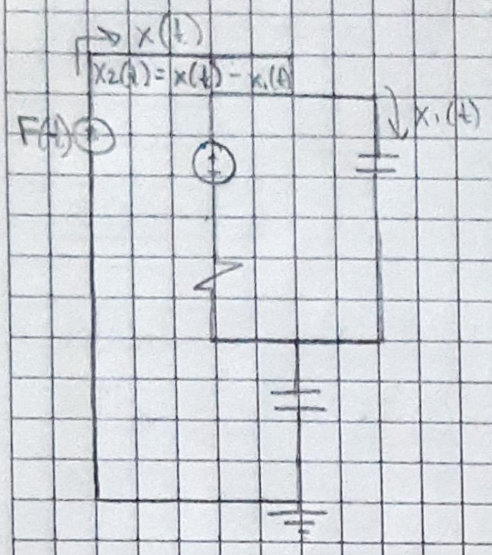
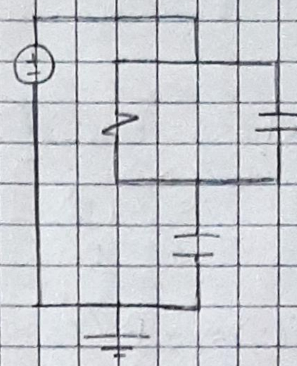
Circuito eléctrico



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

Función de transferencia

Análisis aplicando F_a



$$X(t) = X_1(t) + X_2(t)$$

$$\rightarrow x(t) = C_p \frac{d[F_s(t)]}{dt}$$

$$\rightarrow X_2(t) = \frac{F(t) - F_s(t)}{R}$$

$$\rightarrow X_1(t) = C_s \frac{d[F(t) - F_s(t)]}{dt}$$

$$C_p \frac{dF_s(t)}{dt} = C_s \frac{d[F(t) - F_s(t)]}{dt} + \frac{F(t) - F_s(t)}{R}$$

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

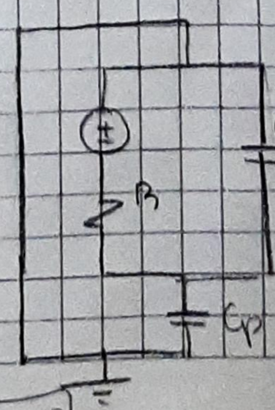
$$\left(C_p S + C_s S + \frac{1}{R}\right) F_s(s) = \left(C_s S + \frac{1}{R}\right) F(s) \rightarrow \frac{F_s(s)}{F(s)} = \frac{C_s R S + 1}{C_p R S + C_s R S + 1}$$

$$(C_p R S + C_s R s + 1) F_s(s) = [C_s R s + 1] F(s)$$

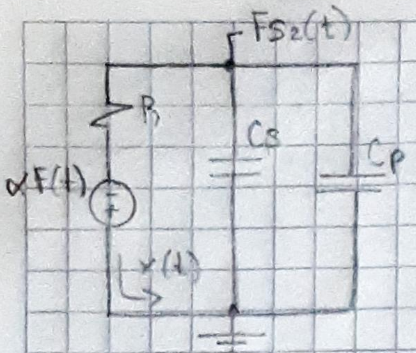
$$\frac{F_s(s)}{F(s)} = \frac{C_s R S + 1}{S(C_p R + C_s R) + 1}$$

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

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



ec. principales



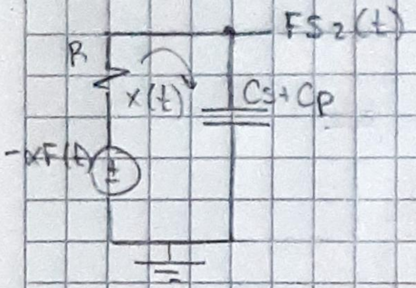
$$-\alpha F(t) = R x(t) + \frac{1}{C_s+C_p}\int x(t)\,dt$$

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

Laplace

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

$$F_s(s) = \frac{x(s)}{s(C_s+C_p)} \;\Big]\bigstar$$



$$F(s) = -\frac{R(C_s+C_p)s+1}{\alpha(C_s+C_p)s}\, x(s) \;\Big]\bullet$$

$$\frac{F_s(s)}{F(s)} = \frac{\dfrac{\cancel{x(s)}}{(C_s+C_p)s}}{\bullet\left[-\dfrac{R(C_s+C_p)s+1}{\alpha(\cancel{C_s+C_p})s}\,\cancel{x(s)}\right]} \;\Big]\bigstar = -\frac{\alpha}{R(C_s+C_p)s+1}$$

$$F_{s2}(s) = \frac{-\alpha F(s)}{R(C_s+C_p)s+1}$$

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

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

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

Error en estado estacionario

$$e(s) = \lim_{s \to 0} s\,F(s)\left[1 - \frac{F_s(s)}{F(s)}\right] \qquad F(s) = 1 \rightarrow \frac{1}{s}$$

$$e(s) = \lim_{s \to 0}\left[\cancel{s} \cdot \frac{1}{\cancel{s}}\left(1 - \frac{C_s R \overset{0}{\cancel{S}} + 1 - \alpha}{R(C_p + C_s)\overset{0}{\cancel{S}} + 1}\right)\right]$$

$$\underline{e(s) = \alpha} \;/\!/ \quad , \quad \underline{e(t) = \alpha V = 0.25\,V} \;/\!/$$

Estabilidad en lazo abierto , respuesta asintóticamente estable

$$R(C_p + C_s)S + 1 = 0$$

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