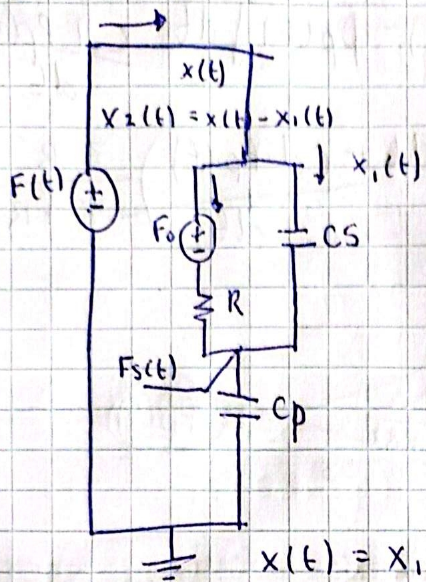
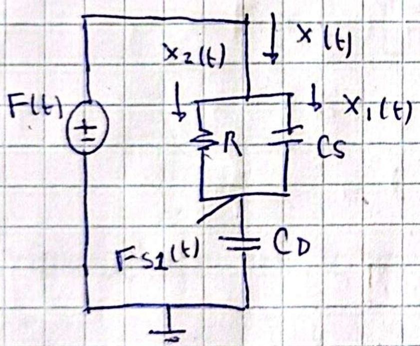
Práctica 4: Sistema musculoesquelético



$$x(t) = x_1(t) + x_2(t)$$

- Función de transferencia

Análisis apagando F_0



$$x(t) = x_1(t) + x_2(t)$$

$$x(t) = \frac{d[Fs(t)]}{dt} \cdot Cp \qquad x_1(t) = Cs\,\frac{d[F(t)-Fs(t)]}{dt}$$

$$x_2(t) = \frac{F(t) - Fs(t)}{R}$$

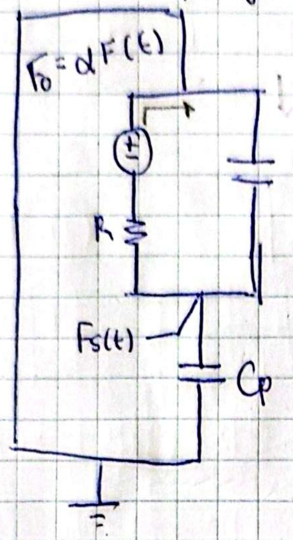
$$Cp\,\frac{d\,Fs(t)}{dt} = Cs\,\frac{d[F(t)-Fs(t)]}{dt} + \frac{F(t)-Fs(t)}{R}$$

$$Cp\,S\,Fs(s) = Cs\,S[F(s) - Fs(s)] + \frac{F(s) - Fs(s)}{R}$$

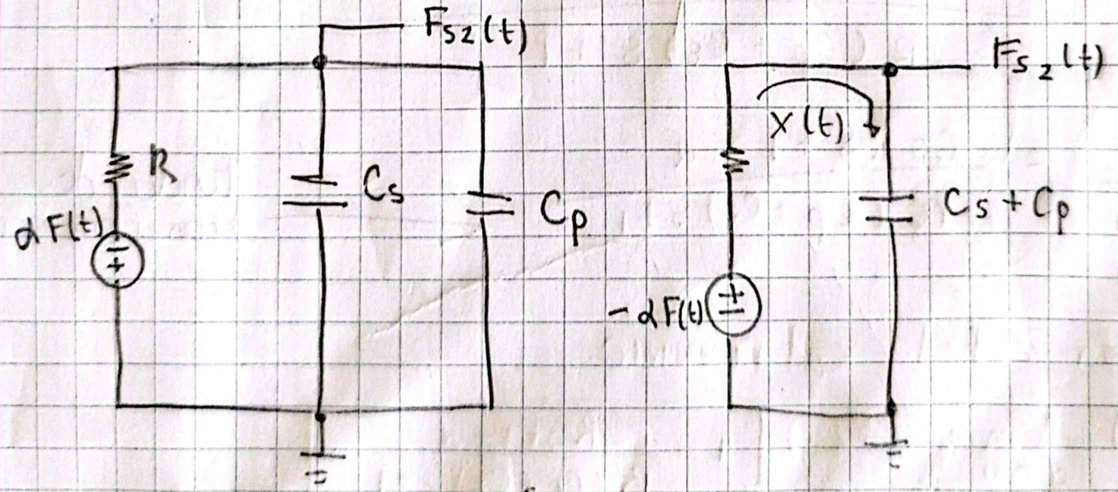
$$\left(CpS + CsS + \frac{1}{R}\right) Fs(s) = \left(CsS + \frac{1}{R}\right) F(s)$$

$$\frac{F_s(s)}{F(s)} = \frac{C_s S + \frac{1}{R}}{C_p S + C_s S + \frac{1}{R}}$$

Análisis apagando $f(t)$.



$$F_{s1}(S) = \frac{(C_s R S+1)\, F(s)}{R(C_s+C_p)S+1}$$



$$-\alpha F(t) = R\,x(t) + \frac{1}{C_s+C_p}\int x(t)\,dt$$

$$F_s(t) = \frac{1}{C_s+C_p}\int x(t)\,dt$$

$$-\alpha F(t) = \frac{x(s)}{(C_s+C_p)S} + R\,x(s) \qquad F_s(t) = \frac{x(s)}{(C_s+C_p)S}$$

$$F(s) = \frac{-R(C_s+C_p)S+1}{\alpha(C_s+C_p)S} X(s)$$

$$= -\frac{\dfrac{X(s)}{(C_s+C_p)S}}{\dfrac{R(C_s+C_p)S+1}{\alpha(C_s+C_p)S} X(s)}$$

$$= -\frac{\alpha}{R(C_s+C_p)S+1}$$

$$F_{s_2}(s) = -\frac{\alpha F(s)}{R(C_s+C_p)S+1}$$

$$F_s(s) = F_{s1}(s) + F_{s2}(s)$$

$$F_s(s) = \frac{(C_s RS+1)F(s) - \alpha F(s)}{R(C_p+C_s)S+1}$$

$$\frac{F_s(s)}{F(s)} = \frac{C_s RS+1-\alpha}{R(C_p+C_s)S+1}$$

Función de transferencia

D M A

Error en estado estacionario

$$e(s) = \lim_{s \to 0} s\,F(s)\left[1 - \frac{F_s(s)}{F(s)}\right] = \lim_{s \to 0} s\,\frac{1}{s}\left[\frac{1 - RC_s s + 1 - \alpha}{R\,(C_p + C_s)s + 1}\right]$$

$$= 1 - 1 + \alpha$$

$$e(s) = \alpha$$

$$e(t) = \alpha V = 0.25V$$

Estabilidad en lazo abierto

$$R\,(C_p + C_s)s + 1 = 0$$

$$\lambda = -\frac{1}{R\,(C_p + C_s)}$$