tesis practica 29 Junho 2019.

7) $G(s) = K \cdot \frac{s^2+s+1}{s(s+1)^2}$

zeros : $s = -0{,}5 \pm j\,0{,}866$

poles : $s = 0$; $s = -1$ Duplo

$\boxed{R3}$ Are branches of the root locus on the Real axis if the total number of real poles and real zeros to the right is Odd.

8) $G(s) = 24 \frac{(s+1)}{(s+2)(s+3)(s+4)}$

$= 24 \frac{s+1}{s^3+9s^2+26s+24}$

$\Rightarrow 20 \log \frac{24}{24} = 0\,dB$

ou

$G(s) = 24 \frac{(s+1)}{2.3.4\left(\frac{s}{2}+1\right)\left(\frac{s}{3}+1\right)\left(\frac{s}{4}+1\right)}$

$= \frac{24}{24} \frac{(s+1)}{\left(\frac{s}{2}+1\right)\left(\frac{s}{3}+1\right)\left(\frac{s}{4}+1\right)}$

$\boxed{20 \log \frac{24}{24} = 0\,dB}$ starts at zero dB ✓

15 Julho 2019

considere um sistema com F.T

$$G(s) = \frac{5\,e^{-2s}}{s(s+3)^2}$$ e a sua resposta em

frequência (ie, com $s=j\omega$, $j=\sqrt{-1}$) então

pode escrever-se que o modulo e fase G vêm

dados por:

A) $|G(j\omega)| = \frac{5}{\omega(\omega^2+3)}$, $\arg(G(j\omega)) = -\omega - \frac{\pi}{2} - 2\,\text{arctan}(\frac{\omega}{3})$ radianos

$\text{Abs}(e^{-2s})$

B) $|G(j\omega)| = \frac{5 \cdot 1}{\omega(\omega^2+9)}$, ✓

$\arg(G(j\omega)) = -2\omega - \frac{\pi}{2} - \text{arctan}(\frac{\omega}{3}) \times 2$ ✓

$(\sqrt{\omega^2+3^2})^2 = \text{Abs}$

$\boxed{B}$

$2 \times \text{arctan}(\frac{\omega}{3}) = \text{Abs}$

C) $|G(j\omega)| = \frac{5}{\omega\sqrt{\omega^2+9}}$ $\arg e^{-2j\omega} + \arg \frac{1}{\omega} + \arg \frac{1}{\omega^2+9}$

$\arg(G(j\omega)) = -\omega - \frac{\pi}{2} - \text{arctan}(\frac{\omega}{9})$ radianos

sol

$$\frac{5\,e^{-2j\omega}}{j\omega(j\omega+3)^2}$$

nota:

$$\boxed{|e^{j\theta}| = 1}$$

ABC → todos condizem

$\angle e^{j\theta} = \theta$ rad

$\theta \times \frac{180}{\pi}$ graus

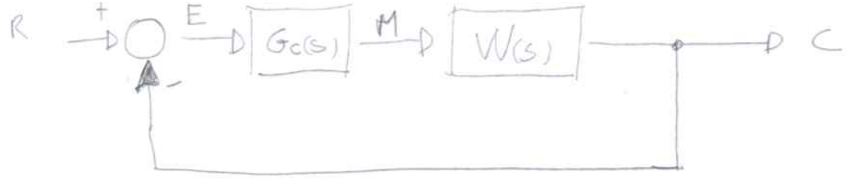
$$\boxed{e^{-2j\omega} \Rightarrow |e^{-2j\omega}| = 1 \qquad \angle e^{-2j\omega} = -2\omega}$$

exponencial apenas influencia angulo

$\text{Abs} = \text{arctan}(\ \cancel{\ }\ )$

19 Junho 2004

$$m(t) = 2 \times K\, e(t) + K \times \frac{d}{dt} e_{(t)} \qquad W_{(s)} = \frac{1}{s(s+1)}$$



