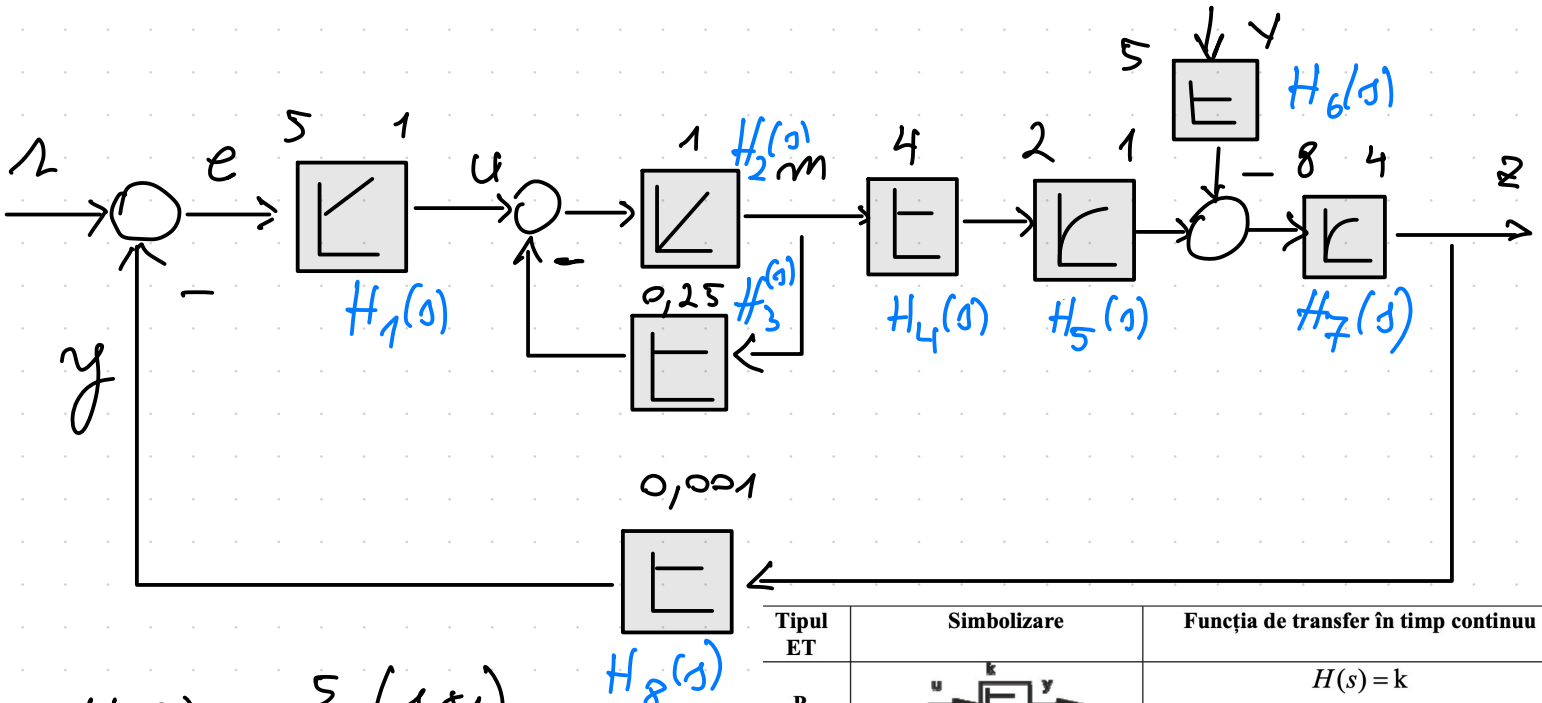
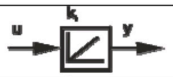
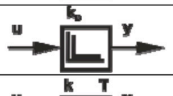
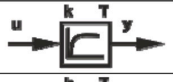


Tipul ET	Simbolizare	Funcția de transfer în timp continuu
P		$H(s) = k$
I		$H(s) = \frac{k_i}{s}$
D		$H(s) = sk_D$
PT1		$H(s) = \frac{k}{sT+1}$
PI		$H(s) = \frac{k}{sT}(sT+1)$

