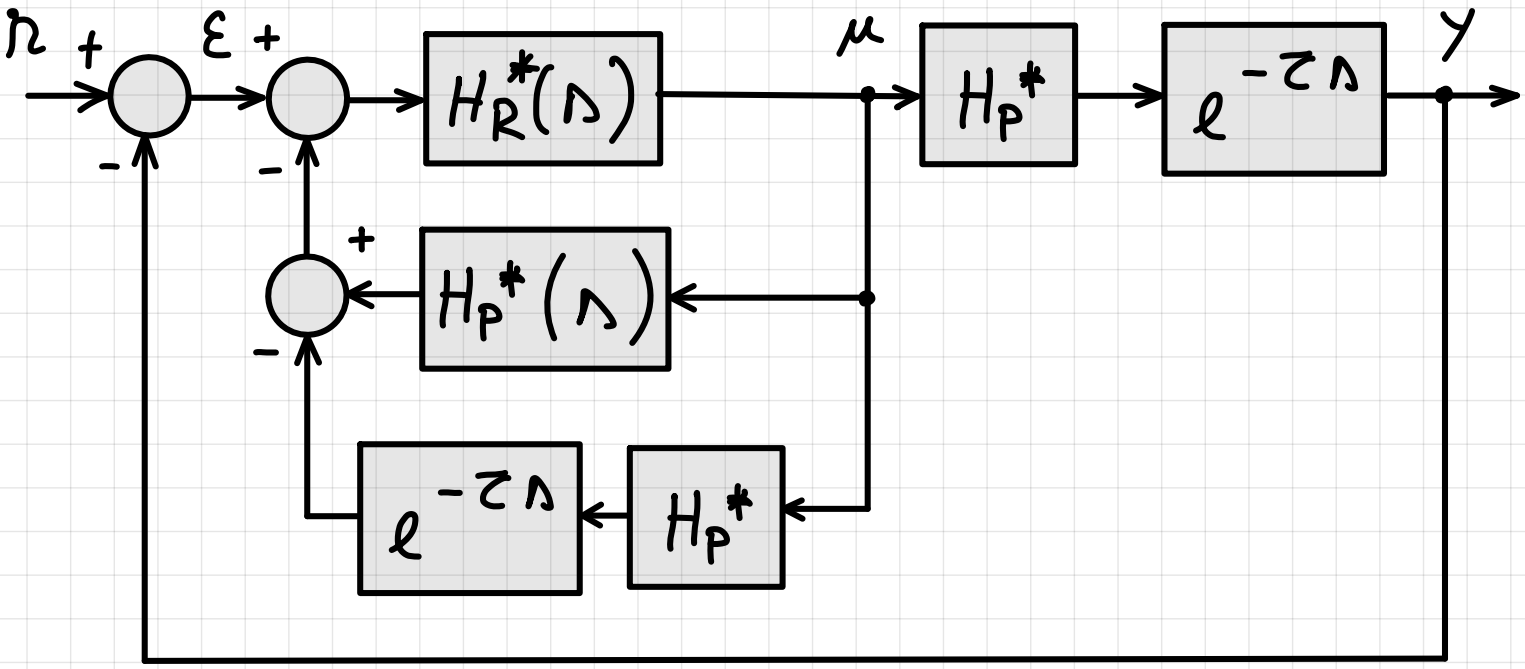
SRA cu Predictor Smith

SRA standard unde

$$H_R(\Lambda) = \frac{H_R^*}{1 + H_R^* \cdot H_p^* \left(1 - e^{-\tau\Lambda}\right)}$$