$$M_{(s)} = 2K\, E_{(s)} + sK\, E_{(s)}$$

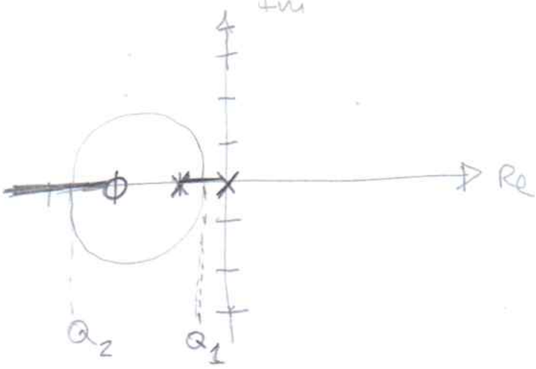
$$= (sK + 2K)\, E_{(s)}$$

$$\frac{M_{(s)}}{E_{(s)}} = sK + 2K = K(s+2)$$

$$G_c(s) \times W_{(s)} = \frac{K(s+2)}{s(s+1)} = FTMA \text{ como } H_{(s)} = 1$$

$\Rightarrow FTMA = FTLG$

$$GH_{(s)} = \frac{K(s+2)}{s(s+1)}$$



$\Rightarrow D_{(s)} = s(s+1) + K(s+2)$

FTMF

$$D_{(s)} = 0 \Rightarrow K = -\frac{s(s+1)}{(s+2)}$$

$$= -\frac{s^2+s}{s+2}$$

$$\frac{dK}{d(s)} = 0 \Rightarrow \frac{(2s+1).(s+2) - (s^2+s)}{\cancel{(s+2)^2}}$$

$$(2s+1)(s+2) - (s^2+s) = 0$$

$$(2s^2 + 4s + s + 2) - (s^2 + s) = 0 \Leftrightarrow s^2 + 4s + 2 = 0$$

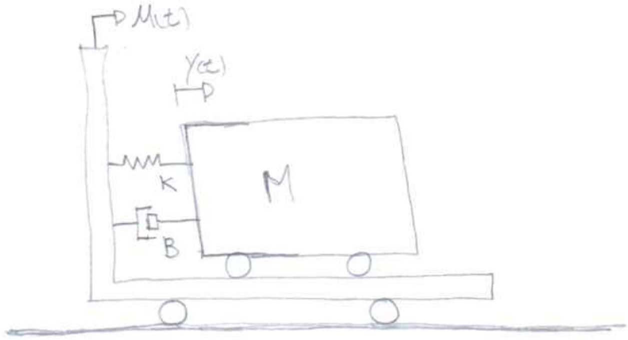
$Q_1 = -0{,}585 \wedge Q_2 = -3{,}414$

$K_1 = 0{,}171 \wedge K_2 = 5{,}828$

$0 < K < K_1 \Rightarrow \xi > 1$

$K = K_1 \wedge K = K_2 \Rightarrow \xi = 1 \qquad K_1 < K < K_2 \Rightarrow 0 < \xi < 1$

$K_2 < K \Rightarrow \xi > 1$



11 sept 1999.

$$\boxed{F_R = M \cdot a}$$

$$\frac{Y(s)}{U(s)} = ?$$

$$M\ddot{y} = -K(y-u) - B(\dot{y}-\dot{u})$$

$$M\ddot{y} = -Ky + Ku - B\dot{y} + B\dot{u}$$

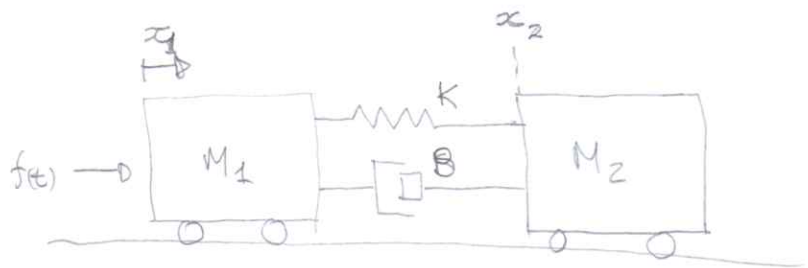
$$s^2MY = -KY + KU - SBY + SBU$$

$$= -(SB+K)Y + (SB+K)U$$

$$(s^2M + SB + K)Y = (SB+K)U$$

$$\frac{Y}{U} = \frac{SB+K}{S^2M+SB+K}$$

18 Fev 1999



$$\boxed{F_R = m\ddot{x}}$$

$$\frac{X_1}{F} = ?$$

$$\begin{cases} x_1: & m_1\ddot{x}_1 = f(t) - K(x_1 - x_2) - B(\dot{x}_1 - \dot{x}_2) \\ x_2: & m_2\ddot{x}_2 = -K(x_2 - x_1) - B(\dot{x}_2 - \dot{x}_1) \end{cases}$$

