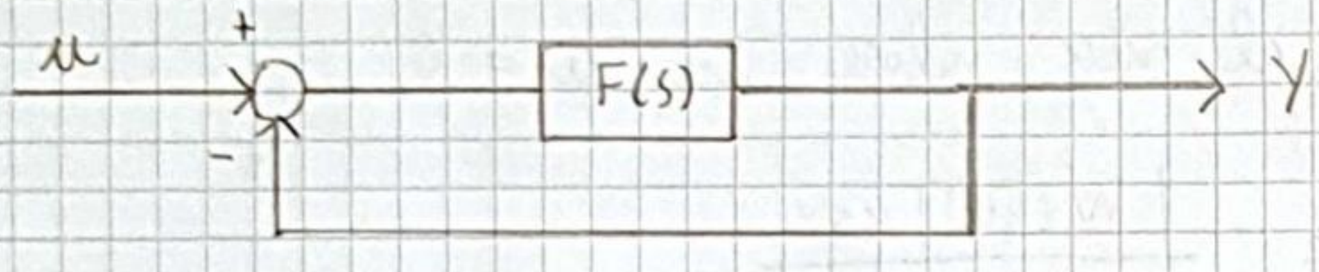
SENSIBILITÀ A VARIAZIONI PARAMETRICHE



$$F_1(s) = \frac{5}{(s+p)} \qquad F_2(s) = \frac{5}{s(s+p)} \qquad p > 0$$

$$W_1(s) = \frac{5}{s+p+5} \qquad W_2(s) = \frac{5}{s^2+ps+5}$$

$$u(t) = \delta_{-1}(t) \longrightarrow \tilde{Y} = ??$$

$$\tilde{Y}_1(t) = W_1(s)\Big|_{s=0} = \frac{5}{5+p} \longrightarrow \text{DIPENDE DA } p$$

$$\tilde{e}_{0,1} = 1 - \tilde{Y}_1(t) = 1 - \frac{5}{5+p}$$

$$\tilde{Y}_2(t) = W_2(s)\Big|_{s=0} = 1 \qquad (\tilde{e}_{0,2} = 0)$$

$$\lceil W(s,p) \rfloor$$

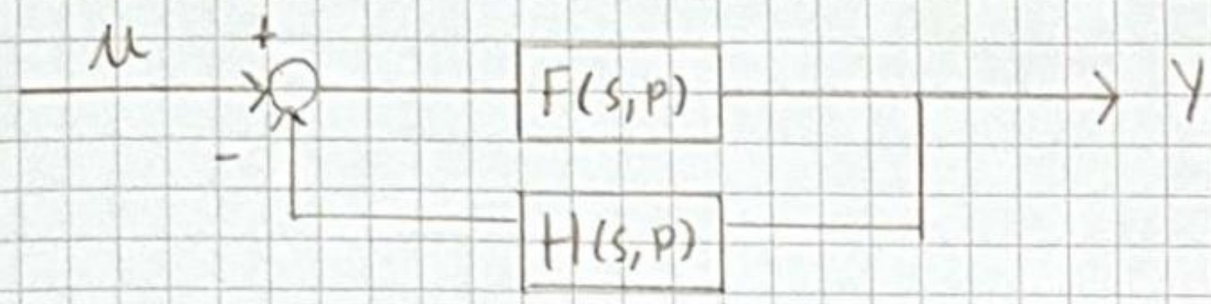
$$S_p^W(s,p) = \frac{\frac{\Delta W(s,p)}{W(s,p)}}{\frac{\Delta p}{p}}$$

↳ FUNZIONE SENSIBILITÀ

$$\longrightarrow \boxed{S_p^W(s,p) = \frac{\partial W(s,p)}{\partial p} \cdot \frac{p}{W(s,p)}}$$

↓

SENSIBILITÀ DELLA FUNZIONE DI TRASFERIMENTO IN CATENA CHIUSA $W(s,p)$ RISPETTO AL PARAMETRO p



$$W(s) = \frac{F(s)}{1 + H(s)\,F(s)}$$

$$S_p^W(s,p) = \frac{\partial W(s,p)}{\partial p} \cdot \frac{p}{W(s,p)} =$$

$$= \frac{\partial W(s,p)}{\partial F} \cdot \frac{\partial F}{\partial p} \cdot \frac{p}{W(s,p)} \cdot \frac{F(s,p)}{F(s,p)} =$$

$$= \underbrace{\left(\frac{\partial W(s,p)}{\partial F} \cdot \frac{F(s,p)}{W(s,p)}\right)} \cdot \underbrace{\left(\frac{\partial F}{\partial p} \cdot \frac{p}{F(s,p)}\right)} = S_F^W \cdot S_p^F$$

In modo analogo $\rightarrow$ $S_p^W = S_H^W \cdot S_p^H$

- $S_F^W = \frac{\partial W}{\partial F} \cdot \frac{F}{W}$ $\qquad W = \frac{F}{1+HF}$

$$\frac{\partial W}{\partial F} = \frac{1 + FH - HF}{(1+HF)^2} = \frac{1}{(1+HF)^2}$$

$$S_F^W = \frac{1}{(1+HF)^2} \cdot F \cdot \frac{1}{W} = \frac{1}{(1+HF)^2} \cdot F \cdot \frac{1+HF}{F} =$$

$$= \frac{1}{1+HF} = \frac{1}{1 + H(s)\,F(s)}$$

- $S_H^W = \frac{\partial W}{\partial H} \cdot \frac{H}{W}$

$$\frac{\partial W}{\partial H} = \frac{\partial}{\partial H}\left(\frac{F}{1+HF}\right) = \frac{-F^2}{(1+HF)^2}$$

$$S_H^W = -\frac{F^2}{(1+HF)^2} \cdot H \cdot \frac{1+HF}{F} = -\frac{H(s)\,F(s)}{1 + H(s)\,F(s)}$$