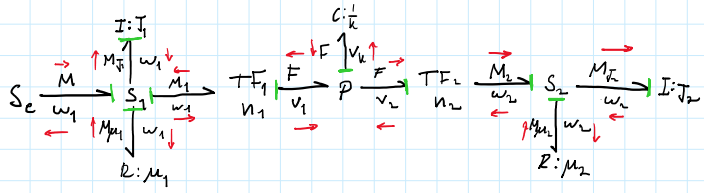
Preperation Lab2.2

den 2 december 2024 19:09

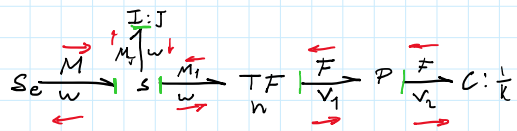
Emil Alsbjer, emral133 , changed to Open Modelica

Preperation 1

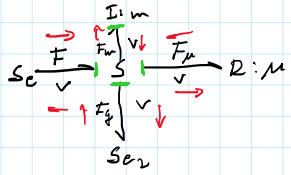
Belt transmission



Screw transmission



Robot Arm



Preperation 2

Belt

$J_1 = \frac{\pi}{2} r^4 h \rho$, $r = 0.01m$, $h = 0.01m$, $\rho = 2.7 \cdot 10^3$

$\Rightarrow \frac{\pi}{2} \cdot (0.01)^4 \cdot 0.01 \cdot (2.7 \cdot 10^3) = 4.24 \cdot 10^{-7}$ kgm^2

$J_2 = \frac{\pi}{2} r^4 h \rho$, $r = 0.04m$, $h = 0.015m$, $\rho = 2.7 \cdot 10^3$

$\Rightarrow \frac{\pi}{2} (0.04)^4 \cdot 0.015 \cdot (2.7 \cdot 10^3) = 1.63 \cdot 10^{-4}$ kgm^2

$\mu_1 = 2 \cdot 10^{-5}$ $Nm \cdot s/rad$

$\mu_2 = 5 \cdot 10^{-5}$ $Nm \cdot s/rad$

Elastic force:

$$F = K_1 \cdot \Delta X \Rightarrow K_1 = \frac{F}{\Delta X} = \frac{200}{0.75 \cdot 0.004} = \frac{200}{0.003} = 6.67 \cdot 10^4 \; N/m$$

TF_1 : Torque → Force:

From bond graph tables : $e_2 = n e_1 \Rightarrow F = n_1 T \Leftrightarrow T = \frac{1}{n_1} F$

radius

$\Rightarrow r_1 \cdot F = \frac{1}{n_1} F \Rightarrow r_1 = \frac{1}{n_1} \Rightarrow n_1 = \frac{1}{r_1} = \frac{1}{0.01} = 100$

radius

$\Rightarrow r_1 \cdot F = \frac{1}{n_1} F \Rightarrow r_1 = \frac{1}{n_1} \Rightarrow n_1 = \frac{1}{r_1} = \frac{1}{0,01} = 100$

TF_2: Force → Torque:

$T = n_2 F \Rightarrow n_2 F = r_2 F \Rightarrow n_2 = r_2 \Rightarrow n_2 = 0.04$

Screw

From B8000, Screw inertia $= 5.2 \cdot 10^{-5}$ oz. -in, -sec/in²

$J_3 = 5.2 \cdot 10^{-5}$ oz.-in, -sec/in²

with all the values for

16 oz = 0.45359 kp, $k_p = 9.81$ N, in = 25.4 mm

Giving:

$J_3 = 5.2 \cdot 10^{-5} \cdot \frac{0,45359}{16} \cdot 9,81 = 1.45 \cdot 10^{-5}$

TF_3: Torque → Force

$e_2 = n_3 e_1 \Rightarrow F = n_3 \cdot T \Leftrightarrow T = \frac{1}{n_3} F$

$\Rightarrow r_3 F = \frac{1}{n_3} F \Leftrightarrow r_3 = \frac{1}{n_3} \Rightarrow n_3 = \frac{1}{r_3}$

$r_3 = \frac{0,0253}{2\pi}$, $n_3 = \frac{1}{\frac{0,0253}{2\pi}} = \frac{2\pi}{0,0253} = 2.48 \cdot 10^2$

$k_2 = 75$ kN

Robot Arm

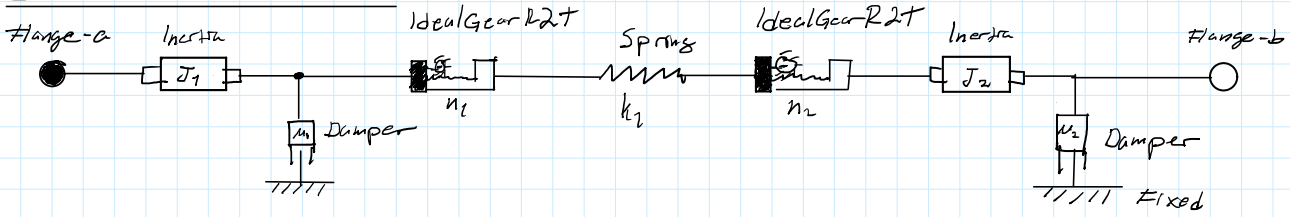
$\mu_3 = 25$ Ns/m

$m_1 = 5,5$ kg

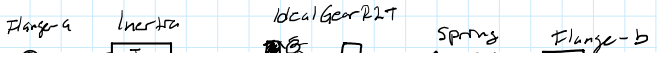
$F_1 = mg = 5,5 \cdot 9,82 = 54$ N

Preparation 3

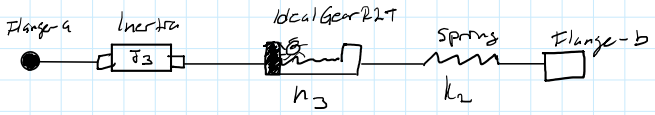
Belt transmission



Screw transmission



Screw transmission



Robot arm