

$$H_1(s) = \frac{5}{s} (s+1)$$

$$H_2(s) = \frac{1}{s}$$

$$H_3(s) = 0,25$$

$$H_4(s) = 4$$

$$H_5(s) = \frac{2}{s+1}$$

$$H_6(s) = 5$$

$$H_7(s) = \frac{8}{4s+1}$$

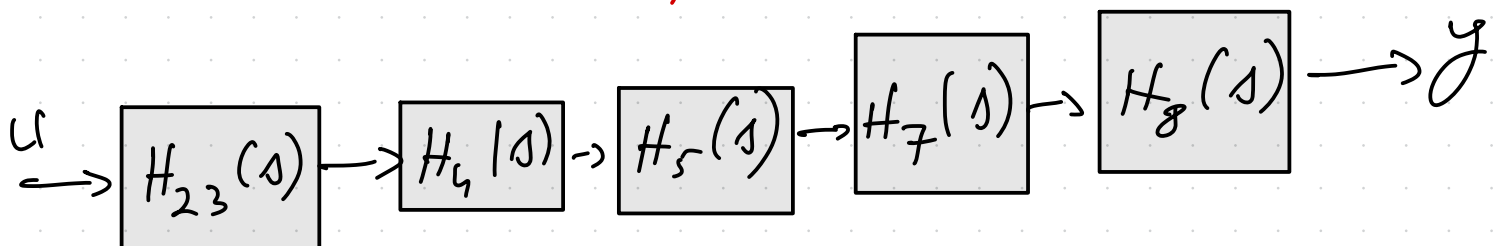
$$H_8(s) = 0,001$$

Tipul ET	Simbolizare	Funcția de transfer în timp continuu
P		$H(s) = k$
I		$H(s) = \frac{k_i}{s}$
D		$H(s) = sk_D$
PT1		$H(s) = \frac{k}{sT+1}$
PI		$H(s) = \frac{k}{sT} (sT+1)$

$$H_{23}(s) = \frac{H_2(s)}{1 + H_2(s)H_3(s)}$$

$$= \frac{\frac{1}{s}}{1 + \frac{1}{s} \cdot 0,25} = \frac{\frac{1}{s}}{1 + \frac{1}{4s}} = \frac{\frac{1}{s}}{\frac{4s+1}{4s}} = \frac{4}{4s+1}$$

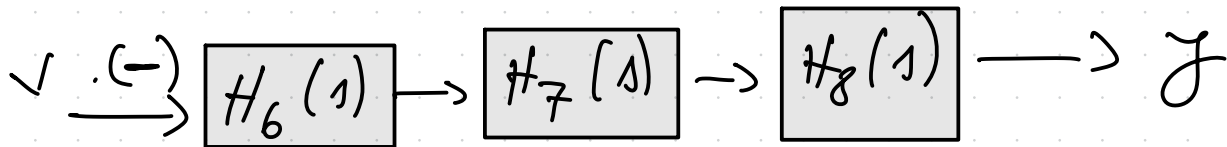
$$\mathcal{I} H_{yu}(s) = \frac{y(s)}{u(s)} \Big|_{u=0}$$



$$H_{yu}(s) = H_{23}(s) \cdot H_4(s) \cdot H_5(s) \cdot H_7(s) \cdot H_8(s)$$

$$H_{yu}(s) = \frac{4}{4s+1} \cdot 4 \cdot \frac{2}{s+1} \cdot \frac{8}{4s+1} \cdot \frac{1}{1000} = \frac{256}{1000} \cdot \frac{1}{(s+1)(4s+1)^2}$$