$$\begin{cases} F(s) = s^2M_1X_1 + KX_1 - KX_2 + SBX_1 - SBX_2 \\ 0 = s^2M_2X_2 + KX_2 - KX_1 + SBX_2 - SBX_1 \end{cases}$$

$$\begin{cases} F(s) = (s^2M_1 + SB + K)X_1 - (SB+K)X_2 \\ 0 = -(SB+K)X_1 + (s^2M_2 + SB + K)X_2 \end{cases}$$

$$X_1 = \frac{\begin{vmatrix} F & -(SB+K) \\ 0 & s^2M_2 + SB + K \end{vmatrix}}{\begin{vmatrix} (s^2M_1 + SB + K) & -(SB+K) \\ -(SB+K) & (s^2M_2 + SB + K) \end{vmatrix}}$$

$$X_1 = \frac{F(s^2M_2 + SB + K)}{(s^2M_1 + \underbrace{SB + K}{})(s^2M_2 + \underbrace{SB + K}{}) - (SB+K)^2}$$

$$\frac{X_1}{F} = \frac{s^2M_2 + SB + K}{s^4M_1M_2 + s^2M_1(SB+K) + s^2M_2(SB+K) + \cancel{(SB+K)^2} - \cancel{(SB+K)^2}}$$

$$= \frac{s^2M_2 + SB + K}{s^2(s^2M_1M_2 + M_1(SB+K) + M_2(SB+K))}$$

$$= \frac{s^2M_2 + SB + K}{s^2(s^2M_1M_2 + (SB+K)(M_1+M_2))}$$

Practice

2 Feb 1999

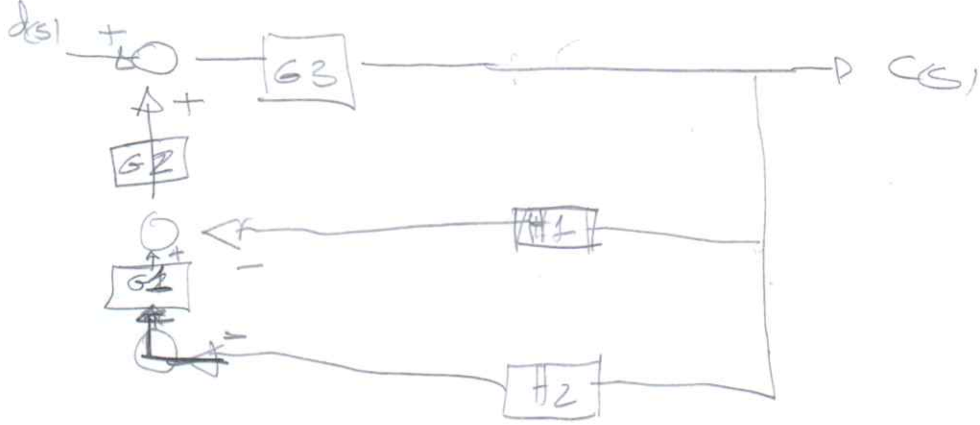
1a)

$$G1 \times \frac{G2 \cdot G3}{1 + \cancel{G2G3}H1}$$

$$\frac{\cancel{1+G2G3H1} + G1\,G2\,G3}{\cancel{1+G2G3H1}} \cdot H2$$

$$\frac{G1\,G2G3}{1 + G2G3H1 + G1\,G2G3\,H2} \qquad \boxed{A}$$

1b)