Varianta implementare Simulink



P1

$$H_p(s) = \frac{0,1}{s + 0,02} \cdot e^{-10s}$$

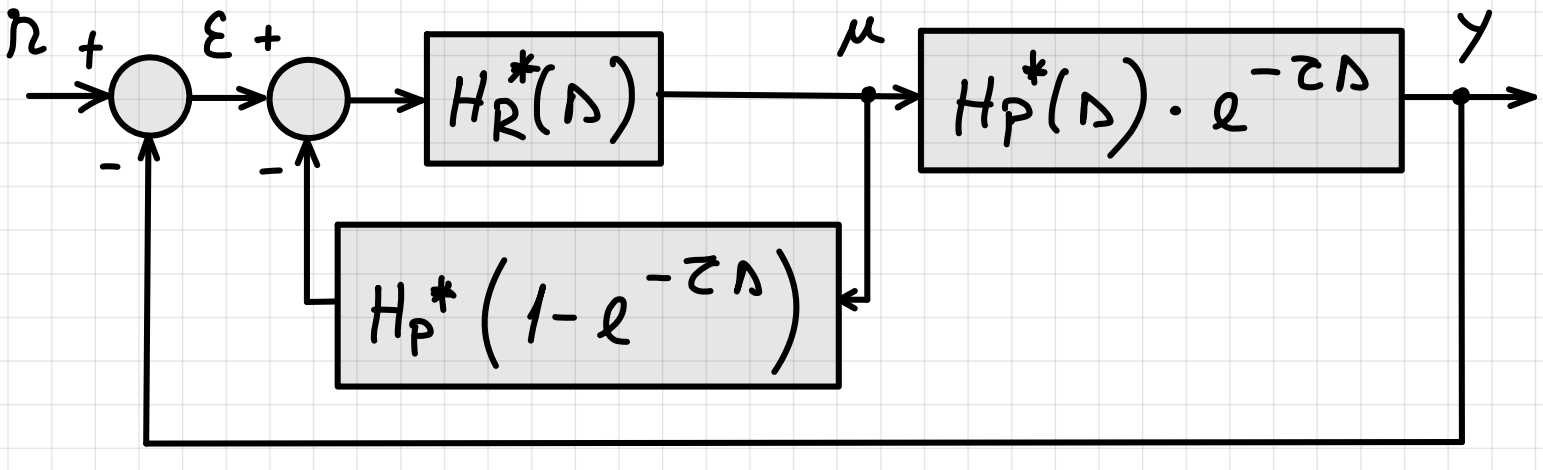
a) Structura SRA care asigură urmărirea referinței și rejecția perturbațiilor