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

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

$H_3(s) = 0,25$

$H_4(s) = 4$

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

$H_6(s) = 5$

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

$H_8(s) = 0,001$

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

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

$$H_{yu}(s) = \left.\frac{y(s)}{U(s)}\right|_{V=0}$$

$u \longrightarrow H_{23}(s) \longrightarrow H_4(s) \rightarrow H_5(s) \rightarrow H_7(s) \rightarrow H_8(s) \longrightarrow y$

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

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

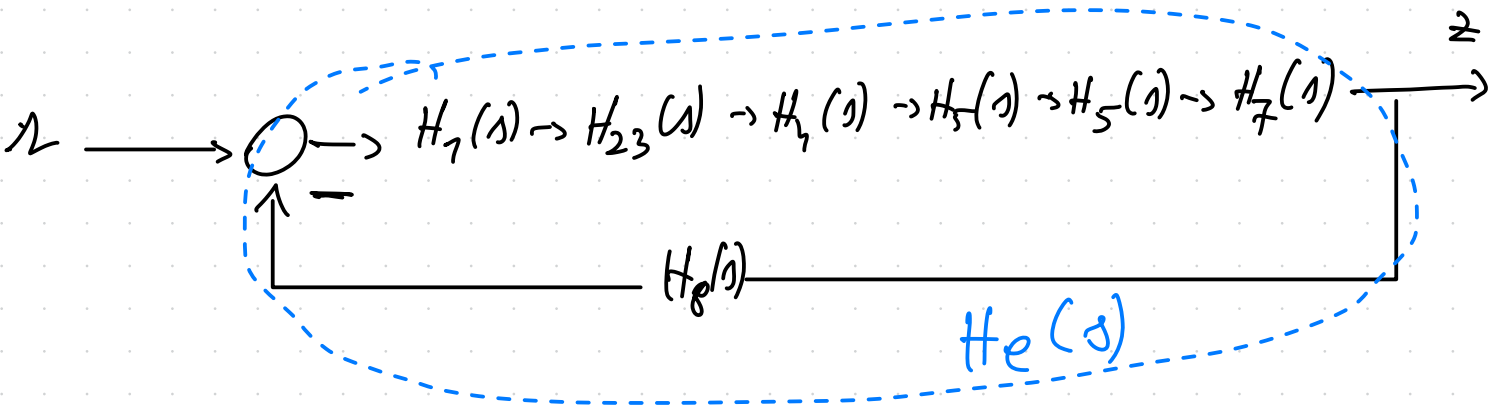
II $H_{yv}(s) = \left.\frac{Y(s)}{V(s)}\right|_{u=0}$

$V \longrightarrow H_6(s) \rightarrow H_7(s) \rightarrow H_8(s) \longrightarrow Y$

