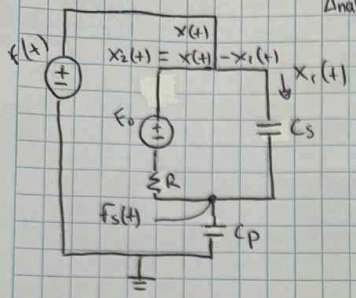
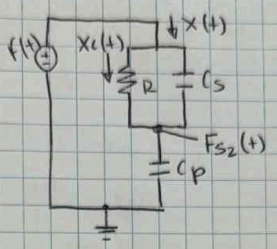
Circuito electrico

23-Oct-25

nodos = derivadas para capacitor

Analisis apagando F_0





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

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

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

$X_2(t) = \frac{F(t) - F_s(t)}{R}$ $\quad X_1(t) = C_s \frac{d[F(t) - F_s(t)]}{dt}$

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

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

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

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

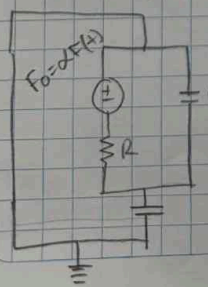
entrada

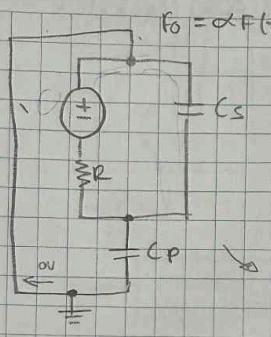
$$\frac{\left(C_p S + C_s S + \frac{1}{R}\right) F_s(s)}{F(s)} = \left(C_s S + \frac{1}{R}\right)$$

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

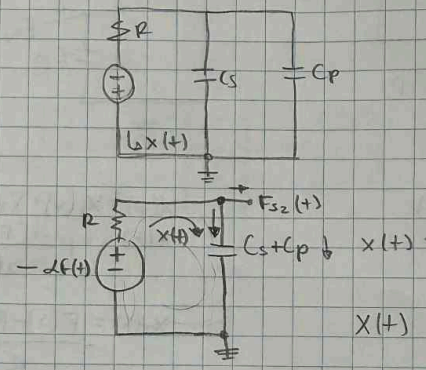
$$\frac{C_s R s + 1}{C_p R s + C_s R s + 1}$$

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





$$f_0 = \frac{\alpha F(t)}{R} + \frac{C_s \, d[F(t)]}{dt}$$



ecuaciones principales

$$\begin{cases} -\alpha F(t) \cdot R x(t) + \frac{1}{C_s + C_p} \int x(t)\, dt \\ F_{s_2}(t) = \frac{1}{C_s + C_p} \int x(t)\, dt \end{cases}$$

Función de trasferencia

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

2 $$F_0(s) = \frac{X(s)}{(C_s + C_p)s}$$

3 $$F(s) = \frac{R((C_s + C_p)s + 1}{\alpha (C_s + C_p)s}$$

4 $$\frac{F_s(s)}{F(s)} = \frac{\frac{X(s)}{(C_s + C_p)s}}{\frac{R(C_s + C_p)s + 1}{\alpha (C_s + C_p)s}} \cancel{X(s)} = -\frac{\alpha}{R(C_s + C_p)s + 1}$$

5 $$F_{s_2}(s) = \frac{-\alpha F(s)}{R(C_s + C_p)s + 1}$$

error estacionario de tarea
estabilidad de lazo abierto.

$$F_S(s) = F_{S_2}(s) + F_{S_2}(s)$$

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

final

P = 4.521195745054976

PID → I = 511.06202373227 3

Tarea

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

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

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

Función de transferencia

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

error estacionario

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

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

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

- Estabilidad lazo abierto

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

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

$\text{Re}\,\lambda < 0$

Respuesta estable

asintóticamente estable