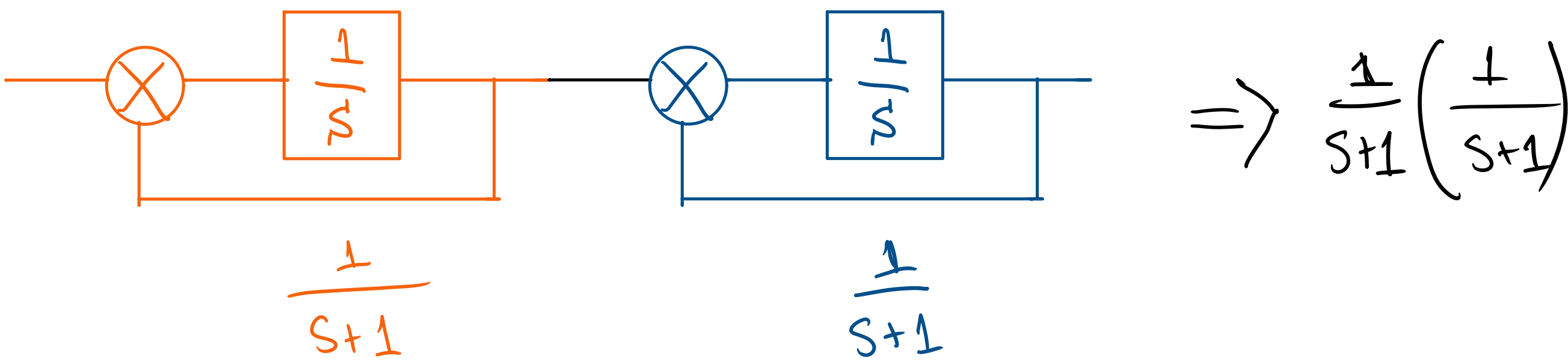
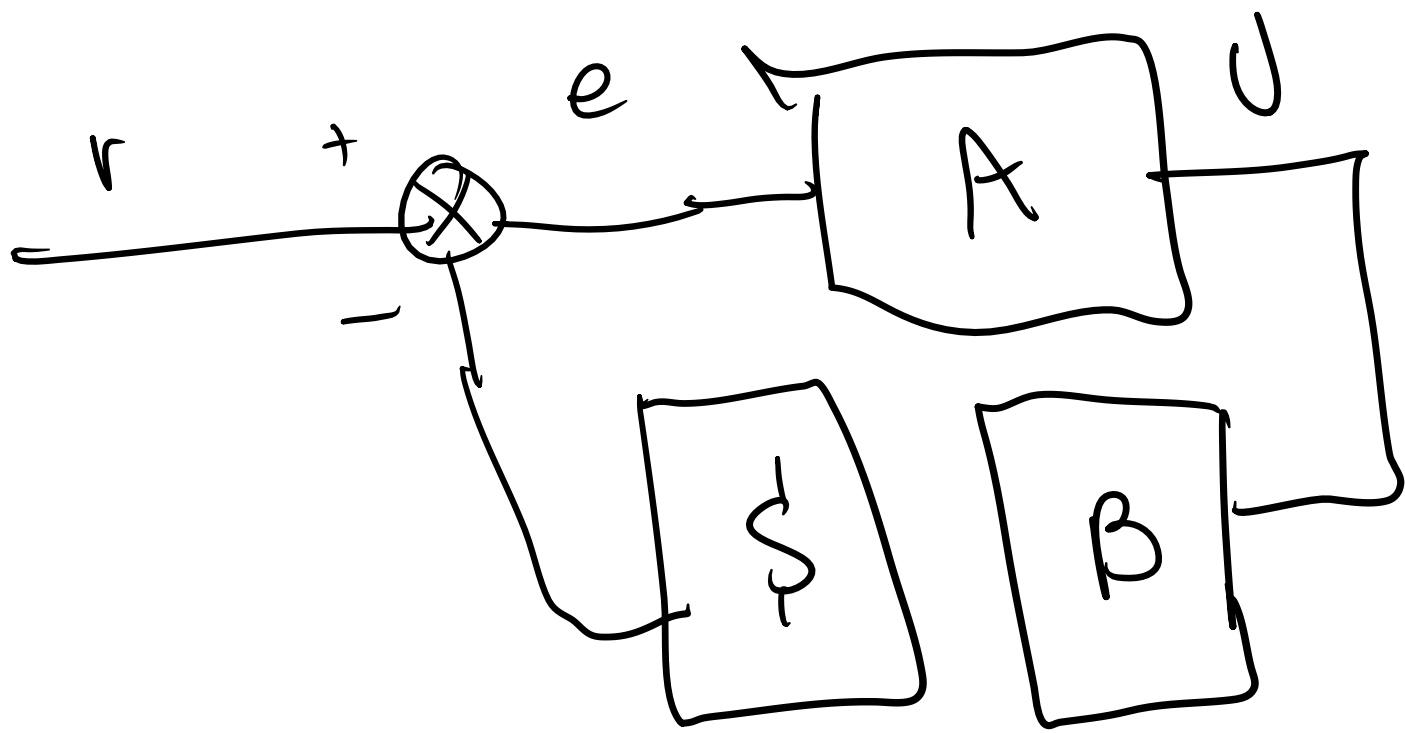


$$\frac{K\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2} = \frac{A}{s^2 + B + C} = \frac{A}{(s+D)(s+E)}$$

