03 Primeiro, nota-se que

$$\Psi(s)\cdot\frac{N}{s}=H(s)$$

$$\Psi(s)=\frac{sH(s)}{N}$$

$$\left((R(s)-H(s))K_p-\frac{sH(s)}{N}\right)\frac{K_\psi\cdot a\cdot N}{(s+a)s^2}=H(s)$$

$$K_pK_\psi aN\,R(s)-K_pK_\psi aN\,H(s)-sK_\psi a\,H(s)=(s^3+as^2)H(s)$$

$$K_pK_\psi aN\,R(s)=s^3+as^2+aK_\psi s+aK_\psi K_pN)H(s)$$

$$G_F(s)=\frac{K_pK_\psi aN}{s^3+as^2+aK_\psi s+aK_\psi K_pN}$$

As relações são:

$$\begin{cases} bw_n^2=K_pK_\psi aN \\ 2\xi w_n+b=a \quad * \\ w_n^2+2\xi w_n b=aK_\psi \end{cases}$$

b) de *: $b=a-2\xi w_n$

$$a-2\xi w_n\geq 5\xi w_n$$

$$\boxed{a\geq 7\xi w_n}$$