Semestrální práce MSM

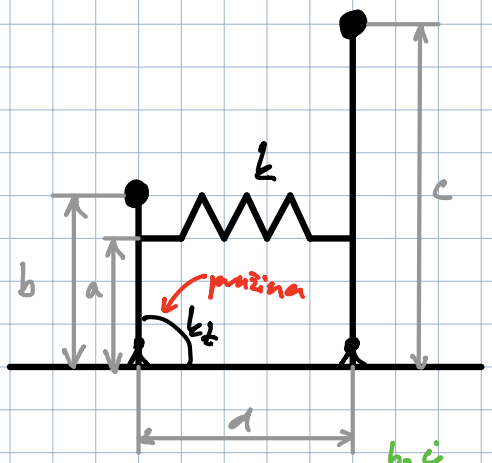
Znamenáček

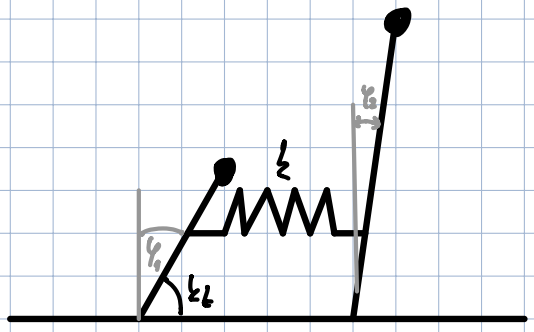
1

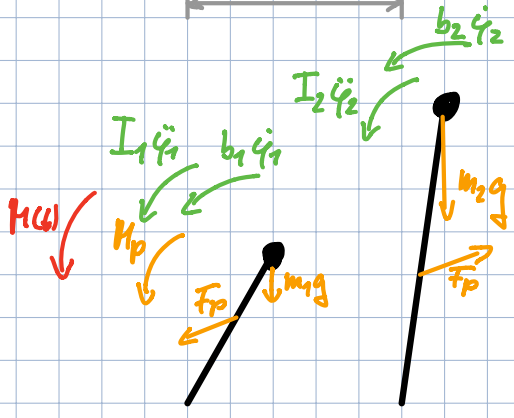
$m_1 = 6\,kg$, $m_2 = 8\,kg$, $a = 0{,}5\,m$, $b = 0{,}75\,m$

$c = 1{,}25\,m$, $d = 1\,m$, $k = 5{,}8 \cdot 10^3\,N/m$,

$k_t = 11\,Nm/rad$, $b_1 = 2{,}1\,Ns$, $b_2 = 3{,}8\,Ns$

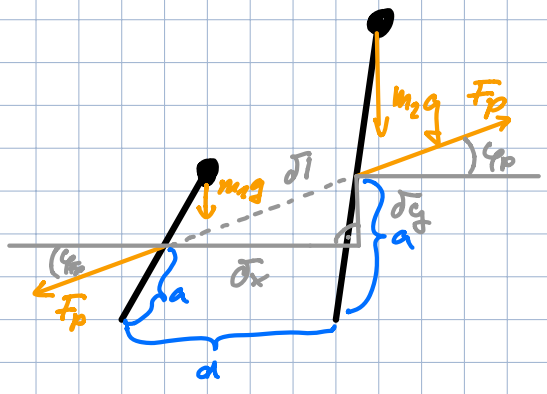






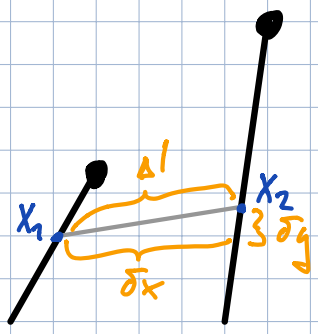
$$I_1\ddot{\varphi}_1 = -M_p - b_1\dot{\varphi}_1 - F_p \cdot \cos\varphi_{F_p} \cdot a \cdot \cos\varphi_1 + G_1 b \cdot \sin\varphi_1 - M_L$$

$$I_2\ddot{\varphi}_2 = -b_2\dot{\varphi}_2 + F_p \cdot \cos\varphi_p \cdot a \cos\varphi_2 + G_1 \sin\varphi_2$$



$$\text{arctang}\left(\frac{\delta y}{\delta x}\right) = \varphi_p$$

$F_p = k \cdot \Delta l$



$\delta_x = d - a \cdot \sin\varphi_1 + a \cdot \sin\varphi_2 = d - a(\sin\varphi_1 - \sin\varphi_2)$

$\delta_y = a \cdot \cos\varphi_2 - a \cdot \cos\varphi_1 = a(\cos\varphi_2 - \cos\varphi_1)$

"$X_1 = [a \cdot \sin\varphi_1, a \cdot \cos\varphi_1]$"

"$X_2 = [a \cdot \sin\varphi_2, a \cos\varphi_2]$"

$$\Delta l = d - \sqrt{\delta_x^2 + \delta_y^2} = d - \sqrt{(d - a(\sin\varphi_1 - \sin\varphi_2))^2 + a^2(\cos\varphi_2 - \cos\varphi_1)^2}$$

⇓ Upraveno již v matlabu

$$m_1 b^2 \cdot \ddot{\varphi}_1 = -\varphi_1 k_t - b_1 \dot{\varphi}_1 + k\underbrace{\left(d - \sqrt{(d - a(\sin\varphi_1 - \sin\varphi_2))^2 + a^2(\cos\varphi_2 - \cos\varphi_1)^2}\right)}_{\Delta l} a\cos\varphi_1 + G_1 b \sin\varphi_1$$

$$m_2 c^2 \ddot{\varphi}_2 = -b_2 \dot{\varphi}_2 - k\underbrace{\left(d - \sqrt{(d - a(\sin\varphi_1 - \sin\varphi_2))^2 + a^2(\cos\varphi_2 - \cos\varphi_1)^2}\right)}_{\Delta l} a\cos\varphi_2 + G_2 c \sin\varphi_2$$

