1 a) $G(s) = \dfrac{s+10}{(s+4)(s+2)^2}$

ceros: $s = -10$

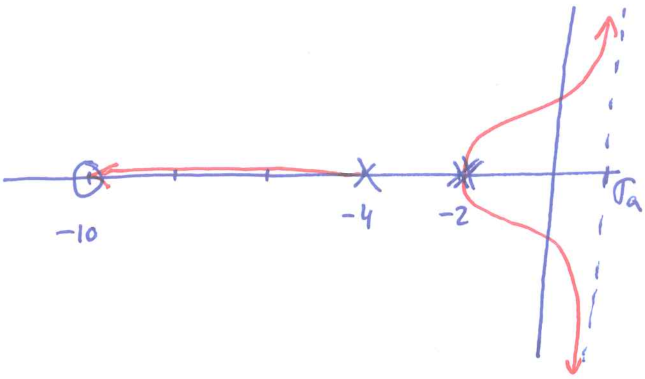
polos: $s = -2, -2,$ ...

Grado rel. $2 \Rightarrow$ 2 asín... ...ales

$\sigma_a = \dfrac{-4-2-2-(\ldots}{2}$

Punto de ruptura ... ...lo

doble: $\underline{\underline{\sigma_r = -2}}$



b) $G_{BC} = \dfrac{1}{1+KG(s)} = \dfrac{K(s+10)}{(s+4)(s^2+4+4s)+Ks+10K} = \dfrac{K(\ldots}{s^3+4s+\ldots \ldots 6s+Ks+10K}$

$= \dfrac{K(s+10)}{s^3+8s^2\ (20+K)s+(16+10K)s^0}$ Rango de estab... ...Routh

s^3	1	$20+K$
s^2	8	$16+10K$
s^1	a_{11}	0
s^0	$16+10K$	0

$a_{11} = \dfrac{(20+K)8-16-10K}{8} = \dfrac{160-16 \ldots}{8 \ldots} \ldots \dfrac{\ldots 4-\ldots}{8}$

Estabilidad: 1ª columna positiv...

$\dfrac{144-2K}{8} > 0 \Rightarrow 72-K>0 \Rightarrow K \ldots$

$16+10K>0 \Rightarrow K > \dfrac{-16}{10}$

Como $K>0 \Rightarrow K \in (0, 72)$

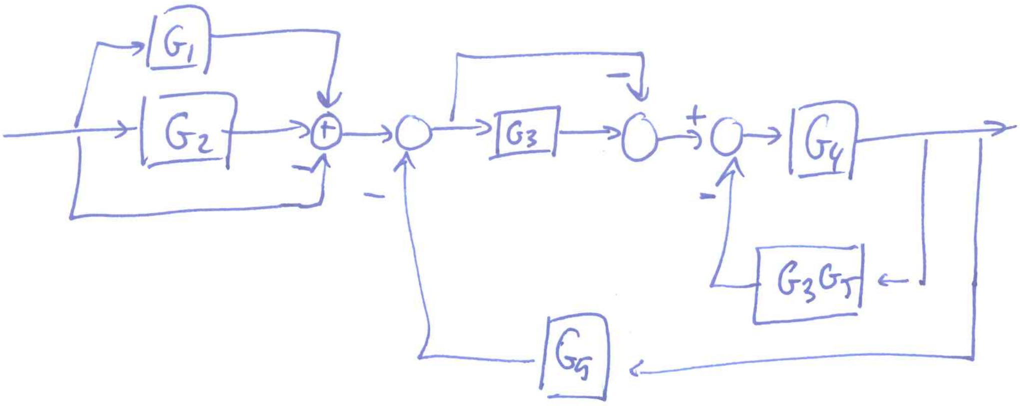
c) $T_s = 4s \Rightarrow \dfrac{4}{\xi\omega_n} = 4 \Rightarrow \xi\omega_n = 1$ Cuando los pol... ...s conjugados estén en $-1 \pm ?j$. Para calcular la ... ...l polo de la recta real. Calculo su posición por la regl... ...entre

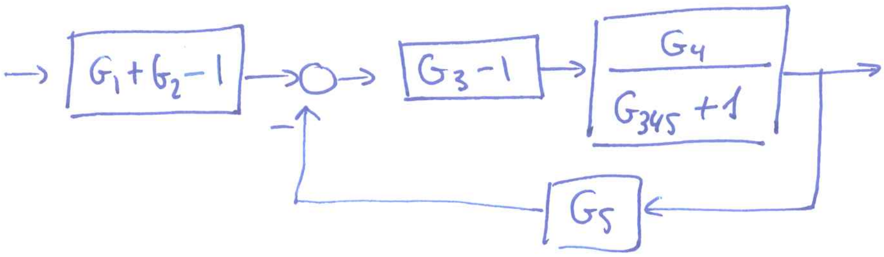
$\Sigma p_i = -4-2-2=-8$. Luego $2\cdot(-1)+p=-8 \Rightarrow \underline{\underline{p=-6}} \Rightarrow$ ...