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

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

III $H_{zz}(s) = \left.\frac{Z(s)}{Z(s)}\right|_{v=0}$



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

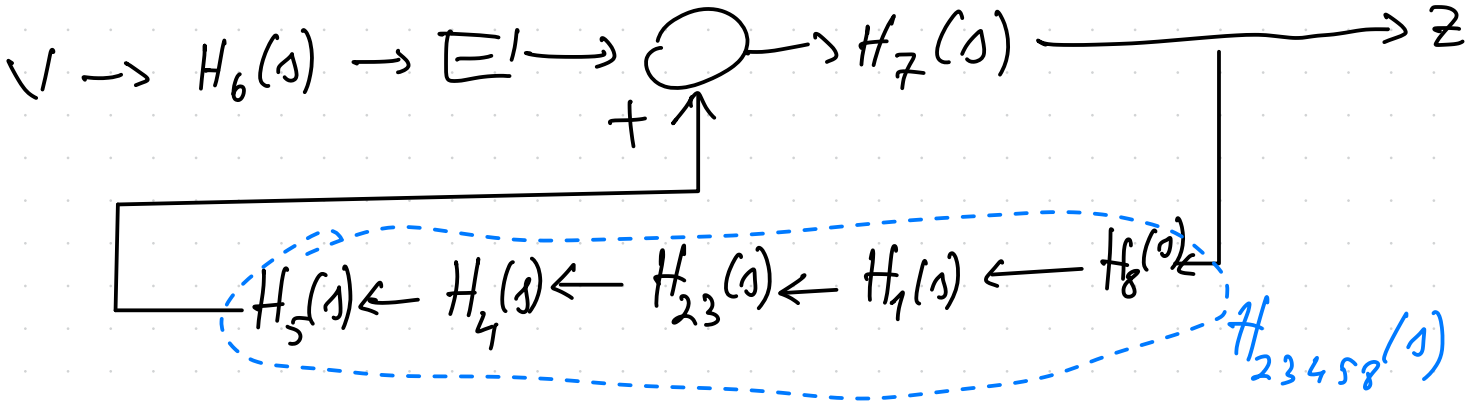
$$H_e(s) = \frac{H_1(s) \cdot H_{23}(s) \cdot H_4(s) \cdot H_5(s) \cdot H_7(s)}{1 + H_1(s)\, H_{23}(s)\, H_4(s)\, H_5(s)\, H_7(s)\, H_8(s)}$$

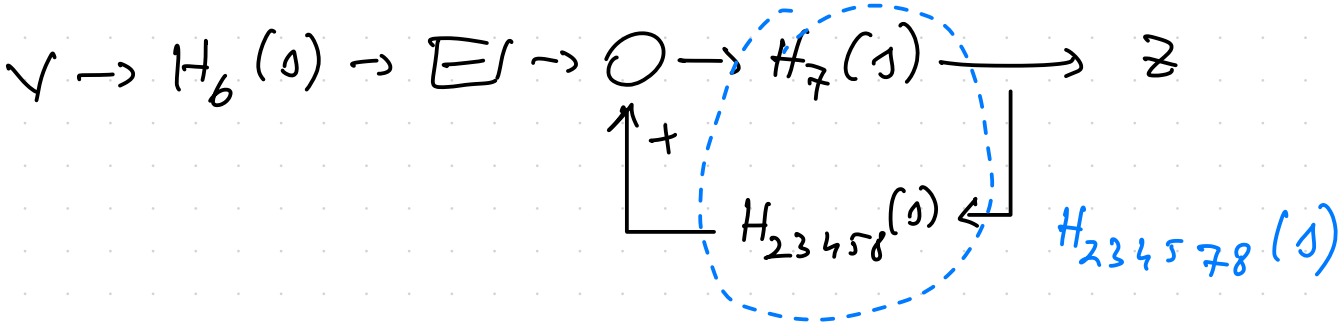
$$H_{Z1}(s) = \frac{\frac{5}{s}\cdot\frac{4}{4s+1}\cdot 4\cdot\frac{2}{s+1}\cdot\frac{8}{4s+1}}{1+\frac{5}{s}\cdot\frac{4}{4s+1}\cdot 4\cdot\frac{2}{s+1}\cdot\frac{8}{4s+1}\cdot\frac{1}{1000}}$$

$$H_{Z1}(s) = \frac{\frac{5\cdot 256}{s(4s+1)^2}}{1+\frac{5\cdot 256}{1000s(4s+1)^2}} = \frac{5\cdot 256}{s(4s+1)^2}\cdot\frac{1000s(4s+1)^2}{1000s(4s+1)^2+5\cdot 256}$$