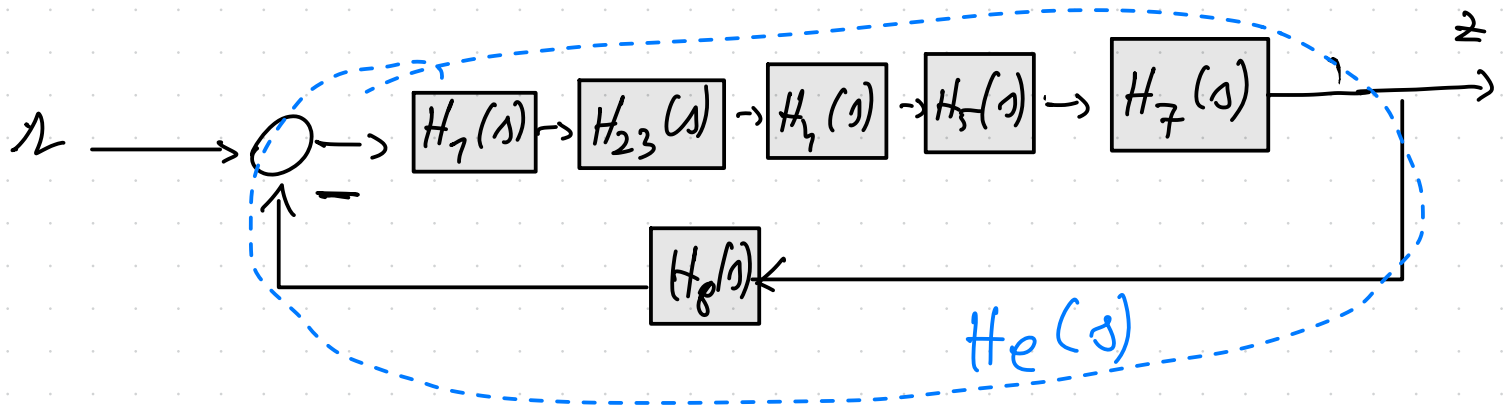
$$\text{II } H_{yv}(s) = \frac{Y(s)}{V(s)} \Big|_{u=0}$$



$$H_{yv}(s) = -H_6(s) \cdot H_7(s) \cdot H_8(s)$$

$$H_{yv}(s) = -5 \cdot \frac{8}{4s+1} \cdot \frac{1}{1000} = -\frac{4}{100} \cdot \frac{1}{4s+1} = -\frac{1}{25(4s+1)}$$

$$\text{III } H_{zu}(s) = \frac{Z(s)}{U(s)} \Big|_{v=0}$$

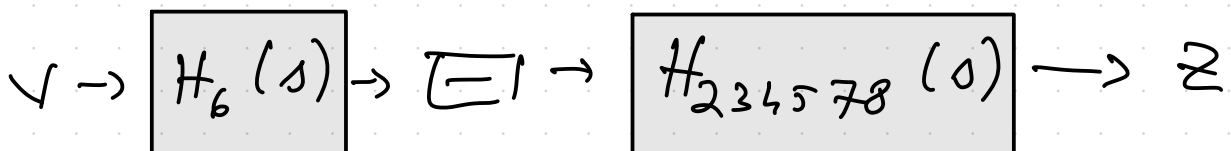
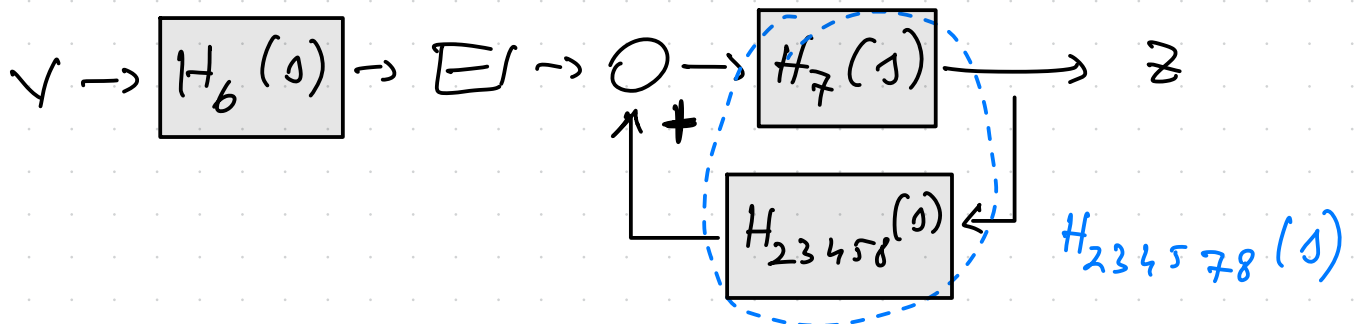
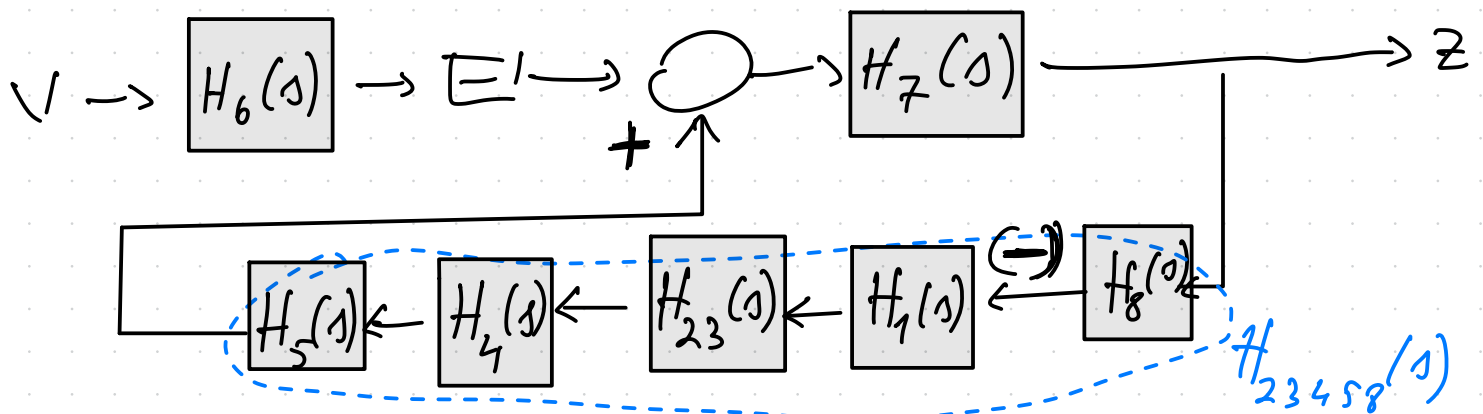


