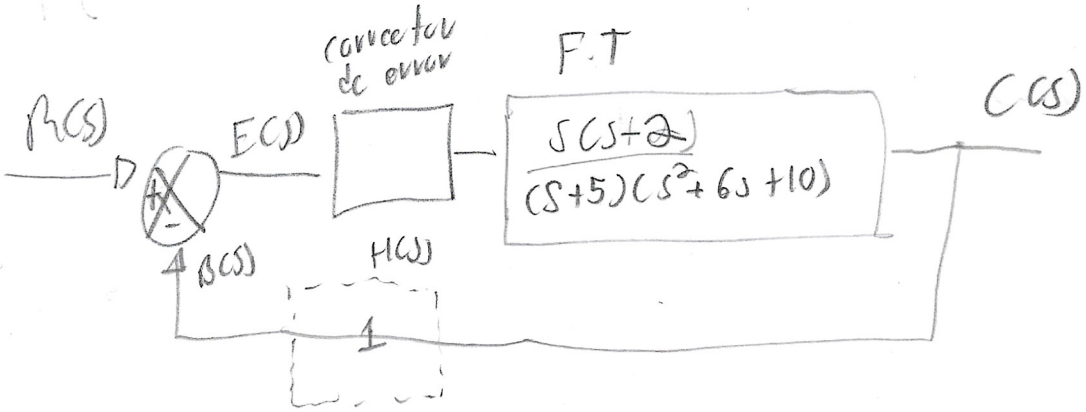


$$e_{ee} = \lim_{s \to 0} \frac{s\,R(s)}{1 + H(s)G(s)}$$

$$e_{ee} = \lim_{s \to 0} \frac{s\frac{1}{s}}{1 + \frac{s(s+2)}{(s+5)(s^2+6s+10)}} = \lim_{s \to 0} \frac{1}{\frac{(s+5)(s^2+6s+10) + s(s-2)}{(s+5)(s^2+6s+10)}}$$

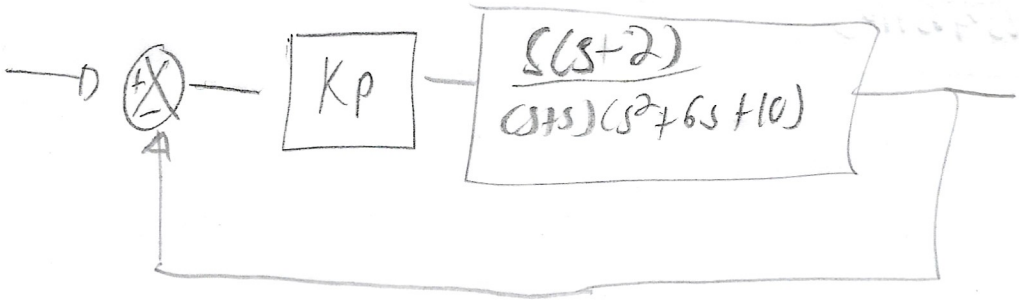
$$= \lim_{s \to 0} \frac{s^3+6s^2+10s+5s^2+30s+50}{s^3+6s^2+10s+5s^2+30s+50+s^2+2s}$$

$$= \frac{50}{50} = 1 = 100\,\%$$

Observamos que el error es mayor al 2%

⇒ Necesitamos una estrategia para reducirlo

Haciendo uso de un integrador



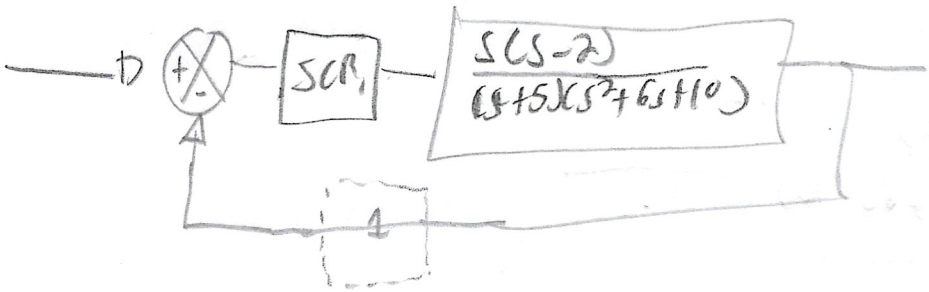
$$e_{ss} = \lim_{s \to 0} \frac{s\left(\frac{1}{s}\right)}{1 + \frac{Kp(s-2)s}{(s+5)(s^2+6s+10)}}$$

$$= \lim_{s \to 0} \frac{1}{\frac{(s+5)(s^2+6s+10) + Kp\,s(s-2)}{(s+5)(s^2+6s+10)}}$$

$$= \lim_{s \to 0} \frac{s^3+6s^2+10s+5s^2+30s+50}{s^3+6s^2+10s+5s^2+30s+50+Kps^2-Kps2}$$

$$= \frac{50}{50} 1 = 100\%$$

Haciendo uso de un Integrador



$$e_{ee} = \lim_{s \to 0} \frac{s\left(\frac{1}{s}\right)}{1 + \frac{s(s-2)}{s(s+5)(s^2+6s+10)}}$$

$$= \lim_{s \to 0} \frac{1}{\frac{(s+5)(s^2+6s+10) + s - 2}{(s+5)(s^2+6s+10)}}$$

$$= \lim_{s \to 0} \frac{s^3+6s^2+10s+5s^2+30s+50}{s^3+6s^2+10s+5s^2+30s+50+s-2}$$

$$= \frac{50}{48} = 1.04 = 104\%$$