$$H_{Z1}(s) = \frac{5\cdot 256\cdot 1000}{1000s(4s+1)^2+5\cdot 256}$$

IV $H_{ZV}(s) = \left.\frac{Z(s)}{V(s)}\right|_{1=0}$





V → $H_6(s)$ → Σ → $H_{234578}(s)$ → Z

$$H_{ZV}(s) = -H_6(s) \cdot H_{23458}(s)$$

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

$$H_{23458}(s) = H_2(s) \cdot H_4(s) \cdot H_5(s) \cdot H_8(s)$$

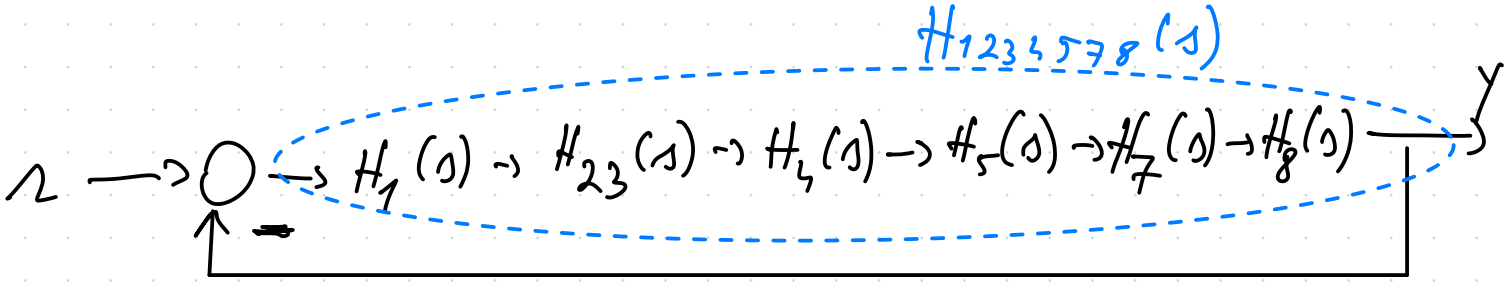
$$H_{23458}(s) = \frac{4}{4s+1} \cdot 4 \cdot \frac{2}{s+1} \cdot \frac{1}{1000} = \frac{32}{1000} \frac{1}{(s+1)(4s+1)}$$

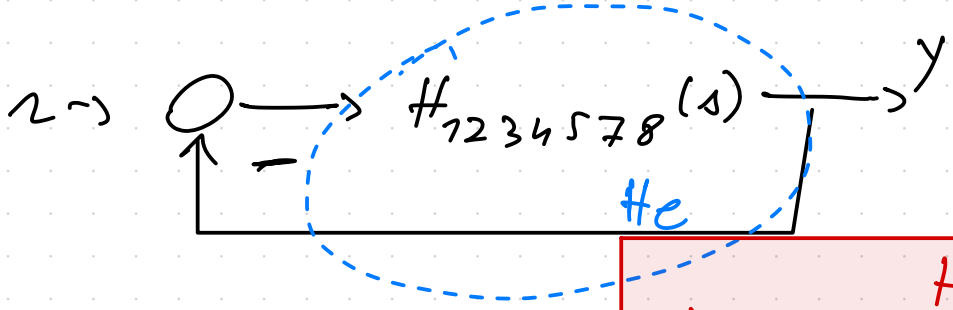
$$H_{234578}(s) = \frac{\frac{8}{4s+1}}{1 + \frac{256}{1000} \frac{1}{(s+1)} \cdot \frac{1}{(4s+1)^2}} =$$