$$H_{zu}(s) = H_e(s)$$

$$H_e(s) = \frac{H_1(s) \cdot H_{23}(s) \cdot H_4(s) \cdot H_5(s) \cdot H_7(s)}{1 + H_1(s) H_{23}(s) H_4(s) H_5(s) H_7(s) H_8(s)}$$

$$\begin{aligned}
 H_{Z1}(s) &= \frac{\cancel{5}(s+1)}{\cancel{4s+1}} \cdot 4 \cdot \frac{\cancel{2}}{\cancel{4s+1}} \cdot \frac{8}{4s+1} \\
 &= \frac{1 + \frac{1}{100} \cdot \frac{\cancel{8}(s+1)}{\cancel{4s+1}} \cdot 4 \cdot \frac{\cancel{2}}{\cancel{4s+1}} \cdot \frac{8}{4s+1}}{1 + \frac{4 \cdot 4 \cdot 8}{100} \cdot \frac{1}{(4s+1)^2}} \\
 &= \frac{\frac{5 \cdot 4 \cdot 4 \cdot 2 \cdot 8}{100 (4s+1)^2}}{\frac{5 \cdot 4 \cdot 4 \cdot 2 \cdot 8}{100 (4s+1)^2 + 4 \cdot 4 \cdot 8}} \\
 &= \frac{5 \cdot 4 \cdot 4 \cdot 2 \cdot 8 \cdot 100}{100 (4s+1)^2 + 4 \cdot 4 \cdot 8} = \frac{32000}{25 (4s+1)^2 + 32}
 \end{aligned}$$