$K = \dfrac{|D(s)|}{|N(s)|} = \dfrac{2\cdot4\cdot4}{4} = 8$

d) como $\dfrac{|-6|}{|-1|} \geq 5$, la a... ...ron... e...

①





$$\boxed{(G_1+G_2-1)\,\frac{(G_3-1)\,G_4}{G_{45}(G_3-1)+G_{345}+1}}$$

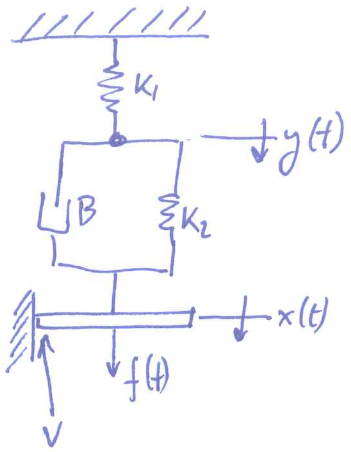
b) $\underbrace{\left(2+\frac{1-s}{s}-1\right)}_{\frac{\cancel{2s}+1-\cancel{s}-\cancel{s}}{s}}\dfrac{(5s-1)\,s}{2s(5s-1)+10s^2+1} = \dfrac{1}{\cancel{s}}\,\dfrac{(5s-}{10s^2-}$

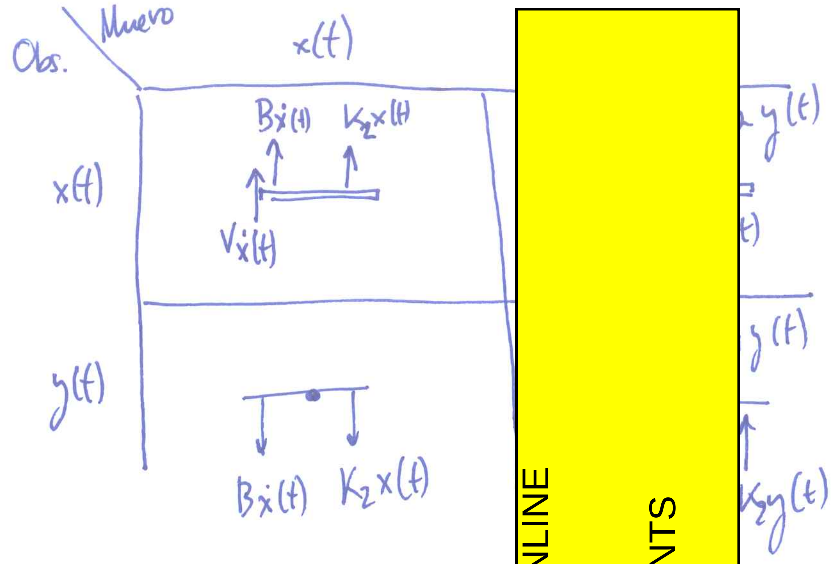
$$= \frac{5s-1}{20s^2-2s+1} \xrightarrow{\text{Realim}} = \frac{}{20s^2-} \quad -K$$

s^2	20	$1-K$
s^1	$5K-2$	$\emptyset$
s^0	$1-K$	$\emptyset$

$$\left.\begin{array}{l} 1-K>0 \Rightarrow K<1 \\ 5K-2>0 \Rightarrow K>\frac{2}{5} \end{array}\right\} K$$

2) a)





$$(1)\quad f(t) + B\dot{y}(t) + K_2 y(t) = (B+V)\dot{x}(t) + K_2 x(t)$$

$$(2)\quad B\dot{x}(t) + k_2 x(t) = B\dot{y}(t) + (K_1+K_2)y(t)$$

b) $$(1)\quad F(s) + BsY(s) + k_2Y(s) = (B+V)sX(s) + K_2X(s)$$

$$(2)\quad BsX(s) + K_2X(s) = BsY(s) + (K_1+K_2)Y(s)$$

c) Sustituyo: $$(1)\quad F(s) + Y(s)(K+s) = X(s)(2s+K)$$

$$(2)\quad X(s)(s+K) = Y(s)(s+2K)$$

Despejo $Y(s)$ en (2): $Y(s) = X(s)\dfrac{K+s}{2K+s}$ Sustituyo en

$$F(s) + X(s)\frac{(K+s)^2}{2K+s} = X(s)(2s+K) \Rightarrow F(s) = X(s)\Big[(2s$$

$$= X(s)\left[\frac{(2s+K)(2K+s) - K^2 - s^2 - 2Ks}{2K+s}\right] = \Big[\frac{4Ks + 2s^2 +}{}$$

$$\Rightarrow \frac{X(s)}{F(s)} = \frac{2K+s}{K^2+3Ks+s^2}$$

d) $\mu = \dfrac{2K}{K^2} = \dfrac{2}{K}$ $\quad f(t) = 10\,Kg \cdot 9'8 = 98N \Rightarrow 98\cdot\dfrac{2}{K} = 0'$