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Lista G

PME3380 - Modelagem de sistemas dinâmicos

SÃO PAULO

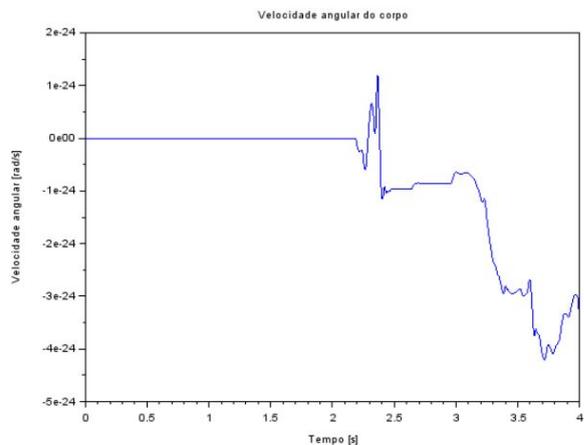
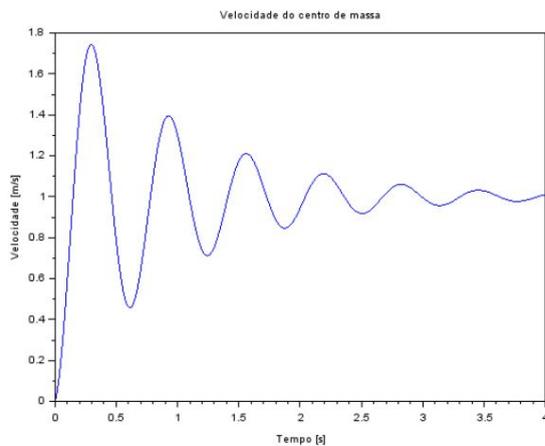
Lista G

- Questão 1

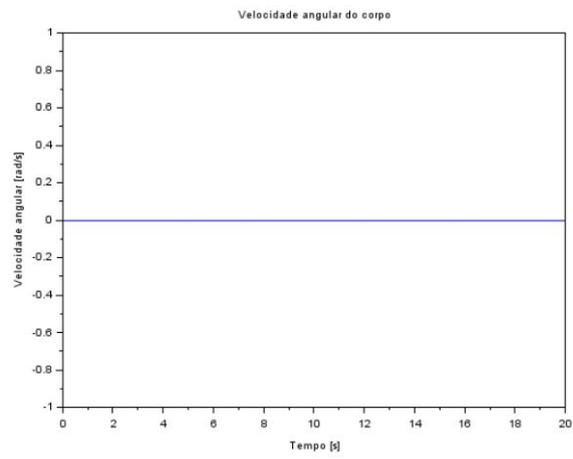
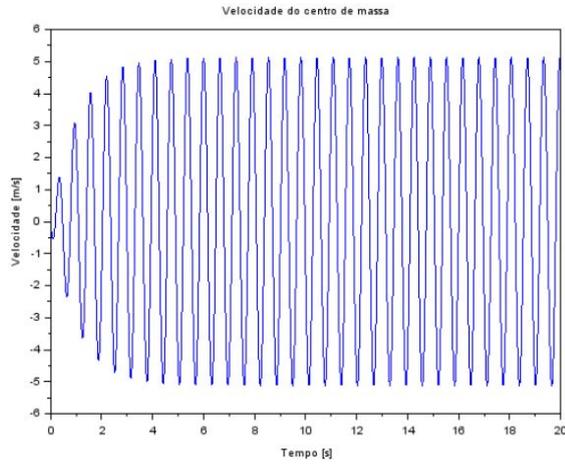
João Paulo Souza Flores 10773892
 $M_G^{Ext} = m(G - OG) \times \dot{\alpha} + \frac{d}{dt} (J_G(\dot{\omega}))$
 $\Rightarrow J_G^{Ext} = J\dot{\omega} = k_a k_b (x_a - x_c) - k_c x_c (x_b - x_a) + k_a k_b (x_a - x_c) - k_a k_b (x_b - x_a)$
 $\dot{x}_a = V_G - l_a \omega; \dot{x}_b = V_G - l_b \omega$
 $V_G = \frac{-k_a x_a}{m} - \frac{k_b x_b}{m} - \frac{k_c}{m} (V_G - l_a \omega) - \frac{k_a k_b}{m} (V_G + l_b \omega) + k_a x_a$
 $\quad \quad \quad + \frac{k_b l_a}{m} \omega + \frac{k_c l_b}{m} \omega + \frac{k_a l_b}{m} \omega$
 $\dot{\omega} = \frac{k_a k_a x_a}{J} - \frac{k_b x_b k_c}{J} + \frac{k_a k_b}{J} (V_G - l_a \omega) - \frac{k_a k_b}{J} (V_G + l_b \omega) - \frac{k_a k_b x_c}{J}$
 $\quad \quad \quad + \frac{k_b k_a x_a}{J} - \frac{k_b k_a x_c}{J} + \frac{k_a k_b l_a}{J} \omega$
 $\therefore \begin{bmatrix} \dot{x}_a \\ \dot{x}_b \\ \dot{V}_G \\ \dot{\omega} \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 & -l_a \\ 0 & 0 & 1 & -l_b \\ \frac{k_a}{m} & -\frac{k_b}{m} & -\frac{l_a + l_b}{m} & \frac{k_a l_a - k_b l_b}{m} \\ \frac{k_a k_a}{J} & -\frac{k_b k_c}{J} & \frac{k_a k_b - k_b k_c}{J} & -\frac{k_a k_b (l_a + l_b)}{J} \end{bmatrix} \begin{bmatrix} x_a \\ x_b \\ V_G \\ \omega \end{bmatrix}$
 $+ \begin{bmatrix} 0 \\ 0 \\ \frac{k_a x_a}{m} \\ \frac{k_a k_a x_a}{J} - \frac{k_b k_c x_b}{J} - \frac{k_a k_b x_c}{J} + \frac{k_b k_a x_a}{J} - \frac{k_b k_a x_c}{J} + \frac{k_a k_b l_a}{J} \omega \end{bmatrix}$