$$-(G1\,H2 + H1) \cdot G2$$

$$\frac{G3}{1 + (G1\,H2 + H1)\,G2 \cdot G3} = \boxed{B}$$

13 Jan 2005

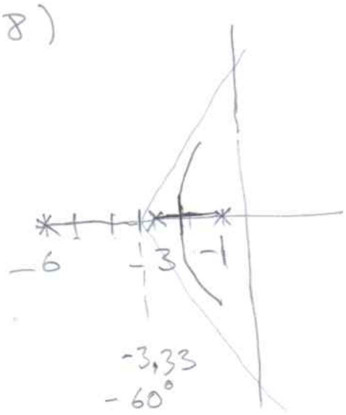
5. $(s+1)(s+3)(s+6)+K=0$ $\qquad K=?$

$$K = -(s+1)(s+3)(s+6)$$

$$= -(s^2+\overset{4s}{3s+s}+3)(s+6)$$

$$= -(s^3+6s^2+4s^2+24s+3s+18)$$

$$= -(s^3+10s^2+27s+18)$$



$$\frac{d}{ds}K = -(3s^2+20s+27)$$

$$3s^2+20s+27=0$$

$$s = \frac{-10+\sqrt{19}}{3} \cong -1,88 \qquad \xi > 1$$

$$s = \frac{-10+\sqrt{19}}{3} \cong -4,786 \; \times$$ não pertence a LGR

5a) $\qquad s = \frac{-10+\sqrt{19}}{3} = -1,888$

$s=-1,88$

$K = -(-1,88+3)(-1,88+3)(-1,88+6)$

$= 4,06$

$\therefore$ for $s=-1,888 \Rightarrow K=4,06$

— // —

13 Jan 2005

$(s+1)(s+3)(s+6)+K=0$

not correct
research.

$K+(s^3+10s^2+27s+18)=0$

$K+(j\omega)^3+10(j\omega)^2+27(j\omega)+18=0$

$K+j\omega^3+10(-1)\omega^2+27j\omega+18=0$

$\begin{cases} K-10\omega^2+18=0 \\ \omega^3+27\omega=0 \end{cases}$ $\begin{cases} K=0 \Rightarrow K=-18 \\ \omega=0;\ \omega=3\sqrt{3}i;\ \omega=-3\sqrt{3}i \end{cases}$

8 Julho 2008

4. $G(s) = \dfrac{(s+0,1)}{(s+1)(s^2+10s+100)}$

FT $\rightarrow K = 0,001$

$s^2+10s+100$

$\omega_n = 10$

$\xi = 0,5$

$p_1 = -5+8,66j$

$p_2 = -5-8,66j$

$M_p = 0,163$

$t_p = 0,362$

$t_s = 0,8$

$\omega_d = 8,66$

$t_r = 0,2418$

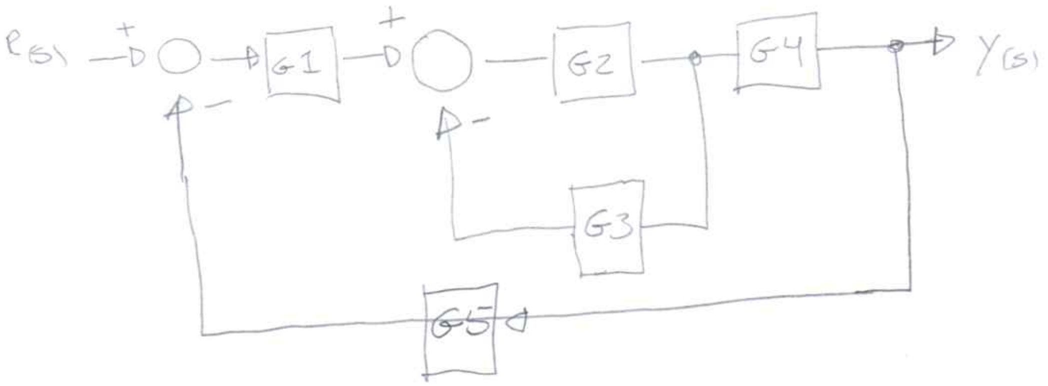
$|p_1| \cong 10$

$\omega_r = 7,07$

$M_r = 1,155$

29 Junho 2019

1



$$\frac{G1 \cdot \frac{G2}{1+G2G3} \cdot G4}{1+\frac{G1G2G4}{1+G2G3} \cdot G5}$$

$$\frac{\frac{G1G2G4}{1+\cancel{G2G3}}}{\frac{1+G2G3+G1G2G4G5}{\cancel{1+G2G3}}} = \frac{G1G2G4}{1+G2G3+G1G2G4G5}$$

Di - $1+G2(G3+G1G4G5)$

logo Resposta $\boxed{C}$

2. $q_i = A \cdot \frac{d}{dt}h + q_1 + q_0$

$\boxed{D}$

6. $\boxed{B}$

F.T.

ver se existe MF e MG

as vezes MG não existe, não intercepta o 180° no diagrama Nyquist

7.

