TRABALHO 6:

Dados: $\alpha_0 = 0°$

$\dot{\alpha}_0 (t=0) = 0,2 \text{ rad/s}$

$C = 1785 \text{ N.m.s/rad}$

$J = 1300 \text{ Kg.m}^2$

$d = 5 \text{ m}$

▸ Cálculo de K_t através do gráfico: $K_t = \frac{F.d}{\alpha} \therefore \frac{100N.5m}{0,1 rad} \Rightarrow K_t = 5000 \text{ Nm/rad}$

▸ Somatório dos momentos:

$$\Sigma M = 0 \therefore \quad J\ddot{\alpha} + C\dot{\alpha} + K_t\alpha = 0 \quad \Big) \div J$$

$$\ddot{\alpha} + \frac{C}{J}\dot{\alpha} + \frac{K_t}{J}\alpha = 0$$

• $\omega_n = \sqrt{\frac{K_t}{J}} \rightsquigarrow \omega_n = \sqrt{\frac{5000}{1300}} \rightsquigarrow \omega_n = 1,961 \text{ rad}$

• $\xi = \frac{C}{2.J.\omega_n} \rightsquigarrow \xi = \frac{1785}{2.1300.1,961} \therefore \xi = 0,35$

▸ Como $0 < \xi < 1$, tem-se um sistema sub-amortecido:

$$\alpha(t) = A_0 . e^{-\xi\omega_n t} \cos(\omega_d t + \phi_d)$$

• $\omega_d = \omega_n . \sqrt{1 - \xi^2} \therefore \omega_n = 1,837\Omega$

• $A_0 = \sqrt{\alpha_0^2 + \left(\frac{\dot{\alpha}_0 + \xi.\omega_n.\alpha_0}{\omega_d}\right)^2} = \frac{\dot{\alpha}_0}{\omega_d} = 0,1089$

• $\phi_d = tg^{-1}\left(\frac{\omega_d.\alpha_0}{\dot{\alpha}_0 + \xi\omega_n.\alpha_0}\right) = 0$