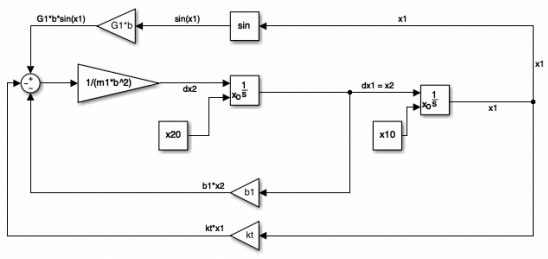
$x_1 = \varphi_1 \quad x_2 = \dot{\varphi}_1 \quad x_3 = \varphi_2 \quad x_4 = \dot{\varphi}_2$

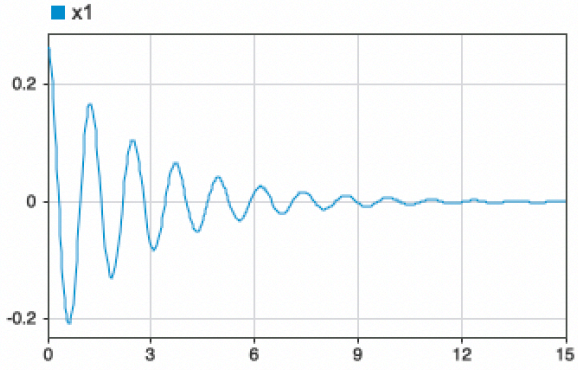
$$\dot{x}_1 = x_2$$

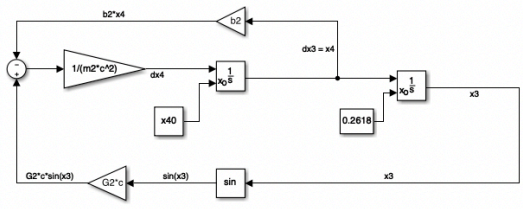
$$\dot{x}_2 = \ddot{\varphi}_1 = \frac{-\varphi_1 k_t - b_1 \dot{\varphi}_1 + k\left(d - \sqrt{(d - a(\sin\varphi_1 - \sin\varphi_2))^2 + a^2(\cos\varphi_2 - \cos\varphi_1)^2}\right) a\cos\varphi_1 + G_1 b \sin\varphi_1}{m_1 b^2}$$

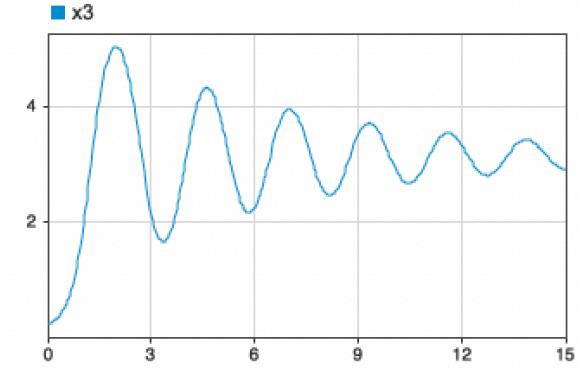
$$\dot{x}_3 = x_4$$

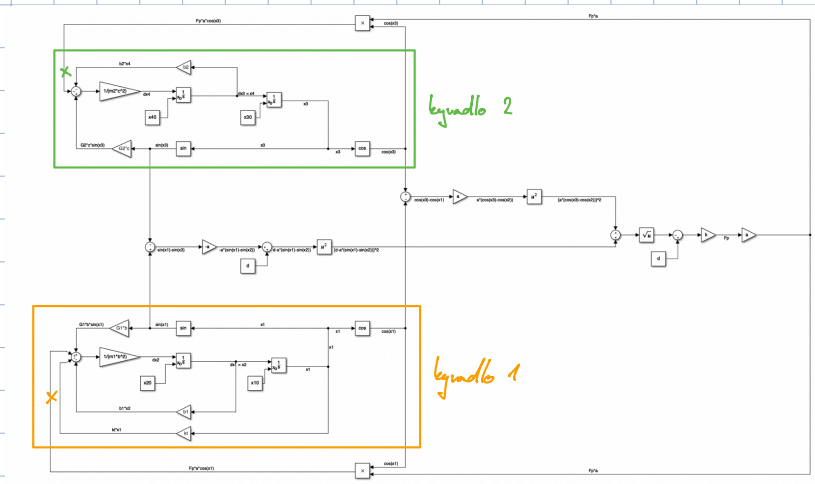
$$\dot{x}_4 = \ddot{\varphi}_2 = \frac{-b_2 \dot{\varphi}_2 - k\left(d - \sqrt{(d - a(\sin\varphi_1 - \sin\varphi_2))^2 + a^2(\cos\varphi_2 - \cos\varphi_1)^2}\right) a\cos\varphi_2 + G_2 c \sin\varphi_2}{m_2 c^2}$$

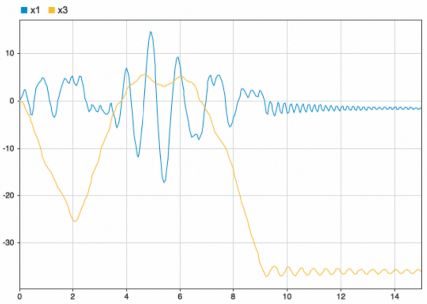









kyvadlo 2
kyvadlo 1


x1
x3
10
0
-10
-20
-30
0
2
4
6
8
10
12
14