$\boxed{\text{ignora } K}$ numero impar OK

Polo ~~+~~ zero

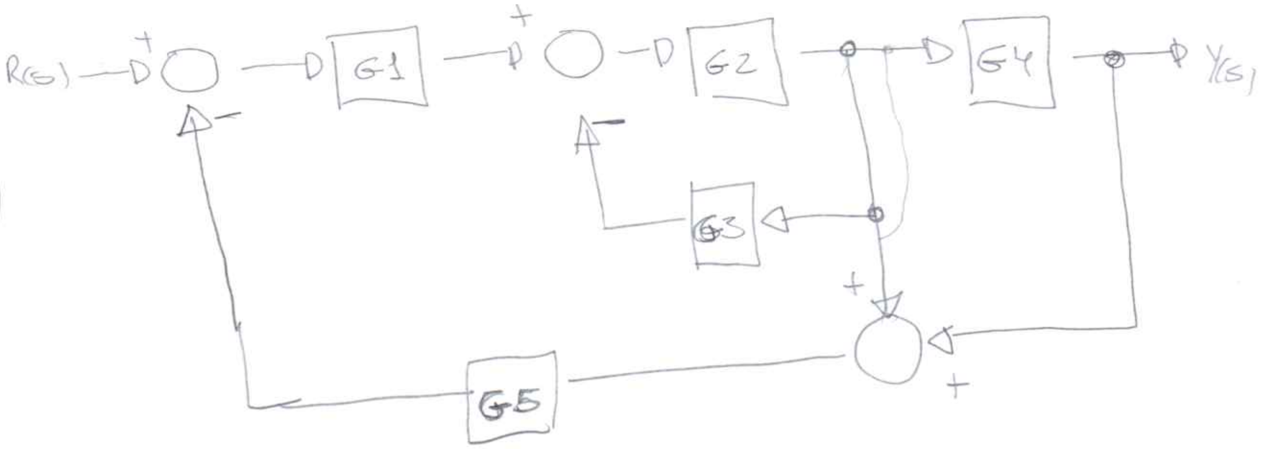
~~A~~ ⇒ A ou B ~~A~~ ~~B~~ nenhum

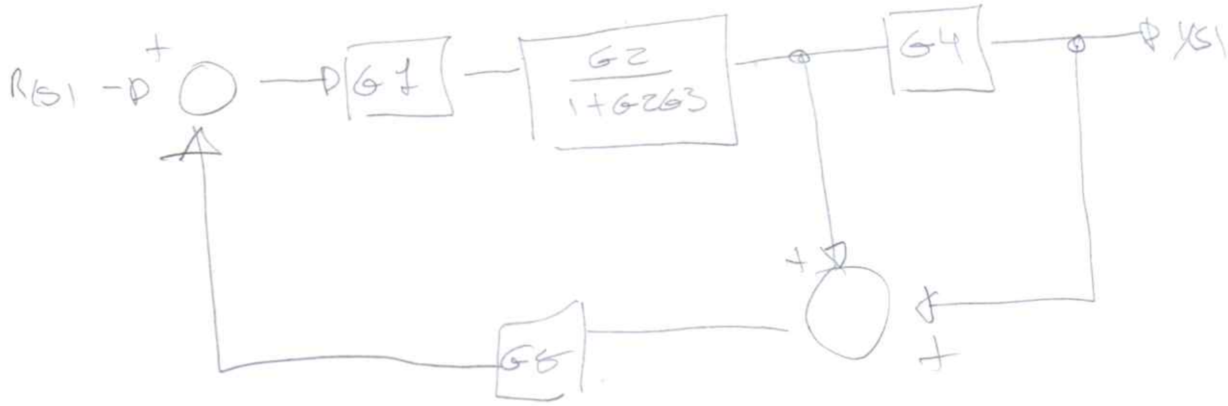
8.