b) Alg. de reglare care asigură

- răsp. aperiodic
- $t_t \leq 130$ sec
- $\varepsilon_{ST} = 0$

Rezolvare

a) SRA cu Predictor Smith



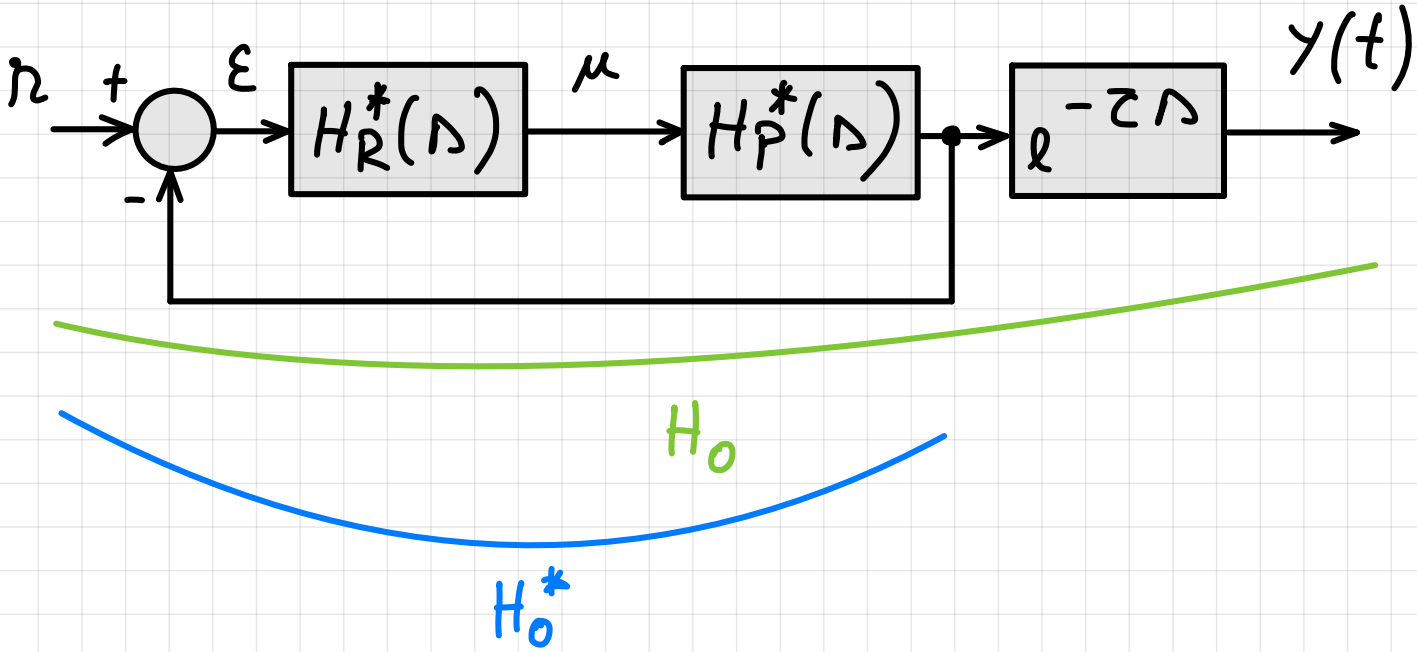
h)

1) Analiza proces

$$H_p(s) = \frac{0,1}{s + 0,02} \cdot e^{-10s} = \frac{5}{50s + 1} \cdot e^{-10s}$$

$T_p = 50$ sec → P. lent fără c.p.

2) Analiză cerințe perf.



H_0 $\begin{cases} \nabla = 0 \\ t_t \leq 130 \text{ sec} \\ \varepsilon_{ST} = 0 \end{cases}$ ⟶ H_0^* $\begin{cases} \nabla^* = 0 \\ t_t^* \leq 120 \text{ sec} \\ \varepsilon_{ST}^* = 0 \end{cases}$!

3) Proiectare

Met. poli - zerouri $\quad H_0^* = \dfrac{K_0^*}{T_0^* s + 1}$

$$\begin{cases} \nabla^* = 0 \ \checkmark \\ t_t^* \le 120 \text{ sec} \Rightarrow T_0^* \le \dfrac{120}{3} \rightarrow T_0^* = 30 \text{ sec} \\ \varepsilon_{ST}^* = 0 \Rightarrow K_0^* = 1 \end{cases}$$

