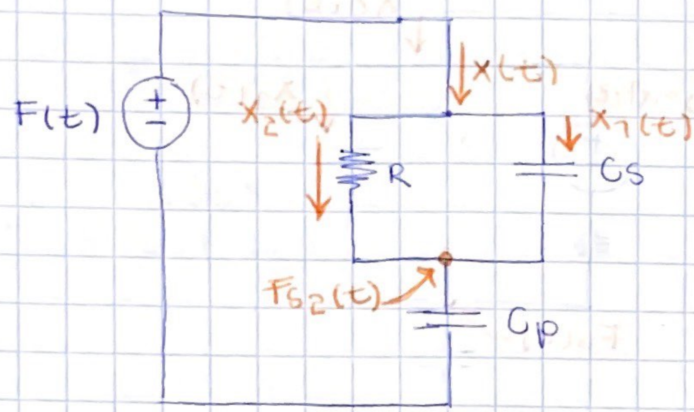
FUNCIÓN DE TRANSFERECIA



$$X(t) = X_1(t) + X_2(t) \qquad X(t) = \frac{Cp\, d[F(t)]}{dt}$$

$$X_2(t) = \frac{F(t) - Fs(t)}{R} \qquad X_1(t) = \frac{Cs\, d[F(t) - Fs(t)]}{dt}$$

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

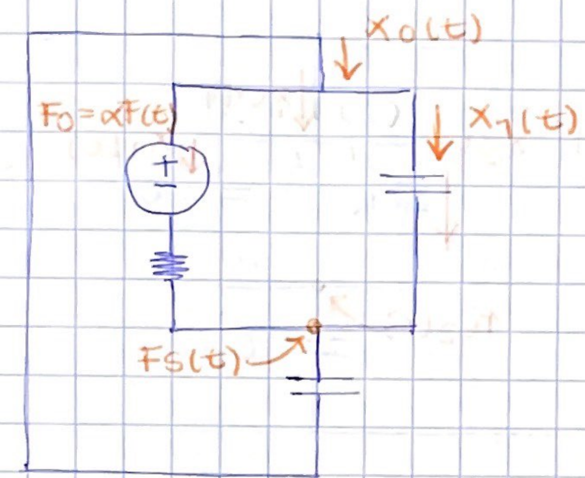
$$CpS\, Fs(s) = CsS[F(s) - Fs(s)] + \frac{F(s) - Fs(s)}{R}$$

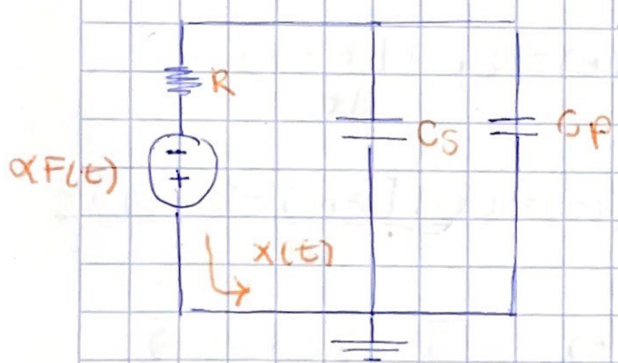
$$\left(Cps + CsS + \frac{1}{R}\right) Fs(S) = \left(CsS + \frac{1}{R}\right) Fs$$

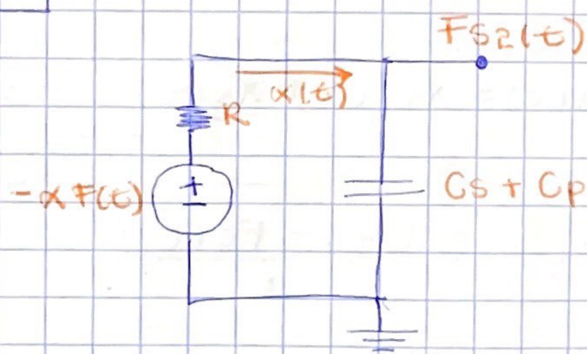
$$Fs(s) = \frac{\left(CsS + \frac{1}{R}\right) Fs}{\left(Cps + CsS + \frac{1}{R}\right)}$$

$$\frac{Fs(S)}{Fs} = \frac{(CsR)s + 1}{(CpR + CsR)s + 1} \rightarrow$$ Funcion de transferencia

PRINCIPIO DE SUPERPOSICIÓN







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

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

Transformada de laplace

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

$$F(s) = -\alpha\left(Rx(s) + \frac{x(s)}{(Cs + Cp)s} \right)$$

$$F(s) = -\alpha\left(\frac{R(Cp + Cs)s + 1}{(Cs + Cp)s} \right) x(s)$$

$$F_s(s) = \frac{x(s)}{(Cs + Cp)s}$$

$$\frac{F_s(s)}{F_s} = \frac{\frac{x(s)}{(Cs + Cp)s}}{\frac{R(Cs + Cp)s + 1)\, x(s)}{-\alpha(Cs + Cp)s}}$$

$$\frac{F_s(s)}{F_s} = \frac{\cancel{x(s)}\cancel{(Cs + Cp)s}}{(R(Cs + Cp)s + 1)\,\cancel{x(s)}\cancel{((Cp + Cs)s)}}$$

$$\frac{F_s(s)}{F_s} = -\frac{\alpha}{R(Cs + Cp)s + 1}$$

$$F_{s_2}(s) = -\frac{\alpha F(s)}{R(Cs + Cp)s + 1}$$

$$F_s(s) = F_{s_1}(s) + F_{s_2}(s)$$

$$F_s(s) = \frac{(CsRs + 1)F(s) - \alpha F(s)}{R(Cp + Cs)s + 1}$$

$$\frac{F_s(s)}{F(s)} = \frac{CsRs + 1 - \alpha}{R(Cp + Cs)s + 1}$$

Estabilidad en lazo abierto.

$$R(Cs + Cp)S + 1 = 0$$

$$\lambda = -\frac{1}{R(Cs + Cp)}$$

$$Re\ \lambda < 0$$

El sistema es estable si $\lambda < 0$

...d en Lazo Abierto

$$\ldots 4ac$$

$$\ldots + Cp) \quad c = 1$$

$$\lambda_{1,2} = \frac{-R(Cs + Cp) \pm \sqrt{(R(Cs + Cp))^2 - 4(0)(1)}}{2(0)}$$

El sistema tiene una respuesta inestable porque $\lambda_{1,2} \approx \infty$

Error en estado Estacionario

$$e(s) = \lim_{s \to 0} sF(s)\left[1 - \frac{Fs(s)}{F(s)}\right]$$

$$= \lim_{s \to 0} \cancel{s} \cdot \frac{1}{\cancel{s}} \left[1 - \frac{\overset{0}{\cancel{CsRs}} + 1 - \alpha}{\underset{0}{\cancel{R(Cs + Cp)s}} + 1}\right]$$

$$= \cancel{1} - \frac{\cancel{1} + \alpha}{1}$$

$$= \underbrace{+\alpha}_{\parallel} \qquad e(t) = \alpha V = 0.25\,V.$$