11 $H_{ZV}(s) = \frac{Z(s)}{V(s)} \Big|_{z=0}$



$$H_{ZV}(s) = -H_6(s) \cdot H_{234578}(s)$$

$$H_{234578}(s) = \frac{H_7(s)}{1 + H_7(s) H_{23458}(s)}$$

$$H_{23458}(s) = H_{23}(s) \cdot H_4(s) \cdot H_5(s) \cdot H_8(s)$$

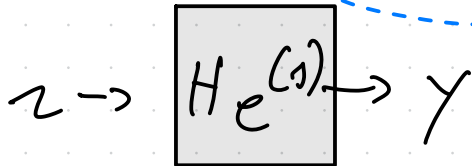
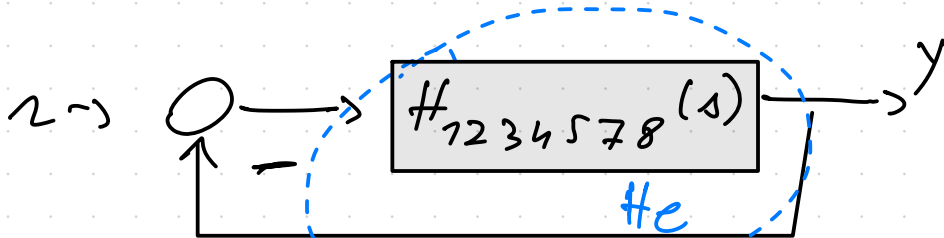
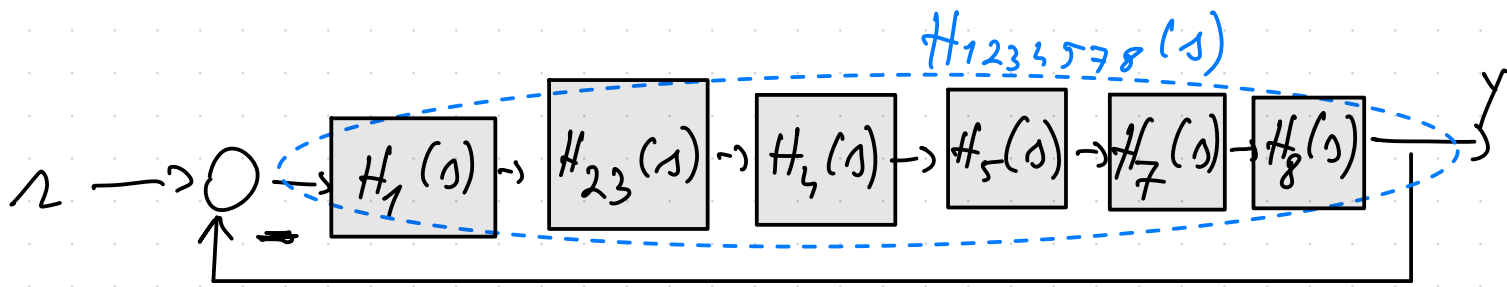
$$H_{23458}(s) = \frac{4}{4s+1} \cdot 4 \cdot \frac{2}{s+1} \cdot \frac{1}{1000} = \frac{32}{1000} \cdot \frac{1}{(s+1)(4s+1)}$$

$$H_{234578}(s) = \frac{\frac{8}{4s+1}}{1 + \frac{256}{1000} \cdot \frac{1}{(s+1)} \cdot \frac{1}{(4s+1)^2}} =$$

$$= \frac{\frac{8}{4s+1}}{\frac{1000(s+1)(4s+1)^2 + 256}{100(s+1)(4s+1)^2}} = \frac{800(s+1)(4s+1)}{1000(s+1)(4s+1)^2 + 256}$$