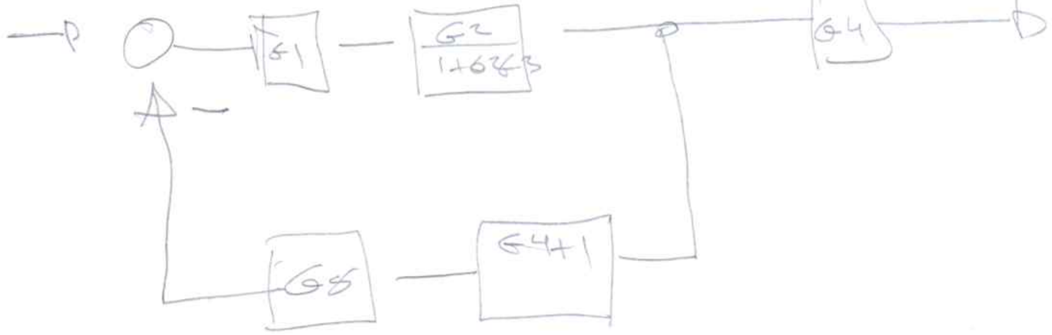
$\boxed{C}$ $K = 1 \Rightarrow 20 \log 1 = \underline{0}$

15 Julho 2019.

1)







$$\frac{\dfrac{G1G2}{1+\cancel{G2G3}}}{\dfrac{1+G2G3+G1G2}{H \mid + \quad \cancel{1+G2G3}}\cdot G5(G4+1)} \times G4$$

$\boxed{C}$ ✓

$$\frac{G1G2}{1+G2G3+G1G2\cdot G5\cdot(G4+1)}\cdot G4$$

D: $\boxed{1+G2(G3+G1G5(1+G4)}$

15 Julho 2019.

FT → root locus

7. $\boxed{C}$

numero impar ⇒ lugar de raiz

- Polo para zero
- Polo para infinito

8. $\boxed{C}$

grau Polo zero indica onde começa o angulo. $\frac{1}{S} \Rightarrow -90°; 20dB$ $\frac{1}{S^2} \Rightarrow -180°; 40dB$

$\frac{1}{S^3} \Rightarrow -270°; 60dB$ $s=0 \Rightarrow$ angulo inicial

ex

$$\frac{(s+1)(s+2)}{s^2(s+3)}$$

	s → 0	s → ∞
	-180	-90°
	-40dB	-20dB

⇓

inicio	1	2	3
-180°	-20dB	0	-20dB
-40dB			

altas frequências s → ∞

$$\frac{s \cancel{\ }}{s^2 \cancel{\ }} \Rightarrow \frac{1}{s} \Rightarrow \emptyset$$