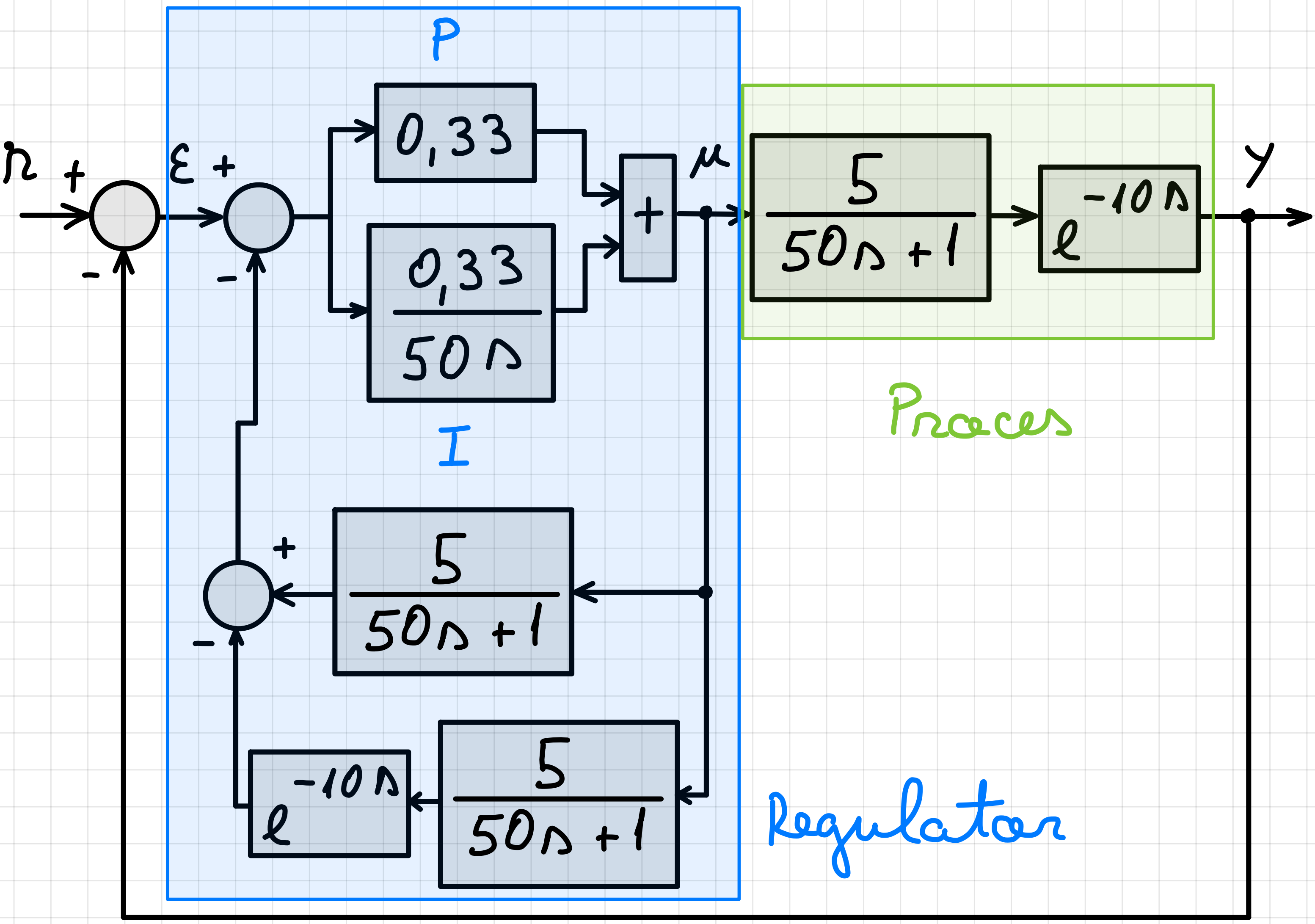
$$H_0^* = \frac{1}{30s+1} \Rightarrow H_d^* = \frac{1}{30s} \Rightarrow$$

$$\Rightarrow H_R^* = \frac{50s+1}{150s} \longrightarrow \text{PI}$$

$$H_R^* = \underbrace{\frac{1}{3}}_{K_R}\left(1 + \underbrace{\frac{1}{50s}}_{T_i}\right)$$

$$H_R(s) = \frac{H_R^*}{1 + H_R^* \cdot H_p^* \left(1 - e^{-\tau s}\right)} =$$

$$= \frac{\dfrac{50s+1}{150s}}{1 + \dfrac{50s+1}{150s} \cdot \dfrac{5}{50s+1}\left(1 - e^{-10s}\right)}$$



r
+
-
ε
+
-
P
0,33
0,33
50s
I
+
μ
5
50s + 1
e^{-10s}
y
Proces
+
-
5
50s + 1
5
50s + 1
e^{-10s}
Regulator