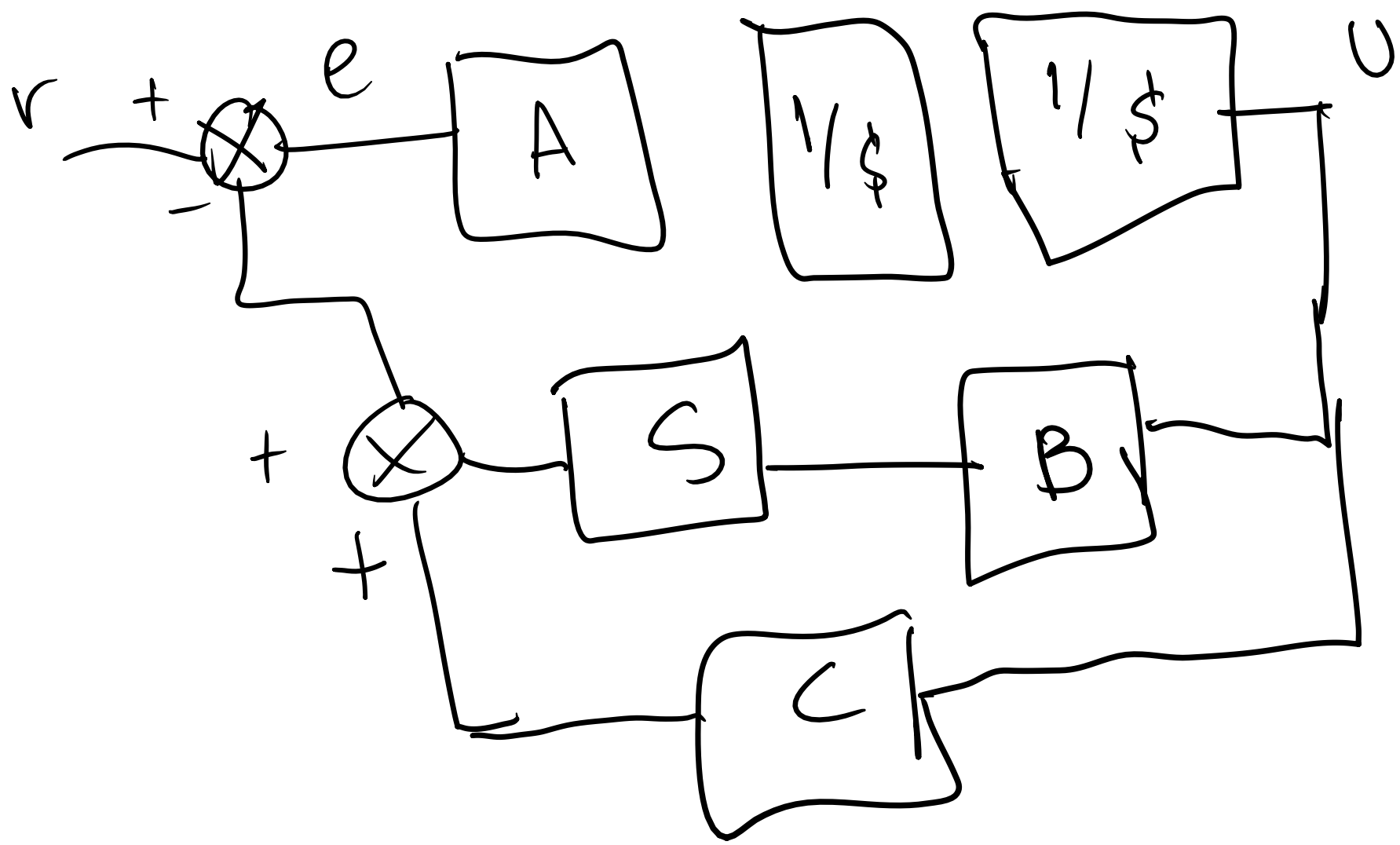
Therefore, one way to solved could be:



Emulation 1st order



Emulation 2nd order



$$\frac{U}{r} = \frac{A}{s^2 + ABs + AC} = \frac{K\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$$

$$\begin{aligned} A &= K\omega_n^2 \\ B &= \frac{2\zeta}{\omega_n K} \\ C &= \frac{1}{K} \end{aligned}$$

$$\begin{aligned} T_s &= 30s \\ K &= 1.2 \\ \gamma OS &= 33\% \end{aligned}$$

$$\omega_n = \frac{4}{T_s \zeta} = \frac{4}{30 \zeta} \therefore \zeta = 0.7430$$

$$\therefore \omega_n = 0.2188$$