$G(s) \quad \dfrac{(s+1)(s+2)}{s(s+3)}$

$\begin{cases} \omega \to \infty \\ s \to \infty \end{cases}$

acaba em

$\dfrac{s \quad s}{s \quad s} = 1 \Rightarrow 0\,dB$

0°

$\begin{cases} \omega \to 0 \\ s \to 0 \end{cases}$

—//—

início -90°

$\dfrac{(s+1)(s+2)^2}{s+(s+5)^2}$

acaba em 0 dB

9_0

$\frac{1}{s}$

$\frac{1}{s^2}$

$\frac{1}{s^3}$

$R_{(s)} \longrightarrow \boxed{FT} \longrightarrow Y_{(s)}$

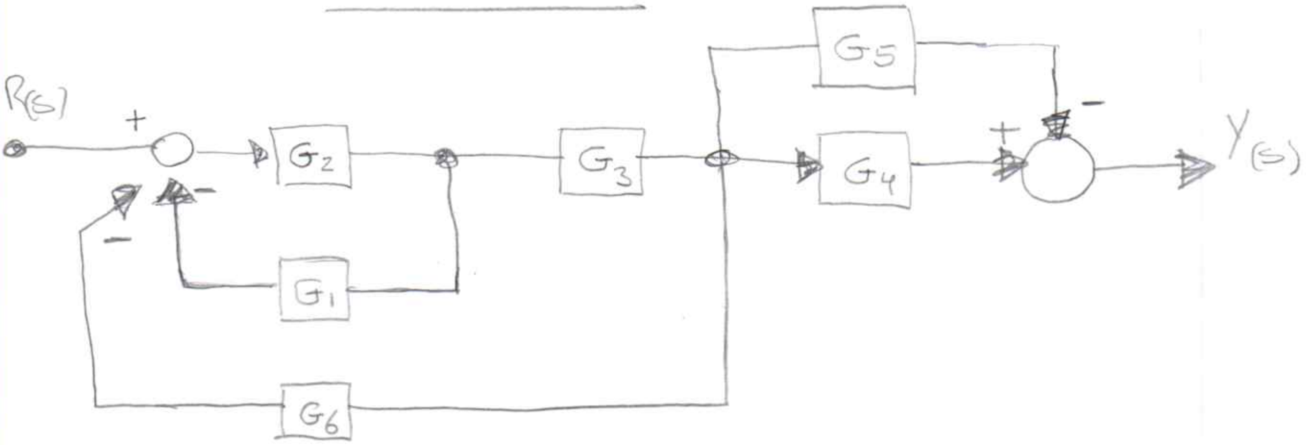
$1^{\underline{a}}$ ordem

$2^{\underline{a}}$ ordem

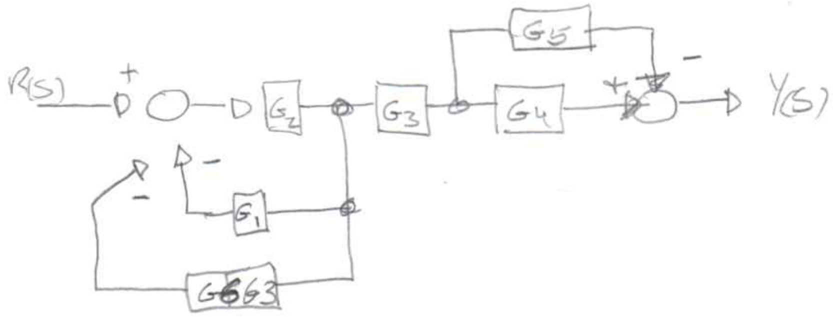
$$\lim_{s \to \emptyset} s \times FT_{(s)} \times R_{(s)} \rightarrow K_{p,v,a}$$

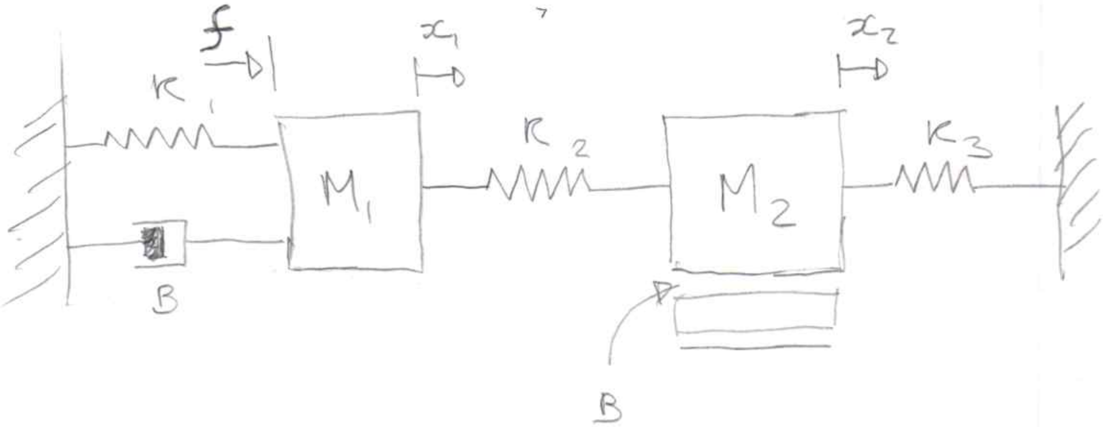
1º test teórico

9/4/2009



sol





sol

$$\begin{cases} f_{(t)} - k_1 x_{1(t)} - B\dot{x}_{1(t)} - K_2(x_{1(t)} - x_{2(t)}) = M_1 \alpha_{1(t)} \\ K_2(x_{1(t)} - x_{2(t)}) - k_3 x_{2(t)} - B x_{2(t)} = M_2 \alpha_{2(t)} \end{cases}$$

Matéria até

Modelação de sistemas.