- Questão 2

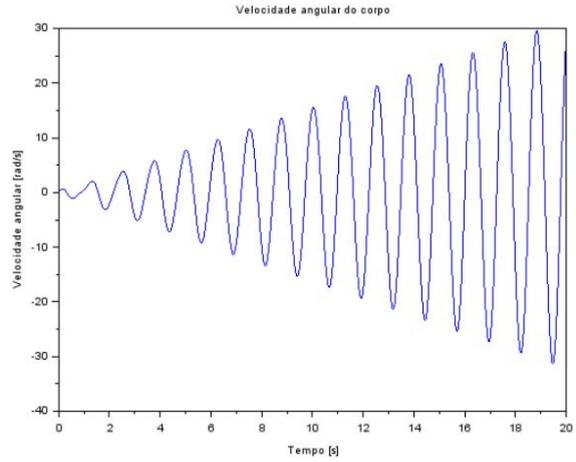
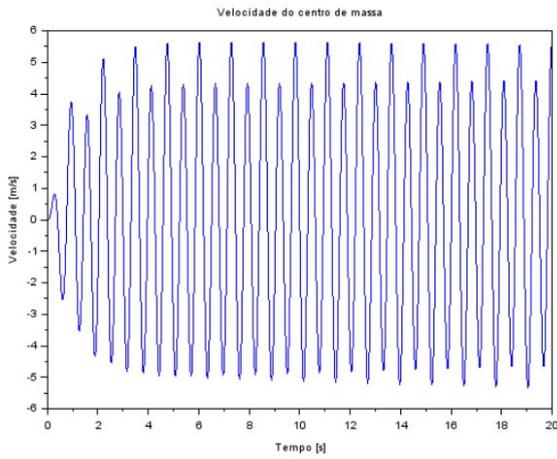
Caso 1:



Caso 2:

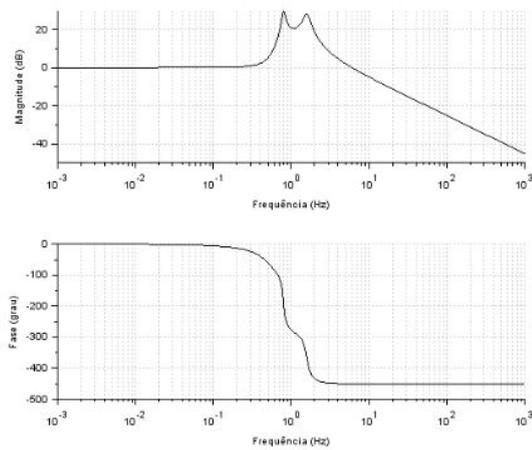


Caso 3:

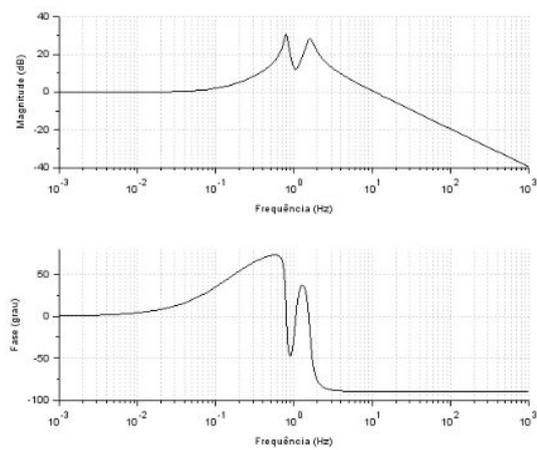


● Questão 3

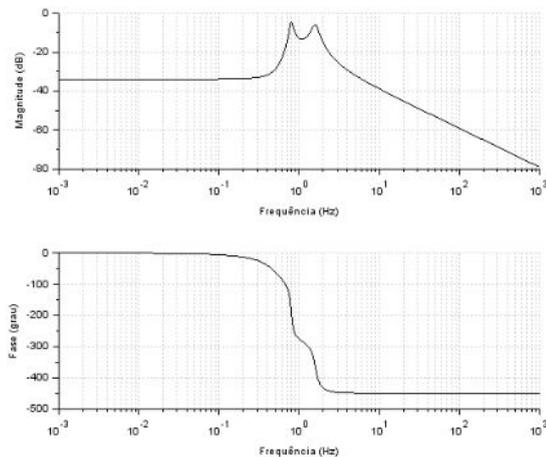
Para Xa:



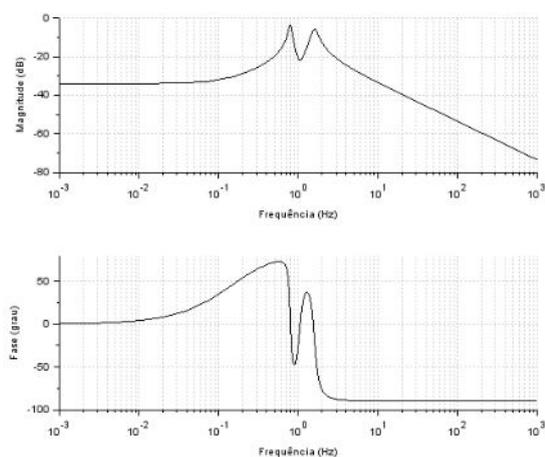
Para Xb:



Para V_g :



Para w :



```

1 clear
2 clc
3 xdel(winsid())
4 M = 200;
5 J = 512;
6 lA = 0.8;
7 lB = 0.8;
8 kA = 10000;
9 kB = 10000;
10 bA = 200;
11 bB = 200;
12 vH = 10;
13 td = (lA + lB)/vH;
14
15 ti = 0;
16 tf = 1;
17 t = linspace(ti,tf,1000);
18 simulação = 3;
19
20 xa0 = 0;
21 xb0 = 0;
22 vg0 = 0;
23 w0 = 0;
24
25 function dy=susp(t, y)
26     dy(1) = y(3) - lA*y(4);
27     dy(2) = y(3) + lB*y(4);
28     dy(3) = -(kA/M)*y(1) - (kB/M)*y(2) - ((bA + bB)/M)*y(3) -
29     + ((bA*lA - bB*lB)/M)*y(4) + (kA/M)*u1(t) + (kB/M)*u2(t) -
30     + (bA/M)*u3(t) + (bB/M)*u4(t);
31     dy(4) = (lA*kA/J)*y(1) - (lB*kB/J)*y(2) + ((lA*bA - lB*bB)/J)*y(3) -
32     - ((bA*lA^2 - bB*lB^2)/M)*y(4) - (lA*kA/J)*u1(t) + (lB*kB/J)*u2(t) -
33     - (lA*bA/J)*u3(t) + (lB*bB/J)*u4(t);
34 endfunction
35 Y = ode([xa0;xb0;vg0;w0],0,t,susp);
36 xA = Y(1,:);
37 xB = Y(2,:);
38 vG = Y(3,:);
39 w = Y(4,:);
40 scf(1)
41 plot(t,vG);
42 scf(2)
43 plot(t,w);
44 A = [0,0,1,-lA;0,0,1,lB;-kA/M,-kB/M,-(bA+bB)/M,(bA*lA - bB*lB)/M;lA*kA/J,
45 -lB*kB/J,(lA*bA-lB*bB)/J,-(bA*lA^2 + bB*lB^2)/J];
46 B = [0,0,0,0;0,0,0,0;kA/M,kB/M,bA/M,bB/M;
47 -lA*kA/J,lB*kB/J,-lA*bA/J,lB*bB/J];
48 sistema = syslin('c',A,B,[1,1,1,1]);
49 h = ss2tf(s1);
50 scf(3);
51 bode(h(1,1));
52 scf(4);
53 bode(h(1,2));
54 scf(5);
55 bode(h(1,3));
56 scf(6);
57 bode(h(1,4));

```