$$H_{ZV}(s) = - \frac{4000(s+1)(4s+1)}{1000(s+1)(4s+1)^2 + 256}$$

$$\underline{\text{VI}} \quad H_{y2}(s) = \frac{Y(s)}{1(s)} \Big|_{v=0}$$



$$H_e(s) = \frac{H_{1234578}(s)}{1 + H_{1234578}(s)}$$

$$H_{y2}(s) = H_e(s)$$

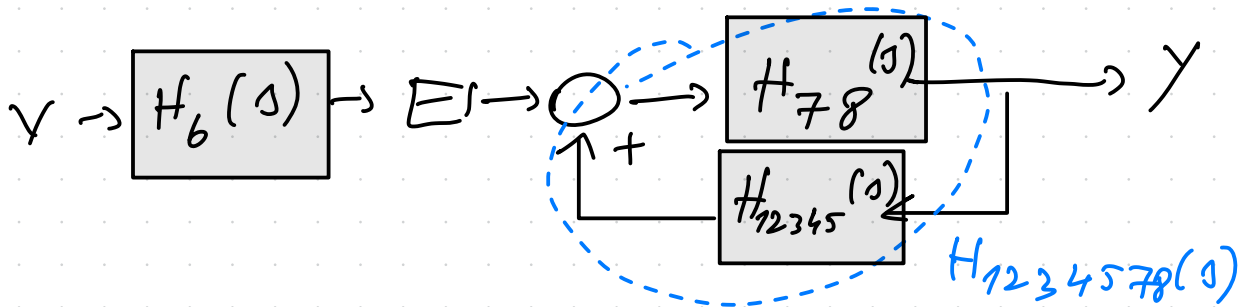
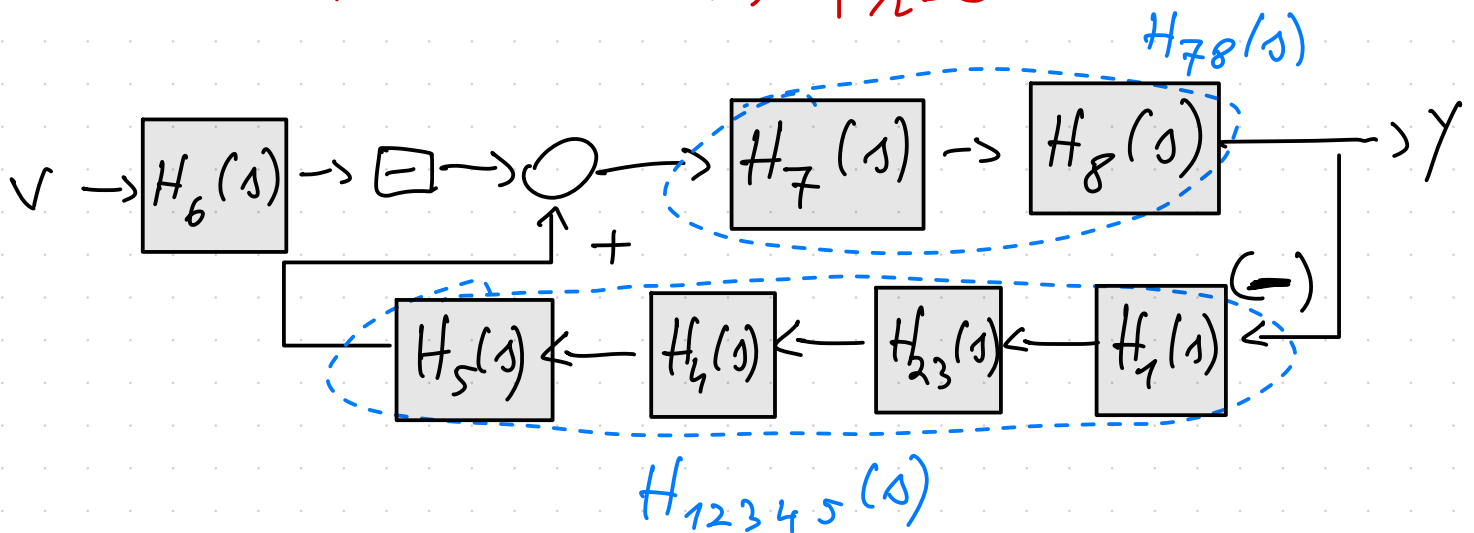
$$H_{1234578}(s) = \frac{5}{s} \cdot \frac{4}{4s+1} \cdot 4 \cdot \frac{2}{s+1} \cdot \frac{8}{4s+1} \cdot \frac{1}{100}$$

$$= \frac{128}{100} \cdot \frac{1}{s(4s+1)^2}$$

$$H_e(s) = \frac{\frac{128}{100} \cdot \frac{1}{s(4s+1)^2}}{1 + \frac{128}{100 s(4s+1)^2}} = \frac{\frac{128}{100} \cdot \frac{1}{s(4s+1)^2}}{\frac{100 s(4s+1)^2 + 128}{100 s(4s+1)^2}}$$

$$H_{y2}(s) = \frac{128}{100 s(4s+1)^2 + 128}$$

$$\underline{\underline{VI}} \quad H_{\gamma v}(s) = \frac{\gamma(s)}{v(s)} \quad | \quad \lambda=0$$



$$v \rightarrow H_6(s) \rightarrow \Sigma \rightarrow H_{1234578}(s) \rightarrow \gamma$$

$$H_{\gamma v}(s) = - H_6(s) \cdot H_{1234578}(s)$$

$$H_{1234578}(s) = \frac{H_{78}(s)}{1 + H_{78}(s) H_{12345}(s)}$$

$$H_{78}(s) = H_7(s) \cdot H_8(s)$$

$$H_{12345}(s) = (-) H_1(s) \cdot H_{23}(s) \cdot H_4(s) \cdot H_5(s)$$

$$H_{72345}(s) = -\frac{5}{3} \cancel{(s+1)} \cdot \frac{4}{4s+1} \cdot 4 \cdot \frac{2}{\cancel{s+1}} = \frac{1600}{3(4s+1)}$$

$$H_{78}(s) = \frac{8}{4s+1} \cdot \frac{1}{1000} = \frac{8}{1000(4s+1)}$$

$$H_{7234578}(s) = \frac{\frac{8}{1000(4s+1)}}{1 - \frac{8}{1000(4s+1)} \cdot \frac{1600}{3(4s+1)}} =$$

$$= \frac{\frac{8}{1000(4s+1)}}{\frac{10s(4s+1)^2 - 8 \cdot 16}{10s(4s+1)^2}} = \frac{8 \cdot 10s(4s+1)}{1000[10s(4s+1)^2 - 8 \cdot 16]}$$

$$H_{yv}(s) = -\frac{\cancel{8} \cdot 8s(4s+1)}{\cancel{1000} \cdot 2[5s(4s+1)^2 - 64]}$$

$$H_{yv}(s) = -\frac{s(4s+1)}{25s(4s+1)^2 - 320}$$