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

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

V $H_{yz}(s) = \left.\frac{Y(s)}{Z(s)}\right|_{V=0}$





$z \to H_e(s) \to y$

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

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

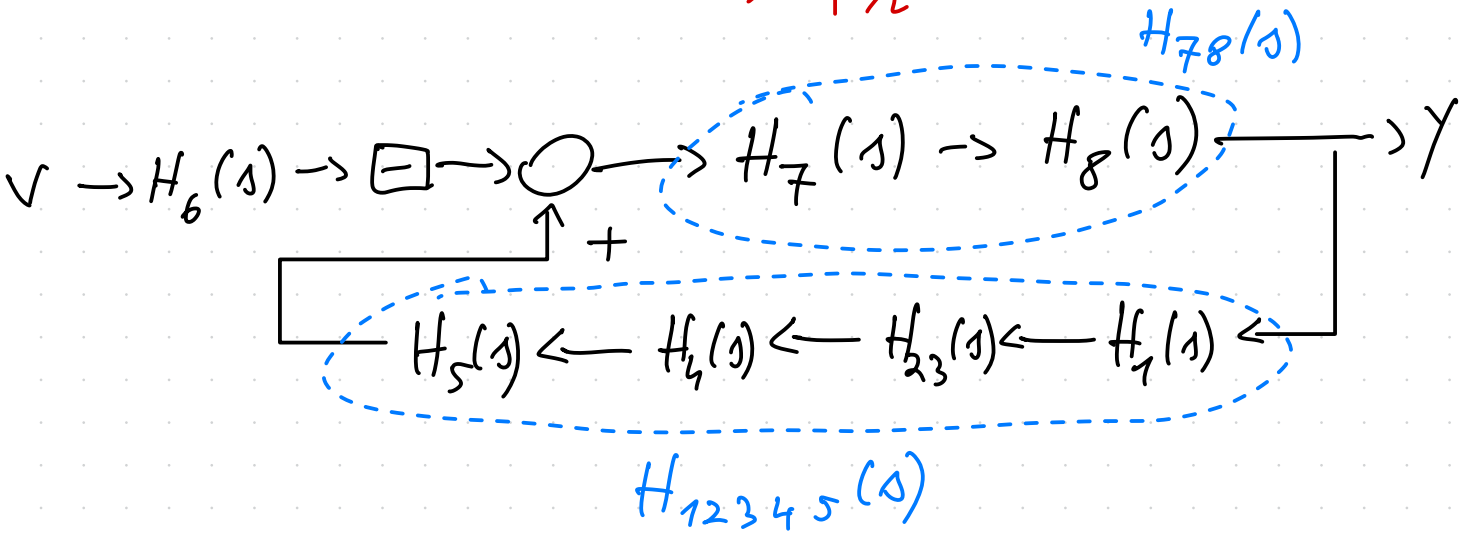
$$H_{1234578}(s) = \frac{5}{s}\cancel{(s+1)}\,\frac{4}{4s+1}\cdot 4 \cdot \frac{2}{\cancel{s+1}} \cdot \frac{8}{4s+1} \cdot \frac{1}{\cancel{100}}$$

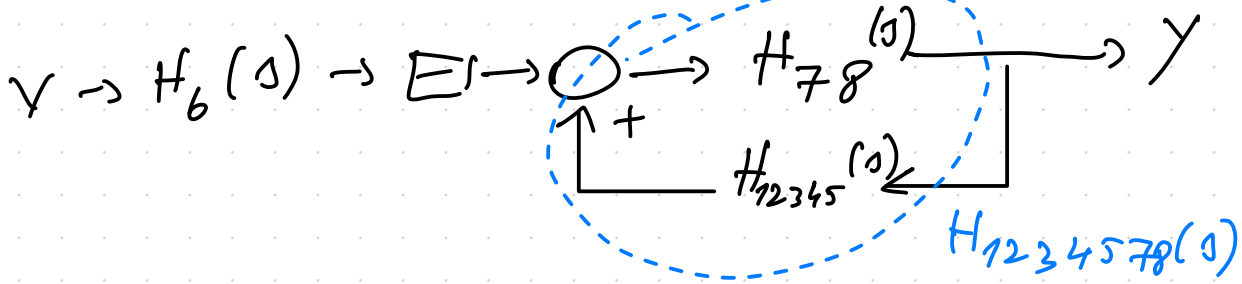
$$= \frac{128}{100}\,\frac{1}{s(4s+1)^2}$$

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

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

VI $H_{yv}(s) = \left.\frac{Y(s)}{V(s)}\right|_{x=0}$





V → $H_6(s)$ → $H_{123457}(s)$ → Y

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

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

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

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

$$H_{12345}(s) = \frac{5}{s}\cancel{(s+1)} \cdot \frac{4}{4s+1} \cdot 4 \cdot \frac{2}{\cancel{s+1}} = \frac{1600}{s(4s+1)}$$

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

$$H_{12345\,78}(s) = \frac{\dfrac{8}{1000(4s+1)}}{1 + \dfrac{8}{1000(4s+1)} \cdot \dfrac{1600}{s(4s+1)}} =$$

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

$$H_{yv}(s) = \frac{-\cancel{8} \cdot \cancel{8}s(4s+1)}{\cancel{100 \cdot 2}\left[5s(4s+1)^2 + 64\right]}$$

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